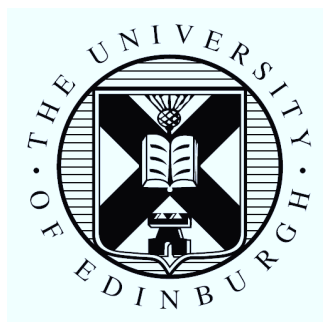


Media Literacy in Responsive Physical Environments

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Abstract

This thesis addresses the production of media literacy practices in physical environments. It reflects a specific trajectory through a design space. The work is founded on four studies including design sessions and expositions in primary schools and in an art museum. The focus is on how to devise practices and make the supporting media evolve by describing how people jointly make sense of media literacy tasks.

The thesis addresses research problems of interaction design and media studies by: (a) configuring interactive tangibles and audiovisual media, to give different perspectives on media literacy within the same physical environment; (b) developing a set of practices which are attuned to how participants collaborate when accessing and producing media texts; (c) developing the design method by employing practical knowledge from theatre practices.

The thesis tackles some specific design problems. One is that the qualities of the practices and qualities of the tools need to be addressed at the same time. Also, aesthetic and technical aspects often are indistinct. The thesis seeks help in some specific traditions in the performing arts. Some terms such as ‘participatory theatre’ and ‘masked performance’ are redefined in order to address both aspects of practices and tools. Terms such as ‘genre’, ‘framing’, ‘packaging’, ‘authoring’, ‘deconstruction’, ‘media agenda setting’ are also redefined from literature on media studies, through the production and study of collective activities.

The thesis aims to contribute to the integration of findings in interaction design and media studies by: (1) applying advances from interaction design for the support of new media literacy practices in the physical environment; (2) applying the perspectives on media literacy which emerge from these integrations in order to contribute to current research on interaction design.

The thesis applies practices from the performing arts in order to enable a participatory design of physical environments for media literacy. The focus is on the role played by audience groups when they adopt media contents and artifacts.

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Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification except as specified.

(Carlo Jacucci)

To Maria Teresa and Gianni

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Chapter 1

Introduction

Because literacies depend on the media, supporting media literacy with mixed media poses the question of whether and how changing the medium can support people in being more critical and in accessing the means of media production. The question is becoming even more relevant as the current development of ubiquitous computing and tangible interfaces is providing new means for the access and production of mediated representations in physical and everyday environments. This thesis develops a set of media literacy practices that are enabled by interactive tangibles and through the integration of new and traditional media. The study is based on field studies in different settings, including primary schools and a museum. It reflects a specific trajectory through a design space.

1.1 Motivation and vision

The design of interactive tangibles and spaces for media literacy cannot be envisioned, simulated or described ‘out of context’. In this study, the contexts are created together with the people whose activities are to be enabled and mediated. Hence, a problem concerns the need to develop technologies together with the emergence of new ways of working. New practices are devised and made to evolve, according to how people manage to make sense of them. The tools are designed in order to support the abilities to combine interactive media and resources.

Today, opportunities for people to manipulate multiple digital media (e.g., graphics, audio, video, text and animation) become quicker and easier. Also, the boundaries between media which traditionally were distinct (the internet, television, films, etc) increasingly erode. This phenomenon has been linked to various aspect of ‘technological convergence’ (e.g., Oliver 2000). In this specific case, it motivates the integration of different curricula in addressing media literacy in the large.

Past approaches to media literacy (e.g., section 2.1) advocated the need for learners to not only ‘decode’ media texts but also to *produce* them. However, those approaches treat the problem as that of providing learners with a similar – even if simplified – environment to that of professional producers. But a more sound exploration of the space of design possibilities should not consider that kind of a setting as the only source of inspiration. Also, one should take into account that such ‘simplifications’ bias the practices. In order to address these concerns, the following assumptions are set:

1.1.1 A design oriented approach to media literacy

For a long time, the term ‘media literacy’ has been used in debates about the competencies to critically analyse print and audio-visual communication (Livingstone and Bovill 1999, Buckingham 2005). Amongst the necessary skills that were advocated are the abilities to size and assess the relative value of information from different sources, and the abilities to understand the construction, forms, strengths and limitations of screen based content.

More recently, the concept of media literacy has been extended from its original focus on audiovisual media to encompass the internet and other new media (Livingstone 2003). There are extensive debates regarding new forms of literacy. They are differently termed: computer literacy, internet literacy, cyber literacy and so forth. In order to convey a multifaceted reality, media literacy has been defined as the ability to access, analyse, evaluate and create messages across a variety of contexts (e.g., Thoman 2003, Buckingham 2005). Not all the definitions of media literacy include the requirement to produce media texts. But there is general agreement

about the fact that people achieve a deeper understanding of the conventions and merits of media texts if they have direct experience of production (Livingstone 2003).

The arguments about media literacy have not focused only on critical readership of ‘receivers’ and of media ‘creators’. In general, debates over literacy are also about the practice and the purposes of public ‘participation in society’ (Livingstone 2003, Freire and Macedo 1987). The promise of media literacy is that “it can form part of a strategy to reposition the media user from passive to active, from recipient to participant, from consumer to citizen” (Livingstone 2003: 3).

In this thesis, the traditional principles which define the practical importance of *media literacy* will be reassessed and enriched by devising new practices for media literacy education. The practices are devised and supported by designing tools, tasks and conventions through practical attempts with people. In the design work, interactive tangibles and ‘digital augmentation’ of the physical environment are researched to provide new opportunities to address practices of media literacy education. Hence, the definition of media literacy that will be used here encompasses both traditional and new connotations of the term. Also, the research is design driven, and it addresses both aspects of technology and aspects of practical work.

1.1.2 A theatre-based interpretation of ‘participatory design’ and ‘action-oriented artefacts’

This study is exploratory in that it tries out different ways to integrate technological artefacts and environments as mediators of human activities. Also, the study *devises* the named activities. They constitute a product of the study. Activities are devised by engaging different groups of people – of different ages and in different settings – in practical tasks of media fruition and composition. Hence, the study aims to concurrently define the supporting role of technology in human activities and the nature of those activities.

This way of proceeding is intentionally chosen and is intended to be a contribution to the problem of supporting media literacy with novel uses of interactive tangibles and HCI. In fact,

related research often lacks practical investigations of what practices can be devised with users. The main difficulty is that, as developed further in the next chapter, literacies depend on the *media*, and, at the same time, the *mediating* role of technology depends on the activities.

As explained further in the next chapter, in tackling these problems, the present study follows basic principles of participatory design. The thesis specifically interprets these principles through practical methods in theatre. The motivations for employing such theatre practices are:

1. Innovation and the design questions need to be addressed by inviting audience groups to participate in interpreting and changing representations. They work needs to be attuned to those specific audience groups. Boal's (1979) theatre addresses similar problems.
2. It is necessary to rely on incomplete designs. Some of these designs have expressive qualities, and can mediate human action. There is a need to define a space of design alternatives to design and vary incomplete objects. These problems are analogous in the case of designing masks and directing masked performances (e.g., Lecoq 1997). In fact, masks mediate action. Also, they are "action-oriented" design tools in the sense that they can be used in action in order to devise other extraneous features, such as characters and scripts.

Practical methods in participatory design are employed in order to engage groups of people to collectively contribute to interpreting and changing design qualities. Practical methods in the design of masks and in masked performance are employed to rely on different qualities of 'incomplete' and 'mediating' objects in embodied action.

These methods characterise the ways in which the practical studies in the thesis:

1. do not assume the pre-existence of designated or classifiable ‘users’;
2. identify research questions through practical attempts in making sense of work and technology;
3. research people’s participation in developing technologies and practices.

In conclusion, the present work studies users and their work practices through practical attempts. Users and activities are not defined in advance, nor is their existence in the world, prior to the study, taken for granted. Also, the study does not assume that people know in the abstract what requirements technology should have, in order to support their practices, especially before they have had experience in the practices. The technological aspects, along with the ‘infrastructure’ of categories and conventions, which are needed to carry out and describe activities, are progressively defined through practical attempts. Hence, the studies are directed towards the description of activities. They aim to understand human needs in the activities.

The approach will point to devising human activity as a central concern. It will focus on the concept design and it will develop mock-ups and incomplete design artefacts, before regulating details.

1.2 Intended contribution to the literature

The thesis jointly addresses research problems of interaction design and media studies by:

- configuring tangible and digital media for media literacy practices;

- developing a set of practices which are attuned to how participants work;
- devising design methods that apply practical knowledge from theatre practices.

The thesis contributes to the literature by redefining relevant terms. The motivation comes from a major difficulty in the studies: that is, the fact that aesthetic and technical aspects are not clearly distinguishable. To this end, the thesis addresses qualities of the practices and qualities of the tools, and it redefines terms which permit the addressing of both aspects of practices and tools. Terms such as genre, framing, packaging, authoring, deconstruction, media agenda setting will be redefined from literature on media studies, through the production of collaborative inquiries. What readers are meant to take away from the present dissertation is a way of creating activities, and a documented set of alternatives, along with design principles, rather than implemented systems ready to be applied.

The more general aim is to contribute to the integration of interaction design and HCI with research on media studies and media literacy. In the studies, practical knowledge in theatre practices is applied to facilitate the integration.

The motivations in the thesis are attuned to current themes in research, in the media industry and in the arts. The current development of ubiquitous computing and tangible interfaces is providing new means for the access and production of mediated representations in physical and everyday environments. At the same time, the internet and other new media increasingly assimilate the traditional broadcast media. This opens a wider range of both needs and opportunities to learn about how to access, modify and produce media contents in a variety of ways. Hence, traditional and new studies on media production and literacy on the one side, and studies on HCI and interaction design on the other, increasingly need to integrate their practices, principles and terminologies.

In recent years, different design-based research works have proposed new applications and paradigms for an interactive access of the media. However, they have not addressed the need to integrate also 'media literacy' and media studies in the large. The vast body of knowledge on

traditional media studies, which concerns screen-based, linear, audiovisual media, is mostly neglected in interaction design research. Also, when focusing on literacy, research has often been limited to specific competences about the computational aspects of new media (e.g., Reimann et al. 2003) or on fruition of hypermedia, as, for example, with interactive narratives (e.g., Mazalek et al. 2002).

Also, recent research has not addressed a participatory design of environments for media literacy. Still, a neglected subject of inquiry, in these areas of design research, is the role played by audience groups, when they ‘adopt’ media contents and artefacts and assign to them a significance which is rooted in ‘needs’ and ‘uses’. There is still a need to research together with people what those uses can be, what meaningful practices can potentially be devised, before an interaction paradigm can be prescribed.

The thesis aims to contribute to the integration of findings in interaction design and HCI and research on media studies and media literacy by:

1. applying advances of HCI for the supporting new media literacy practices in the physical environment. These practices will be enabled by ways of coupling “traditional” and “new” media, which would not be possible without the digital ‘augmentation’ of tangible objects and spaces;
2. applying the perspectives on media literacy which emerge from these integrations in order to contribute to current research on HCI and interaction design.

1.3 The refinement of the research questions

1.3.1 Main questions from the literature review

The major terms reviewed in the literature review are synthesized in table 1.1.

Table 1.1: A synthesis of the terms and of the goals of the literature reviews

	Major aim of the review	Major terms
‘Media literacy’	To discuss why some aspects of media literacy, and media studies are addressed in the thesis more than others	Medium, literacy, authoring, deconstruction, access
‘Designing for participation and through participation’	To describe the sources in Participatory Design and Participatory Theatre from which the basic methods to elicit the participation of people are adopted. The problem of eliciting participation in design practices will be completed in chapter 3, which describes how analogous problems are tackled in the design and performances with certain types of masks in theatre	Participation, design
‘Naming the objects of design’	To employ a terminology to describe different ways in which the outcomes of design change the environment and the practices	Infrastructure, application unit, multiple representations
‘The design of interactive tangibles’	To relate core terms from the literature on tangible interfaces to the intent to devise practices of media authoring and deconstruction for media literacy	Augmentation, (digital/physical) coupling, control, representation

Concerning the definition of research questions, the literature review highlights major themes for investigation for the design of support for media literacy in physical environments. In particular, the following questions, also directed to the literature on HCI, are set:

1. *What practices to devise and study?* There is a need to explicitly discuss what practices can be enabled and supported.

This question will be refined in chapter 4, considering that in the case of designing tools for media literacy, a relevant question is how design choices impose generalisations or theoretical abstractions over the many, varied and often implicit ways that people create (whether or not they can be said to be authors).

2. *How information aggregates can be organised in a way that they can relate to media codes, conventions and formats?*

This question is addressed and articulated further in chapters 5 and 6. In particular, the question will be refined by asking: What counts as a digital information ‘element’? The designed artefacts should serve as physical manifestations of what particular kinds of digital media associations? What are the consequences, in relation to collaborative ‘authoring’, of researching associations with specific data or media texts, data aggregates, digital parameters, functions?

The approach in present thesis in addressing these questions recognises some specific needs:

1. *The need to enable ‘extra-ordinary’ inquiries* A tangible environment for media authoring or deconstruction should consider also different paradigms than those which characterise traditional interfaces to edit and produce media contents. Hence, it might constitute an environment where operations are not necessarily easier, nor quicker, but where some of the workings of media production or fruition can be uncovered in a way that would not be possible otherwise. So extra-ordinary practices and inquiries are to be researched as well.

2. *The need to couple traditional and new media* An appropriation of traditional media and of orthodox ways of media production is necessary. This is needed in order to equip participants with instruments which allow them to access the media according to traditional media literacy. At the same time, these tools need to be able to be adapted to the emerging purposes. Hence, the coupling of traditional and “new” tools and practices is necessary
3. *The need to ‘produce’ practices* A tangible environment for media literacy must be studied in relation to how people make use of the tools in practical accomplishments. Hence, a set of activities needs to be devised and studied. Other than the findings from the studies, the very practices constitute in themselves a product of the research.

In order to facilitate dialogue between the design research and the media studies, this thesis will use the term ‘media literacy’ to address the use of media which are either part of the broadcast or of the net. However, the focus will be on questions posed by the convergence of audiovisual, computer media, and the new interactive capabilities of the physical environment.

1.3.2 The framework derived from masked performance

In chapter 3 the questions are formulated and refined according to the suggestions from the framework inspired by approaches to masked performance. In particular, the refinement of the questions points forward to the different empirical studies in the following way.

In the pilot study, a main principle applied from the masks framework is the introduction of variations between expressive and neutral. Once expressive motives are imposed in design features, their possible applications can be researched by trying out variations along different dimensions: expressive (played) or neutral are two particular dimensions. In fact, in the pilot study cards were designed to constitute incomplete referents of digital representations. In the unfolding activities, their further characterisation served both the need for expressive intents –

for instance the collages – and for non expressive intents – for instance the negotiations between participants.

In the school studies in chapter 5, the main questions raised by the application of the mask framework are (1) *What is the role of neutrality?* and (2) *How to practice and take advantage from the introduction of variations of incompleteness in the designed artefacts?*

The first issue concerns the fact that, once an artefact has been designed to embody some characteristic features, one does not need to research only through an expressive use of those features. Characterisation can be researched also aiming for neutrality. In fact, in the school studies, tangibles were not only incrementally characterised in order to accommodate expressive or neutral tasks (as done in the pilot study). In the school studies, tangibles were also modified in order to be less characterised in order to express less.

The second issue concerns the fact that design relying on the incompleteness of artefacts is another dimension and the search for variations can consider both the world suggested by the incomplete form and the working of the incomplete form in the world. Another novelty in the school studies, compared with the pilot study, was the support for both expressive tasks with incomplete objects – such as the composition/decomposition of commercials with tangibles – and abstract/incomplete achievements using expressive (characterised) elements – such as the understanding of alternatives to video editing with specific video episodes, that is, the use of installations as abstract representations of film making.

In the study in the museum in chapter 6, the application of the mask framework led to asking: (1) *How can universality and uniformity in the designed artefacts be addressed?* That is, variations in the design features can be introduced by seeking universality of the actions performed with the mediating artefact. This can mean not only a search for uniformity of the artefacts with familiar features, but also a search of singularities in personal use in order to achieve behaviours that are understood by all. (2) *How can performances guide the search for design alternatives?* In fact, neutral, expressive (characterised) and incomplete (larval) designs are not defined as such in the abstract. They can be researched by trying them out in different

situations, which can be those performing activities in which one looks for universality/uniformity of action and interpretation, played characters, and imaginary features.

A further articulation of the questions concerning the principles in the mask framework through the studies in the thesis is synthesised in table 1.2.

Table 1.2: This table points to specific aspects of the studies in the rest of the thesis that have been researched through particular features of the masks paradigm

	<i>Composition work in installations as “building sites”</i>	<i>“Framing” and “packaging” of contents in tangibles</i>	<i>Abstraction and memory in the responsive and physical environment</i>
Neutral	How can interactive tangibles make the construction process more overt?	How can a neutral use of tangibles (non expressive actions on them) be favoured in order to display their packaged functions?	Neutral use of tangibles and their role in supporting abstraction and memory.
Larval	How can incompleteness of the tangibles be used in order to favour concurrency and reiteration in design?	How can incomplete but suggestive character of tangibles be put into use when digital content are framed in them?	How can incompleteness and larvality help to achieve abstraction?
Expressive	How the incompleteness of the tangibles be accommodated with the need for the achievement of expressive tasks?	What will the expressive achievements of participants in design sessions by the act of characterise tangibles be?	What is the use of tangibles as expressive designs in relation to abstraction?

1.3.3 The pilot study

Prior to the pilot study, a research question is formulated as a design problem: *How to transpose digital video editing in the physical environment, for media literacy applications?*

This question is posed with the intention of refining it through the empirical studies. In fact, the

main evolution of the research questions in chapter 4 follows the emerging need for a terminology to address the design problem. The pilot study evolved the tangibles and provided instances of specific practices. Some words and concepts adopted so far can be now discussed according to the observations: the ‘physical setting’, ‘inquiry’, ‘order’, ‘authoring’, ‘content’ and ‘container’, ‘literacy’ as ‘exploration’ and ‘expression’.

Further questions in chapter 4 are formulated for the definition of ‘literacy’. Because literacy refers to definitions of ‘reading’ and ‘writing’, which here are intended in their larger meaning, questioning related terms becomes relevant. Definitions of reading usually refer to such terms as ‘scrutiny’, ‘examination’, ‘recognition’; definitions of writing refer to terms among which are ‘indicating’, ‘showing’, ‘fitting’, ‘composing’, ‘qualifying’.

1.3.4 The two studies in the primary schools

In the first study, the research questions are articulated further by asking: (1) *what are the forms and roles of tangibles as tokens in media literacy applications?* This first study also addresses the design of tokens in conjunction with the act of devising practices. The pilot study opened different questions regarding tokens: what alternatives are available to physically design an object that can be used as a token? In the following study, ‘sealed’ or dynamic ways of allowing for its attributions to digital representations will be proposed.

Also, the first study asked (2) *how can tangibles be put into use as bricks (or building blocks)?* Tangibles are better defined as providing opportunities to build up in order to ‘shape’ or display a composition. In this chapter, the definition will be articulated further, by considering how such opportunities can include to fit, to mount, to join, to combine blocks, to shape by use of a block. In particular, the present study addresses how they can enable putting in place, positioning, and setting up and ‘installing’. In other words, how can they enable the ‘formulation’ and exhibiting through the action of assembling physically?

In the second study, the research questions are articulated further by asking: (1) *what are the forms and roles of tangibles as containers in media literacy applications?* In chapter 4, the

word ‘containing’ was used to point to tangibles’ functions, according to which they ‘lodge’ the representations, and the ways they incorporate or embody digital elements. Several questions concerning containers in the present environment were open in the pilot study. They will be addressed further in this study. How should a container collect, unite, or condense the contents? What should be manifest, and what should be hidden of the contained contents? How should a container strengthen or improve one’s control over the contained (hosted) elements? How should be contents be received and taken in?

Also, the first study asked (2) *how can tangibles be put into use as utensils?* Tangible objects or features of the physical environment can be ‘charged’ with digital properties. These properties can be representations, such as streams of digital recording or pictures. The pilot study in chapter 4 opened questions regarding the use of tangibles for the implementation of ‘operations’ in the physical world, such as ‘join’, ‘shrink’, ‘enlarge’, ‘shift’. The nature of these operators or ‘utensils’ will be addressed further in the present study. Because, in this view, tangibles need to be ready for ‘practical use’, they are concerned also with experience and actual use, not just with a theoretic use. This opened the quest for practical capabilities for tangibles, and their potential need to be adapted or adaptable for use.

1.3.5 The study in the arts museum

Because addressing the study in primary school has posed limitations, moving to the context of a museum, and with adult participants in design sessions enables the reformulation of some of the questions. A general question that is posed in this study is the role of installations as design tools. Other questions concern specific dimensions of tangible interfaces design, relating to media literacy. In particular, in the specific cases of three practical tasks of designing three interactive installations in the museum, design questions are set:

1. How can the environment be configured in order to enable scenarios of meeting between two people trigger the composition of an image (first installation)?

2. How can the action of composing videos with blocks be made to evolve into a coordinated event involving different people (second installation)?
3. How can composition through different media be enabled in order to support collaborative storytelling with physical objects and characters triggering video projections (third installation)?

Chapter 2

Media literacy and participation between digital and physical environments

This chapter reviews most terms employed in the present thesis, and reviews the literature from which they have been adopted. This exposition is in itself the proposal of an approach to deal with media literacy in responsive physical environments. It is motivated by difficulties and opportunities encountered in the practical work described in the following chapters. The design activities in this thesis are conceived as:

- leading to design features through practical attempts to create or reform practices;
- not only as rational and explicit but also as practically emerging in the form of activities;
- producing not only self-contained or intrinsically meaningful objects, but, more generally, as devising forms of cultural practices.

In this thesis design is conceived as ‘participative’. This will be intended mainly as: (1) devising design work as a collaborative activity, and (2) developing design concepts through

practice. Consequently, whereas this approach has the purpose of supporting both the phases of “observation” and of “design”, it does not consider these phases as necessarily separate. Also, design ideas are articulated into objects, infrastructures and activities. They include the description of a system and rules, procedures and conventions. In this way, design is intended as being more than *concept* design and more than the creation of a *scenario* for each design idea. As argued in the following literature review, the thesis addresses gaps in the literatures, and in particular:

1. the need to link work in HCI and Interaction Design with practical attempts to address media literacy according to core terms in media studies and critical pedagogy;
2. the need to ground the research in the description of specific forms of cultural practices, which have to be devised in participation with some specific audiences.

Section 2.1 will refer to literature on media studies, media literacy and critical pedagogy. It will further discuss ‘mediation’ and ‘literacy’ in order to introduce the view on ‘media literacy’ which is addressed in the rest of the thesis. This will lead to the theme of the supporting technology and, in particular, to the theme of interactive tangible media. A recurring observation across the reviews is that the pedagogical interests, and especially those addressing the role of mediating artefacts, still need to be discussed in relation to specific human practices. Hence, section 2.2 proposes a design approach focusing on devising practices, as much as on the implementation of self-contained technological tools. The approach is necessarily participative, as practices cannot be designed in the abstract, but also because the approach to media literacy taken here relies on forms of participatory theatre.

The concepts employed will be reviewed from literature on participatory design and will be interpreted, for the context of this thesis, through practical knowledge in specific forms of theatre. The approach is motivated by difficulties encountered in the studies in this thesis in orchestrating design work. These will clarify the relationship between ‘design’ and

‘participation’ to address media literacy in physical environments. The theme of design will also introduce the problem of defining what aspects of practice and the environment are considered as being included in the ‘object of design’. Section 2.3 introduces the complexities encountered in the practical work, and the terminology adopted in this thesis to describe them.

Considering the objects of design will lead to focusing on the technological aspects that are in the scope of this thesis. That is, ‘interactive tangibles’ and various forms of ‘digital augmentation’ of the physical world. Different conceptual framework have been proposed to describe how tangibles relate to people’s behaviour and to core cognitive abilities. The review in section 2.1 addresses core terms from the literature on tangible interfaces, with the intent to relate them to the application proposed in this thesis, which is the devising of practices of media authoring, in contexts of collaborative work and learning.

2.1 Tangibles and embodied interfaces

The aim of this section is to review the terminology to address the design of interactive tangibles which, in the studies in this thesis, will be put to use to support media literacy practices. In order to motivate the review, two design goals, which were found in the design sessions, can be put forward. As practically researched in the studies from chapter 4, two design problems question how to design:

1. representations and physical artefacts that can be aggregated in the physical environment in order to enable compositions in other modalities. This is researched to make goals and actions shared between people, as well as to enable new actions;
2. physical representations which enable different degrees of abstraction, which is important in order to delay commitment to definitive compositions and to detail.

The main problem in the design work in this thesis is how to devise media literacy practices with the interactive tangibles; what infrastructures to provide; and how can one support, tutor and instruct the practices. Hence, the nature of human practices is at the centre of the design problem, as much as the design of the visible, tangible and interactive features of technology. This is not always the case in the research reviewed below. An aim in this thesis is to contribute to the wider discussion by devising practices and describing some of the ways in which people can appropriate the tools in their activities. The review will briefly discuss some of the terms employed in literature on interactive tangibles, in order to link the present work with the theories.

2.1.1 Common areas and classifications

Systems addressing objects and infrastructures across digital and physical domains are usually classified according to historical design-driving propositions, such as ‘augmentation’, ‘ubiquity’ and ‘mobility’, ‘constructive assemblies’ and ‘tangible interfaces’. The definition of ‘tangible interfaces’ used in this thesis is that proposed by Ullmer and Ishii (2000). It relies on the (static or dynamic) coupling of physical objects with digital information, such as digital media, digital attributes, or computational operations. Whereas the definition originally proposed by Fitzmaurice et al. (1995), emphasises the ‘seamless integration of representation and control’.

One of the first instances of tangible computing which explicitly researched HCI issues with interactive tangibles was a ‘graspable user interface’ called Bricks, (Fitzmaurice et al. 1995). It consisted of bricks (similar to LEGO bricks), which could be ‘attached’ to virtual objects. So they made virtual objects physically graspable. Two main aspects which were foregrounded by Fitzmaurice et al.’s work were:

1. the increased possibilities for parallel input specification by the user. In this way interactive features in the physical domain can improve the expressiveness or the communication capacity with a computer;
2. spatial manipulation and spatial reasoning. These were traditionally internal computer representations (MacKenzie and Iberall 1994).

In these earlier instances, the design of interactive tangibles was described according to how it constituted a move away from traditional graphical interfaces based on desktop computers. This is not common anymore in current literature. Also in the context of this thesis, the design work does not aim to relate to desktop computers and traditional GUIs.

Other important concepts relating to Ullmer and Ishii's definition address the nature of physical-digital 'couplings'. They bring to bear 'space', 'representation' and 'control' in more complex relationships. Tangible interfaces use *spatially reconfigurable* physical artefacts as *representations* and *controls* for digital information (Ullmer and Ishii *op. cit.*). For instance, in the mediaBlocks system, described in (Ullmer et al. 1998), physical blocks can be used to capture, transport, and operate playback mechanisms for moving on-line media between different media devices. They act as containers for lists of images, video, and other media. Operations are associated with slots, racks, and pads of media-Block devices (*op. cit.*).

The range of interpretations for physical-digital couplings that have been recently implemented is much broader. But, beyond what designs are technologically feasible, there are few field studies that address how these artefacts can have a role as tools or media that change human practices. A detailed description of activities that reinterprets the common terms employed to describe them – as, for instance, the terms 'composition', 'authoring', or 'editing', for the cases of video production – have not been provided.

Location of interaction

In its first definitions the field of ‘ubiquitous computing’ was concerned with the migration of computing off of the desktop into contexts within the physical environment. The idea of ‘migration’ still has a bearing in current perspectives named after the first vision. It determined an evolutionary trajectory of design ideas, moving from common graphical user interfaces into physical contexts. In fact, ubiquitous computing research has mostly adapted graphical interface approaches to new physical devices and contexts.

An opposite trajectory has been followed in a complementary perspective, which is that of ‘augmentation’. The terms ‘augmented reality’ or ‘computer-augmented environments’ traditionally refer to the role which computationally mediated features (‘augmentations’) play when applied to physical artefacts. For instance, augmented environments have been referred to as those which merge electronic systems into the physical world instead of attempting to replace them (Welner, Mackay and Gold 1993).

Another perspective takes its driving principles from the architectural world. In the contexts of architectural spaces, ‘co-located cooperative interaction’ has defined the interest of the area of ‘cooperative buildings’. Along this perspective, research focus on the nature of situated relationships which interaction establishes in architectural spaces, such as those defined by rooms, furniture, walls, doors and windows (e.g., Streitz et al. 1999, Streitz et al. 2001).

Even if it merges categories from a variety of contexts, the concept of ‘tangible interface’ still concerns the properties of an ‘interface’, intended as a collection of means which enable interaction. In general, in tangible interfaces, this has been intended as a system of representational physical artefacts. The goal of providing supportiveness for physically contextualised interaction has been addressed by different research areas, and by relying on different conceptual tools. A classification resonating with most literature would distinguish the following non exclusive categories.

Tangible interfaces

Ullmer and Ishii (2000) define tangible interfaces as systems that use *spatially reconfigurable* physical artefacts as *representations* and *controls* for digital information. Today, most devices necessarily involve some form of representation and control through physical artefacts. (This does not hold in those contexts in which people stop using their hands to operate and use other means, such as eye movement, voice, or others.) But still, according to Ullmer and Ishii's definition, not every computational device falls within their category. In fact, the emphasis in their definition is on representation, control and a spatial way of configuring the coupling between them.

The most obvious feature of conventional interfaces is that interaction is mediated in visual forms, with simulated virtual objects that have no real physical embodiment. Whereas, in tangible interfaces, *spatial reconfigurability* and the other two design aspects foregrounded in this definition – that is, *representation* and *control* – are further detailed in terms of *embodiment* and *manipulation* (*op. cit.*).

A consequence of this definition is that digital information or functionality is somehow embodied in physical form. Having conceptualised these aspects, research has taken different directions. Ullmer and Ishii (*op. cit.*) focus on the modalities by which people perceive and interact with digital information; in presenting a conceptual framework intended to inform and inspire the design of sensor-based interactions. Rogers and Muller (2005) address the problem of facilitating exploration and reflection.

Also in other work (e.g., Ullmer et al. 1998, Ullmer and Ishii 2001) *physical interfaces* are referred to as including physical objects that can be used both to represent and control digital information. In their work on conceptualising tangibles for learning, Marshall, Price and Rogers (2003), highlight differences between technologies and styles of interaction with tangibles and to explore educational implications. Ullmer and Ishii (2000) divide the current design space of tangible interfaces into three main approaches: 'interactive surfaces', 'constructive assemblies', and 'tokens+constraints'.

Interactive surfaces constitute bi-dimensional spaces where physical objects can be manipulated. The computational mediation in these contexts is achieved by the electronic tracking, computational interpretation and graphical mediation of objects' presence, identity and configuration. This is how they make clear that tangible interfaces are generally composed of *discrete* physical artefacts.

In this case, design is directed towards choices about how to divide the interface into multiple distinct physical elements. Each element has its own digital bindings. Hence, the scope is not much on how to physically aggregate diverse functional elements into complex integrated devices. In order to understand how this is done in other research, it is worth considering related areas, their origins and driving principles.

2.1.2 Representation and control

The literature on interactive tangibles provided different alternatives for coupling representation and control. The embodied nature of the tool on which a person exercises control can be more or less clearly in relationship with the nature of the behaviour of the controlling action.

Researchers in HCI refer to 'direct manipulation' interfaces (Hutchins et al 1986, Shneiderman 1983). Hutchins et al. (1986) addressed the properties of what they called *direct manipulation* interfaces. They identified two components of the directness of manipulating actions. One is the degree to which actions on the interface map onto displays in an articulated way and interactively. The other is the degree to which it is possible to express intentions onto the tangibles, which they termed *semantic directness*.

Articulatory directness refers to the extent to which the behaviour of an action on the interface maps directly on a display. In other words, a system has articulatory directness to the extent that the form of the manipulating action on the interface mirrors the corresponding behaviour on a display.

Semantic directness in Hutchins et al.'s analysis referred to the extent to which the meaning of a digital representation mapped onto the physical referent in the real world.

In terms of tangible user interfaces, similar analyses have been carried out concerning the mapping between (i) the form of physical controls and their effects and (ii) the meaning of representations and the objects to which they refer.

2.1.3 The role of embodiment in action: expression vs exploration

In considering how tangible approaches to computing allow work to be *embodied* in the everyday environment, Dourish (2001) develops a notion of embodiment which emphasises the role of practical engagement with the world in the creation and sharing of meaning.

The characterisation of embodiment as a state of direct engaged action has its roots in phenomenological philosophy, particularly in Heidegger's (1996) notion of 'readiness-to-hand'. This concept refers to the way in which, when working with a tool or representation, one is not focused on the tool, but instead focuses upon the task it is applied to. Dourish's notion of embodied interaction is concerned with how meaning is coupled to actions, objects and representations. Dourish argues that technologies designed in this way must enable a *user* to view them at different levels of meaning, in order to understand how they are coupled to the world.

Depending on the situation, tangibles that are 'ready-to-hand' can become 'present-at-hand'. This can favour rationalising, objectifying and abstracting activities (see the review by Chalmers 2001). Marshall, Price and Rogers (2003) also review these categories, to point to differences in the ways users can attend to the tangibles in a present-to-hand manner, and use two classes of tangible systems: expressive and explanatory. In doing this, they apply Mellar and Bliss' (1994) categorisation of ways children can learn with scientific models.

They distinguish between expressive and exploratory tangible systems. An *expressive* tangible system:

1. embodies aspects of the user's actions with the system. That is, it embodies some of the learner's behaviour either digital or physical, and
2. when users attend to the tangible as present-to-hand, they can focus on an external representation of their own activity.

Whereas, *exploratory* tangible systems do not embody the user's activity. When attending to this type of tangible as present-at-hand, the user will be more likely to focus on the way the system works, rather than reflecting on the history of their own interaction with it. That is, the learner explores a model presented by someone else.

Marshall et al. (*op. cit.*) also distinguish between types of reflective learning:

- Learning to use the tangible itself for some task. The learning in this case would be highly situated. That is it involves understanding how to use a particular tool in a particular situation. This is a *practical* reflective attention to the tangible. For example, "What can I do with this system?"
- The tangible entails a model of the world. That is, a *theoretical* way to orient to the tangible. In this case, the learner explores the model through interacting with the tangible. "How does this model relate to the real world?"

It is according to this tangibles classification scheme, that Marshall et al. (*op. cit.*) define the two ways that people (learners) can orient to a tangible: either working through it as *ready-to-hand* to complete a task, or focusing on the tangible itself as *present-at-hand*.

Such a distinction was also made relevant in Mørch and Mehandjev's (2000) distinction between application units (AUs) – which are usually in ready-to-hand tools – and multiple representations (MPs) – which are usually present-at-hand.

2.1.4 Interactive installations in museums and public places

Recent accounts of designing digitally augmented environments in educational settings or public spaces, such as museums, as in (Ciolfi and Bannon 2002, Ferris et al. 2004), point to relevant conditions for ‘shaping’ experiences and applying tangible interfaces. Concerning understanding how these media and tools can invite people to interact and explore, technologically augmented environments should provide clues, triggers or adequate affordances to make visible which actions the visitors are allowed to perform (Ciolfi and Bannon *op. cit.*). Moreover, they should support different layers of activity in a way that successive surprises and discoveries are encouraged (*op. cit.*). Such designing goals are then intimately related to understanding the nature of these activities.

2.1.5 Media authoring in spatial and tangible arrangements

Mackay and Pagani (1994) proposed solutions to combine the power of paper video storyboards with the full capabilities of video editing software. The system they describe, Video Mosaic, uses an augmented reality approach to extend the static information that appears on paper and provide it with active temporal dimension. One point of interest lies in transposing some of the editing in the physical space, while keeping doing some of the activities in a digital interface.

Another issue is how such an hybrid system can enable users to commit more flexibly to partial results. Relevantly to this point, Mackay and Pagani note that “Current tools tend to concentrate on the production of a final version, rather than on supporting the user in the development and exploration of ideas” (*op. cit.*: 168). However, in order to apply terms such as ‘sketch’, ‘version’, ‘editing’, ‘partial result’, ‘production’, or ‘exploration’, in a way that is sensitive to human practices, one would need to examine what kind of ‘authoring’ practices can be performed by users in a specific setting.

Sokoler and Edeholt (2002) have addressed the use of tangible 'videocards' augmented with interactive features via RFID tags, to enable new participatory design practices. Sokoler and Edeholt address the question of how to make the interaction with digital video snippets a more integral part of the overall collaborative activities during design-oriented workgroup meetings.

The videocards approach that they describe redefines aspects of video remote control for how their augmented objects (in that case, videocards) embed means for control of video playback in novel ways. As argued in (Iacucci et al. 2003), if similar kinds of video cards are used to enable authoring practices in spatial arrangements, then describing peoples' joint work for expressing and interpreting leads to new ways of defining the simple terms of media authoring. In particular one needs to address the specific ways in which users articulate their work in 'media authoring' in 'spatial arrangements'.

According to Sokoler and Edeholt (*op. cit.*) the persistent presence of artefacts not only makes possible a focused mode of engagement, but even a more subtle background mode of 'just being available'. The ephemeral and intangible nature of video playback stands in sharp contrast to the persistent and tangible qualities inherent to the physical design artefacts. If the physical objects do not have a structured way of approaching higher level tasks, either people engage in a focused process of watching a video snippet or do not interact with it at all.

2.1.6 Tangibles in education

This review addresses recent research on tangibles in education. This allows further discussion of some of the concepts introduced earlier in the review that are relevant for the use of these technologies with children and in education. Three major themes, which become relevant in the studies (chapters 4 to 6), are: constructive assembly systems, degree of control and tangibles and learning: limiting the interface. These are discussed in the following subsections. The degree of control, Constructive Assembly Systems, and Tangibles and learning: limiting the interface. Some considerations are attuned to Zuckerman et al. (2005), who provided alternative

frameworks to see a compound design space of TUIs. Many of these instances have been applied to education (Fishkin 2004).

Constructive Assembly Systems, and the interaction design concepts that arose from them are of interest for the present thesis, because they share design problem and opportunities. These will be reviewed here with particular reference to the application of tangibles in education.

Constructive Assembly Systems

Constructive assemblies are mainly concerned with the physical fit between objects, and the kinetic relationships between them. They are used to enable explorations through constructions and varieties of movement. They draw from LEGO™ and building blocks, and they are based on the fact of interconnecting modular physical elements.

Two examples are ActiveCube (Kitamura, et al., 2001), and System Blocks (Zuckerman and Resnick, 2004). Also, Topobo (Raffle, et al., 2004) is a unique instance that inherits the properties from both “constructive assembly” and “tangibles with kinetic memory”.

More relevant for media literacy applications is the *mediaBlocks* system (Ullmer, et al., 1998). It is a tangible interface for manipulating lists of on-line digital media such as video clips and images (Ullmer, et al. *Op. cit.*). The way this system differs from those mentioned above is that it provides a *relational interface* for managing abstract digital information. Even though the other spatial interfaces also allow for experiencing object arrangements, they are more consistent with daily life environments and configurations.

In this thesis similar concepts to mediaBlocks will be studied. The main differences lie in the fact that the emphasis will be on building and deconstructing films, by using installations as building sites or with interactive surfaces. Hence, the blocks will not be used to operate traditional video re-play functions. Instead, the activities will focus on the packaging of tangibles and their digital content to allow for the deconstruction of media texts.

In spite of these differences, some of the interaction design problems encountered in the applications of tangibles in education will become relevant. Some are related to their application for storytelling activities, as outlined below.

The degree of control

Couplings of tangible interfaces and classroom activities include narrative explorations and multimedia storytelling (e.g., O'Malley and Stanton 2002). The emphasis has most often been in providing immersive experiences through browsing and editing (almost always intended as composition) of multimedia narratives (Mazalek et al. 2002, Stanton et al. 2001, Dietz and Leigh 2001, Zancanaro et al. 2003, Africano et al. 2004, Alborzi et al. 2000, Rizzo et al. 2003).

Another example, *Sam the Castlemate* (Ryokai 2003, Cassell 2004), enables children to use a toy castle and its props storytelling. These systems, whether with a robot, stuffed animal or toy, support children as storytellers by allowing physical interactions.

But the question is not only the embodiment and the multimedia feedback. Among others, Ryokai et al. (2003) have discussed the degree of control. The storytelling activities are facilitated by allowing for a smaller degree of control, compared to that which would be technologically possible. The degree of control is an important design dimension, which will be discussed in the studies in this thesis. In the case of each one of the storytelling systems mentioned above, the discrete physical objects support storytelling activities by limiting in different ways the choices and the controls of the users.

Actimates Barney (Strommen 1998) is a system that has a *passive* and fixed degree of control over the tool. By contrast, a *constrained* degree of control is implemented in *Telltale* (Annany 2001, Cassell 2004). In this case, the pupil can control the interface to some degree and, for example, set the number of segments and the order in which they are put together. Another case of limited degree of control is Guha et al.'s (2007). Their model of children's storytelling uses Physically-Oriented Technology (SPOT). The SPOT model draws upon literature regarding current physical storytelling technologies.

Tangibles and learning: limiting the interface

Among applications of tangibles in learning contexts, Mazalek et al. (2002) focus on bodily movements in storytelling experiences. Stanton et al. (2001), use pressure mats, video-tracked and barcoded physical props to navigate stories with the KidPad, aiming to support the re-enactment of stories. Dietz and Leigh (2001) address collaborations about ‘narrative browsing’ and storytelling in DiamondTouch. Alborzi et al. (2000) focus more on story authoring and devise an environment which makes the sharing of results easy and immersive in “StoryRooms”. With the POGO World, (Rizzo et al. 2003) address the nature of composition of narratives (including editing activities) and the acquisition of ‘narrative competences’ in children, by researching an environment in which the tools embody ‘situated editing’.

One of the relevant design issues addressed by these systems is that limited interfaces have good qualities for children.

Neurosmith (www.neurosmith.com) has introduced a number of tangibles that use a design approaches including gestures and tangible features. These encourage embodied action, also with the use of music as content and display. The relevance for the present thesis is the way they emphasize sequencing and concepts of parallel/serial organisation and inclusion.

Similarly, but for storytelling, the *Telltale* system (Annany, 2001; Cassell, 2004) uses a physical worm to store audio sections of a story. Its body segments can be physically combined and sequenced to tell a story.

Interactive surfaces

In interactive surfaces, physical objects are manipulated by users upon a surface where the presence, identity and configuration of these objects is electronically tracked, computationally interpreted, and graphically mediated. In the different types of workbench layouts that have been researched, the meaning of *aggregation* of digital information has been defined in different ways.

In Fukuzaki's (1993), physical tokens have representational shapes and predefined functions. In these systems, tokens are mainly applied to invoke control operations of editing (for example, colour selection, erasing) or file storage.

Different works have made use of physical cards which can be charged with digital information. Examples are the 'hypercards' used in the transBOARD system (Ishii and Ullmer 1997), and the 'videocards' in (Sokoler and Edeholt 2002), and in the video authoring environment in (Iacucci et al. 2003). The differences between these systems include the amount of features in the environment in which the cards are used that is computationally sensed, scanned, encoded or interpreted. For example, the ClearBoard (Ishii et al. 1994) and the Collaborage system (Moran et al. 1999), included eyetracking, the tracking of movements or the scanning of physical annotations.

An important effect of these designs on learning practices is the induced relevance of the 'interactive' surface. The 'wall' or the 'board' becomes the privileged place for interaction and collaboration. In contrast, in the activities studied in (Iacucci et al. 2003), cards are moved, composed together, exchanged and annotated in a wider environment.

2.2 Participation in design and theatre practices

This section reviews the main principles of the design approach, to define the relationship between 'design' and 'participation' in the context of this thesis. The scope of this section is also to describe how these principles have been interpreted and influenced by practical knowledge in Boal's (1979) forms of participatory theatre. Here, Participatory Design as a concept and as a set of techniques has not been taken "off the shelf" as a method ready to applied, but reinterpreted in the light of the practice of Boal's theatre. This was favoured by the fact that during the same years in which the present study was carried out, the author was employed as actor and facilitator at the *Théâtre de l'Opprime* theatre company. Hence, the relation with the methods of Boal's theatre is discussed from the perspective of a personal competence, which was accidental, rather than on the basis of its relevance in the abstract.

A major goal of forum theatre, which resonates with the media literacy practices in the present study, is to direct a social inquiry through embodied interventions that modify an initial, unmediated presentation. The perception of the problem and the unfolding of the inquiry are to be attuned to the experience of a specific group of people.

The main drive for the choices made about the design methodology is the need to devise collaborative tasks as well as their supporting technologies. In these tasks, people are engaged in contributing to the design effort. As explained in the following, the attitude taken here is to describe how the theatre practice influenced the work *a posteriori*. As discussed in chapter 4, this contrasts with different perspectives taken in recent research, in which theatre concepts or procedures are explicitly appropriated in the first place.

2.2.1 'Participation' in Boal's theatre

The following description of forms of participatory theatre originated by Augusto Boal is selective. It aims at highlighting the analogy with the practical problem of engaging participants in designing for practices of media literacy in responsive physical environments.

Theatre forms developed by Augusto Boal

According to Boal (1979), the Theatre of the Oppressed (the overall practice including the specific forms of Forum Theatre, Invisible Theatre, and the introspective forms) has two fundamental principles.

1. First, it helps spectators to transform themselves into protagonists of a dramatic action staged as a form of theatre, in order to train them to not resign under oppression. That

is, spectators are engaged as subjects and creators, and ultimately into agents of social change.

2. Secondly, it is not limited to reflecting the past, but to prepare for the future, and to construct a model of future action.

Boal's conception is a radical move from the aim of merely representing reality through theatre. It aims to transform it. Also, the Theatre of the Oppressed does not aim to be only at the service of social change. It is meant to be part of it, to be its training, its analysis and its rehearsal. To this end, it needs to lead right to the construction of a model of future action.



a.



b.

Figure 2.1: Images from instances of forum theatre addressing forms of social oppression (a) or technology design (b)

Towards the end of the practice, there are new representations of action and conflict. They make sense to the group of people with which the work has been done. Part of the effort goes into trying to attune the representation to the audience which is present through interaction. The

practice tries to avoid 'scripting' as a sole activity and verbal debate is discouraged, as words can manipulate interpretations in a way that the direct experience does not. However, this work is not meant to be a substitute to debate. It is complementary to it, and can be used to inform it.

Figure 2.1.a shows a moment in a forum theatre from a project of the *Théâtre de l'Opprimé* in Bujumbura, Burundi; Figure 2.1.b is an instance of application of some of the procedures of forum theatre in the design of technologies and services (Strömberg et al. 2004).

The practical work of the joker in the forum theatre and in the training

The techniques and exercises in the Theatre of the Oppressed are about uncertainty and complexity. In the practice, the following points seem relevant here, among those emphasised by Boal (1979, 1995):

- the polysemy of images;
- the role of conventions in how people interpret images;
- the need to elicit and resonate multiple interpretations from the audience;
- the precision which is sought in this practice stems from the multiplicity of interpretations and opinions that are made visible;
- participants should be present both in the fiction of the theatre and in the reality of the images they create.

These goals are researched according to specific principles. There are specific approaches to research and attune multiple interpretations to a specific audience. This is a most critical aspect of the collective inquiry leading to a model for the future. These principles include:

- a) '*Osmosis*'. Participants bring their stories to the stage. On the stage such stories are reworked and generalised. They are attuned to the interpretations of the audience. Through this process, singular elements of individual stories acquire a symbolic, or conventional character. These are the forms through which they will enable the inquiry. Boal (1995) calls *osmosis* the 'interpenetration' between different stories.

The act of creating variations of the original versions enables the process. Hence, the act of replaying, and the act of repeatedly questioning the audience about interpretations, are only the surface manifestation of a deeper process. This leads to collectively performing, interpreting and generalising.

- b) '*Metaxis*'. The events in the Theatre of the Oppressed enable a state in which participants belong simultaneously to two autonomous worlds. That is:

- The images of reality. In fact, the practice involves the creation of scenes, which entail images of reality. Participants create these images, by embodying them.
- The real context (or, as named by (Boal *op.cit.*) the 'reality of the image'). In fact, participants become part of those images. Within them, they experience and drive real action on stage.

Boal calls this state *metaxis*. This is how the stage (the scenes) becomes the rehearsal space for real life. In other words, participating in a forum theatre show is not a pure aesthetic experience of 'fiction', nor a pure 'simulation'. It surely relies on the 'representation' of images of reality. But it relies on the experience of the real character of social relationships on stage. These features stem from the *embodiment* of action.

- c) '*Analogical induction*'. It is vital to begin with an individual account, but if this does not generalise, the joker must go beyond it by means of creating other images produced by other participants. Subsequently, it will induce a model which is disengaged from the singular circumstances. This model will contain the general mechanism (of oppression).

The performances can lead to 'analogical induction'. This term is used by Boal to mean that performances allow for a distanced analysis. They offer several perspectives, they multiply the points of view from which the spectators consider each situation. The facilitators do not aim to *interpret*, nor to *explain*. They aim to offer multiple points of reference. And these are researched by analogies from the experiences of spectators.

Problems in earlier attempts to transpose the practice in other fields

Since the 60's, 'Theatre of the Oppressed' (Boal 1979) was devised in Latin America as a political response to forms of oppression. The practice evolved in a context in which the motivations, the culture, the response of the audience, and the human condition were different from the cases proposed by design researchers.

A similar problem was highlighted outside the design context. When the practices of Boal were introduced in Europe, practitioners questioned the applicability of the method in the European context, where the forms of social oppression were different from its countries of origin. Boal himself, in the preface to the subsequent editions of *Games for Actors and Non Actors* (1992) posed the same problem. He made some clarifications about the applicability of the Theatre of the Oppressed in Europe, which started from the late 70's. In fact, during the last 30 years, the practice has developed in Europe by applying the original techniques, the exercises, the methods and the procedures, but with different styles, and not always meeting the basic principles defined by Boal.

Such carefulness motivates different questions about the application of this method in the context of technology design. Firstly, given that some of the techniques, exercises, methods and procedures of the Theatre of the Oppressed are applied in design, even without satisfying the basic principles, how should the terminology be redefined? Secondly, if the basic principles are not met, what gets lost of the practice, and does it matter? Thirdly, what aspects of the practice cannot be applied by a simple transposition? In order to address these questions, it is useful to review a terminology of participatory design, as indicated in the previous section.

Reinterpretation of Boal's theatre in the context of media design

Applying performing arts in design can go beyond applying concepts, rules and procedures. The potential links between participatory design and the performing arts are beyond the sole categories of forms of participatory theatre. The vast majority of approaches to performance training and production have, to varying degrees, and at various stages of their deployment, common objectives with participatory design.

In this thesis, the analogy between participatory theatre and participatory theatre contexts relies on the following similarities. Both types of practices aim to:

- create evidence through embodied action;
- give meaning to performances in relevant situations;
- foster people's creativity by trying out different ways of constraining their work;
- take advantage of practical constraints of the situation;
- focus on creating variations of the achieved forms and on reaching alternative interpretations;
- seek new meanings from associating unrelated material;
- look for contextualised feedback from audiences.

2.2.2 Participation in participatory design and in participatory theatre

Principles from participatory design

In reviewing principles of participatory design, Greenbaum and Kyng (1991: 4) identify four issues for design:

- The need for designers to take work practice seriously – to see the current ways that work is done as an evolved solution to a complex work situation that the designer only partially understands. This is relevant in this thesis, although the work practices are only partly pre-existing and established. They are mostly developed anew.
- The fact that we are dealing with human actors (Bannon 1991), rather than with cut-and-dried human factors – systems need to deal with users' concerns, treating them as people, rather than as performers of functions in a defined work role.
- The idea that work tasks must be seen within their context and are therefore situated actions, whose meaning and effectiveness cannot be evaluated in isolation from the context.
- The recognition that work is fundamentally social, involving extensive cooperation and communication.

More specific terms in participatory design research

A challenge for this thesis is to interpret these principle in a way to relevantly address the setting and the practical tasks. Among those who took forward the dogmas of participatory design, which aim at the direct involvement of people in the shaping of future artifacts, there is an increasing interest in the use of various exploratory design games to organise participation in participatory design projects (e.g., Brandt 2006). However, the games, or theatre practices that are applied must be contextualized in the setting and according to the practices. In the case of this thesis, multi-user interactive environments which are not dedicated to a well established working practices, are in the scope. Because of this, some earlier application of participatory design for general purposes in public places become relevant.

In particular, today the use of participatory design practices that make use of multi-user, immersive, interactive environments (e.g., Brandt and Messeter 2004; Bodker and Buur 2002) intended for public display in public places are becoming more common. An example is *Bystander* (Robertson, Mansfield and Loke 2006), which addresses the context of museums and art galleries. Museums and public places pose a challenge for the access of the dominant media. Combining these contexts and participatory design also poses specific methodological problems, such as the role of video recordings for grounding the furthering of the design steps (e.g., Burr, Binder and Brandt 2000).

Relevantly, according to Lievrouw : “there is a growing tension, between a traditional view of the media environment, including new media and information technologies, as sites for the production, distribution, and consumption of media products, and an alternative view that sees the environment primarily as a venue for participation, speech, interaction, and creativity” (Lievrouw 2006: 115).

But linking participatory design to new media design is particularly difficult because of the variety of contexts that need to be taken into account. It is not a tool in itself that needs to be designed but a more compound cultural practice. Lievrouw (2006) reviews recent artistic and design practices which address major firms and cultural institutions that have dominated media

and information. These have been challenged by people adopting new technologies to intervene and participate in mainstream media culture.

The terms reviewed and proposed by Lievrouw (*op. cit.*) are relevant for the approach advocated in this thesis. Lievrouw discusses some key genres and features of oppositional and activist new media, and lists implications for participatory design. The most relevant practice discussed by Lievrouw is “culture jamming”, a technique that “mines” mainstream media culture to criticize it. The challenges for participatory design stem from the fact that these practices are ‘small scale’. They are also ‘interventionist’, in the sense that their creators aim to subvert commonsense or taken-for-granted meanings and situations. And they are ‘ironic’, playful, humorous, campy, or parodic.

Given these features, the challenge for participatory design concerns the access. Without access, participation is impossible. Lievrouw’s proposal is to look at two critical mechanisms which play a role in participatory systems design today: the reconfiguration of technological systems, and the ‘remediation’ of content. These two particular actions are interpreted and applied in this thesis, especially in the last two studies: the second school study and in the study in the museum. This is done in activities of media deconstruction, which is seen as a particular instance of ‘culture jamming’, according to Lievrouw’s definition.

Anticipation of problems encountered in the present work

These principles are interpreted in many ways across different contexts in which participatory design is practised. The particular approach taken in this thesis is motivated by some specific difficulties which were encountered in the practical trials. In particular the main difficulties were:

1. The tasks devised with participants are not part of well established work practices. In the cases in which they can be inspired by pre-existing ones – such as, for example, those of the media industry – it is difficult to adapt them with the media employed in this thesis.

2. It is difficult to engage participants in devised tasks without being too directive. It is difficult to create an environment in which people feel free to create.
3. The mediating tools and artefacts which enable the practices can merge with their own representations. In other words, system's descriptions and system's constituent parts are not always distinguishable. This is mainly because:
 - a. The aesthetic and the technical features of the environment cannot be always clearly distinguished. This was recognised also as a critical feature of environments for media literacy (see previous section).
 - b. The practical design sessions with participants relied also on mock-ups and abstract representations of parts of the system (this problem is detailed further with an approach proposed in chapter 3)
4. At different stages in the study, tools and artefacts need to be designed and put into use with different degrees of abstraction

Designing with 'action-oriented' artefacts

On the one hand, these four difficulties listed above motivated a particular way of implementing and using design objects. This includes the use of incomplete objects and mockups, as defined by Ehn and Kyng (1991). The approach taken here is inspired by some traditions in the design and use of masks in theatre – as explained in chapter 3. On the other hand, they motivated a way to organise and facilitate collaborative tasks. As mentioned above, this is inspired by some forms of participatory theatre, and is detailed below.

Among the various perspectives described in the literature on participatory design, the approach taken in this thesis is inspired by the one advocated by Ehn (1992). In particular, the following goals put forward by Ehn (*op. cit.*) are particularly relevant. Their adoption is motivated by the four difficulties listed above:

- a) To devise '*practices*'. In Ehn's view the emphasis of design is not so much in producing objects as it is in understanding their role in practice. 'Practice' is intended as being produced in cooperation with others. Also, it is important to capture what understanding of practice becomes socially shared. This is considered to be more relevant than formalisations which researchers can induce alone, from observation.
- b) To '*reform*' practices. There is an emphasis on the need to enable participants to reform practices. This is intended to be achieved by engaging people in 'design games'. So, designers need some rules with which to start, and need to be able to modify them. A relaxed set of rules is given, and, with time, new conventions replace some of the initial ones. Participants build their local versions.
- c) To treat system descriptions as design artefacts. This view rejects an emphasis on the "correctness" of system descriptions. According to Ehn, the crucial question is how we use them and how we share them in the design process.
- d) To research '*action-oriented*' design artefacts. Ehn emphasises the need to transcend some of the limits of formalisation, through the use of more action-oriented design artefacts. There is an emphasis on the need to determine their nature in action.

Participatory theatre in participatory design

Forms of participatory theatre such as those originated by Augusto Boal (1979) have a number of relevant points in common with the foundations of participatory design. The basic link between the principles of such theatre forms and the goals of participatory design can be found in the very foundational principles stated by Boal. These are (*ibid.*):

1. To engage people as protagonists in actions of social change;
2. To not limit the action to reflecting and debating, but to create and embody on stage a model for the future.

Several applications of concepts or procedures from Boal's forms of interactive theatre, such as the "forum theatre" and the idea of 'spect-actor', have been extrapolated and transposed to address the design of interactive technologies. Knowledge from forum theatre and similar forms has been applied to: participatory design (e.g., Tiitta et al. 2005, Dolonen et al. 2003, Strömberg et al. 2004); design paradigms for CSCL (e.g., Fjuk and Sorensen 1997); conceptualising "audience response" in the design of interactive media (e.g., Turley 1997). In particular, these works made use of the procedures of Boal's *forum theatre*.

In the contexts of designing interactive technologies, the driving motives which give meaning to the principles of Boal's theatre forms are missing. These are, for example, the struggle of a group of people to fight for social change under forms of social oppression.

Those who worked at a more theoretical level, and relied on the concepts of those theatre forms, left unspecified the substantial connection with the practice. For example, Turley (1997) reconsidered the idea of spect-actor, and considered how it "perfectly describes an ideal interactive experience for the multi-media audience". However, such concepts need to be reinterpreted in a context which lacks the main motives of the method. This thesis does not aim to transpose theatre techniques or procedures from one context to the other. However, the description of some principles can help accounting about how the work has been conducted.

In its original contexts, in 'forum theatre' shows the audience is invited to change the action in scenes on stage, in order to show how socially oppressed people can fight against specific forms of oppression, and change the conditions of their living. Members of the audience stop the action of the performance and try out their propositions by acting on stage, once they have taken the place of one or more of the original actors.

Influence of Boal's theatre in this thesis

In this thesis, the main motivation for learning from forms of participatory theatre is:

1. the need to find ways to create an environment in which people feel free to create;
2. the need to attune creative contributions to the experience and the needs of a particular audience of participants.

Such motivations are common in design research. For example, as reviewed above, according to the principles of participatory design, the design sessions proceed by engaging participants in 'design games'. The rules are defined at the beginning, but designers must be ready to change them. In particular, Boal's approaches developed a range of techniques and skills which aim at:

1. facilitating without directing;
2. not 'educating' nor 'instructing' participants but 'learning' with them;
3. working *with* participants instead than working *for* them.

Not all the principles that are applied in the studies in this thesis can be found in Boal's accounts (e.g., Boal 1979, 1992, 1995, 1998). The transference of methods and attitudes happened because of the similarities between the two contexts. That is, between the act of designing media and tools for the collaboration around media texts in physical environments and the act of devising and modifying embodied representations of human action through the participation of an audience. The aim of the following is to spot the similarities and describe how principles of participatory theatre and participatory design have been interpreted.

The knowledge about Theatre of the Oppressed that is applied in this thesis comes from work that was personally carried out with Augusto Boal's founded Théâtre de l'Opprimé of Paris. Such work consisted of eleven projects carried out with the Théâtre de l'Opprimé. They are those in which, either alone or assisted, the author worked as 'joker'. The projects took place between September 2002 and august 2005. Seven were carried out in neighbourhoods of

Paris and around France, two in Verona, Italy, one in Glasgow and one in Burundi. They all consisted in applying Augusto Boal's method to develop performances relying on people's stories and experiences over a period of about 8 days, and then staging a forum theatre show, to an audience sharing similar experiences of social oppression from the 9th day.

The projects involved different social groups. Of them, six were teenagers groups and five were adults groups. The work addressed different social conflicts: forms of oppression due to social conflicts in a prison, or related to drug dealing, sexual violence and problems of immigration (Paris neighbourhood and the provinces), educators' management of conflicts between the legal system, health system, the care institution and the family in cases of minors' forced displacement from their family (Melun, Paris), conflicts between the Italian health care system and a community of immigrants from Mali (in Verona), integration of orphans and homeless kids and problems of exploitation (in Bujumbura and surroundings hills in Burundi).

2.2.3 Naming the objects of design

The design work in this thesis extends to considering the nature of authoring and interpreting practices, as well as the tangible nature of the mediating tools and the environment which enable them. This requires a clarification of what elements are considered as being the '*object*' of design. In fact, these can range from abstract to concrete, from material to conceptual, from formal to informal and encompass also matters of convention.

Despite their variety of forms, here the objects of design are not extended to every aspect of the environment. In order to better clarify what is the focus of design and what is intended to be the outcome of the design efforts, the present section borrows some terms from recent research. They will permit reference to selected aspects of the design problem.

Two main design problems are specific to this thesis. They motivate the adoption of the terminology reviewed below:

1. The objects of design need to be treated differently depending on whether they work as ‘distinctive tools’ in practical applications or as part of a seamless ‘infrastructure’. Also, they can be seen and handled as ‘application units’ or as ‘representations’. Furthermore, they can switch from one category to the other, depending on the practice;
2. They evolve during the design work. Recognising and keeping track of their evolution can help having a better view over the range of possibilities, and being able to take advantage of their ‘predecessor artefacts’.

These points are developed further below, with the help of terms from the literature.

Designing for practice

As pointed out by recent research in Interaction Design (e.g., Norman 1988, De Michelis 2003), design needs to question even the most basic assumptions about use and utility. Among these controversies are: the fact that ‘simplification’ is not always desirable, the fact that ‘errors’ can have a virtuous effect, the need to ‘make use’ of constraints, and the ephemeral nature of ‘affordances’ (what objects suggest one might do – *afford* – with them). As a consequence, to assess the appropriateness of design choices is not straightforward, and it is relative to the nature of practices. In fact, when shifting between different practices, objects change their distinctiveness, their qualities, their capability to convey sense (De Michelis 2003).

Furthermore, objects do not have necessarily a single affordance. They can have multiple affordances, and these are frequently not aligned (De Michelis 2003). That is, they are not necessarily practically coherent. Aligning affordances is a difficult task. Disalignment of affordances can be an opportunity for design as much as its crisis. Their convergence annihilates innovation, and their divergence annihilates interaction. As a consequence, the aim of design is not necessarily to make things *simple*. It all depends on the practices. The

principles adopted in this thesis are attuned to the questions of research on the design of interactive tangibles. They are reviewed in section 2.1.

Objects, practices and ‘infrastructures’

The objects of design can extend to what is not immediately visible in practice. Some of these aspects might be not visible because they are intentionally hidden or because they are not material. A clarifying concept is what Star (1999) regards as the ‘infrastructure’: an ensemble of aspects which are designed along the process of making technology work in practice. Examples of such aspects are: standardisation, formal categorisation, design of networks, domain names, exchange protocols.

Information infrastructures provide the tools – words, categories, information processing procedures – with which we can generate and manipulate knowledge. They also reify particular configurations of work practice by shaping the world within which tools can be used (Star and Bowker 1995). Also, this conception of infrastructure simultaneously represents work and *effortlessly* supports it, making possible collective accomplishment (*op. cit.*). This relates to the more common meaning of the term *infrastructure*. That is¹: “a collective term of the subordinate parts of an undertaking; substructure, foundation. (Work) What a person does or did; an act, deed, proceeding, business.”

Star’s concept of ‘infrastructure’ is *relational*. That is, certain aspects of technology can become real infrastructure in relation to organised practices. Also, infrastructure depends on the point of view of whose work is supported by such technology. Consequently, we see and name things differently under different ‘infrastructural regimes’ (*op. cit.*). The resulting view on work-mediating artefacts is beneficial to informing design practices and to grounding an understanding of the role of technology in organised practices.

¹ The Oxford English Dictionary, Version 2.1 online.

Part of the ‘infrastructure’ are also all those results of decisions which: (1) are carried into infrastructural forms (i.e., those forms that permit the integration all aspects of structure and to make them ‘work’), and (2) are relevant to some way of *relating to* the infrastructure. In fact, various aspects of an interface (for example blank spaces) can be considered as an infrastructure, depending on how the interface is used. Another example are the results of categorisation which are adopted when designing technology. Consequently, one generally cannot know in advance what the ‘infrastructure’ will be, because (1) we cannot foresee all decisions that are carried into infrastructural forms, before seeing the system at work, and (2) we cannot foresee all the possible ways of relating to it.

The interest of considering these aspects – which are collectively called “infrastructure”, is not so much because computation is becoming embedded in commodities, as much as because all those aspects, from the moment in which they are infrastructures to some practice, are to be designed *together* with the new form of practice. This is because they are interrelated in the being *part of* an infrastructure (*op. cit.*). In this thesis, this problem will be approached through:

- Explicitly describing the words, categories, practical procedures with which participants can generate and manipulate knowledge. These will include particular *configurations* of work practices which shape the environment within which tools can be used.
- Taking into consideration also those design decisions which are carried out into ‘infrastructural forms’. These include for example, ‘encoding’ and ‘standardising’.
- Distinguishing between different *regimes* in which the infrastructure, which support the practice, is constituted by different subsets of a designed system.

‘Application units’ and ‘multiple representations’

In the studies addressed in this thesis it is important to capture the instability of design objects which, depending on the situation, can be seen as tools, containers, or representations. It is important to make design sensitive to their evolution. They are implemented in different versions, which range from abstract to concrete. Relevantly to this problem, Mørch and Mehandjev (2000) make a distinction between ways of seeing design objects, depending on how, in a particular practice, they are seen as being ‘usable’. They can be ‘application units’ (AU) when they are ready-to-hand (i.e., seen as to be used) rather than present-at-hand, otherwise they fall in the category of ‘multiple representations’ (MR).

In addition, Mørch and Mehandjev’s perspective treats the objects of design as evolutionary and orients design through the range of possibilities between concrete and abstract solutions. Also, they refer to the parts of an object as its ‘aspects’ for practical reasons. Aspects are ways to *see*, rather than to build, an object (*op. cit.*). Another issue addressed by their terminology is the nature of ‘predecessor artefacts’, and the evolution of them into AUs (Mørch 1998). Predecessor artefacts will be considered in chapter 7, when describing the objects and tools emerging from the practical studies.

According to the Star’s perspective reviewed above – that is, that of the ‘infrastructure’ – one uses different categories for analysis. Descriptions are based on aspects which are technical, organisational, and focus on learning and work. All those aspects which make activities *seamless*. But both perspectives can merge in those situations in which activities are not seamless. That is, for example, when an infrastructure stops being an infrastructure and becomes a collection of AUs. This can happen, for example, when there is a fault, or an unintended use or activity. These cases will be considered in chapter 7. They will serve to describe the combination of various designed features. In the context of this thesis, this is done, in particular, to distinguish between activities of *design* and *use*, because they frequently merge in the practical trials.

2.3 Media literacy education

Recent views on media literacy, emphasise that “Rather than just being technical or peripheral, media production must be simple and central to the learning process.” (Yildiz 2004: 1) In order to address this end in the case of this thesis, the following review relates core concepts from media studies to terms employed in Human-Computer Interaction (HCI).

The scope of the review is to address wider applications, which are advocated in the present thesis. That is, the growing need for practical approaches to design for audience participation in those cases in which media texts can be rearranged as *workable material* in physical environments. To this end, the review will rely on terms from media studies addressing the ‘new’ and the ‘old’ media, from structuralist and post-structuralist stances.

2.3.1 Literacies depend on the media

For more than a decade, the use of the terms *media* and *media literacy* cannot be regarded any more as specifically directed towards media types alone, such as word processors, phones, computers, video games, movies or television. It is commonly accepted that media literacy in general refers to a series of screens and other digital representations and tools, which people both access and manipulate in a constantly evolving stream of shared communication (e.g., Rushkoff 1996). In Rushkoff’s perspective, the terms “reading” and “writing” can be applied coherently to refer to how people produce different sorts of texts by composing images, sounds, and words. The experience of the world they get is not confined to a single competence. From these premises, one gathers that the term *literacy*, although sharing a meaning with the ability to read and write, should be extended to the competence to make sense of a wider meaning of the media. In fact, literature across different fields from media studies to learning has long questioned what are the appropriate descriptions of the various competences that make up a literacy in relation to the evolving media.

The choices on the terminology that are made in this thesis are outlined below. They have been motivated by a need to address the coexistence of old and new media in the environments which are considered in the practical studies. The resulting definition of *literacy* will not be accommodated in the first place. It will be debated until the last chapter, although different definitions that are found in different fields are indicated below.

2.3.2 Common terms in different approaches to media literacy

Media education movements have been founded with the explicit aim to pursue learning of media studies and ‘media’ literacy. The term media literacy traditionally refers to the broadcast media, but, at times, it is related to ‘digital’, ‘IT’, or ‘computational’ literacy. Published definitions of media literacy often refer to ‘decoding’ abilities, or indicate media text ‘production’ as an organic ability to be acquired by producing similar texts to those which are distributed through the broadcast media.

A more thorough definition, attuned to the cases in this thesis, should include detailed descriptions of types of inquiry, referring to specific forms of composition. It will still employ some of the common terms, as those in the following review. The review integrates concepts from different sources (Thoman 2003, Yildiz 2004, the *MediaLit Kit*²). Common definitions of media literacy found in the literature usually agree on some main points:

- *Construction*. A core goal of media literacy is to help people understand how the media is constructed. All media representations are created through processes of *selection* and *combination*, and in this sense are “constructed”. Such constructs mostly do not permit the perception of the arrangements that were left out. Media literacy should support

² MediaLit Kit™: A Framework for Learning and Teaching in a Media Age, Center for Media Literacy, available at <http://www.medialit.org> (last accessed on 31 August 2007).

people in questioning what has been left out, with what consequences and for what possible reasons.

- *Decoding media 'languages'*. The construction of mediated representations is often achieved through a creative language governed by rules and conventions, including *media codes*. Media literacy should help people understand the grammar, syntax, and metaphor system of such language. By doing this it should improve people's aesthetic experience of the media.
- *Different people experience the same media texts differently*. Interpretations depend on the experiences and the expectations of each reader. Hence, the details of interpretations usually differ in each reader. However, critical interpretation and analysis of media can potentially lead to convergence of outcomes of spectatorship in audience groups.
- *Media agenda*. Media influence opinions and modify what should be and can be debated. That is, not only do media texts have embedded values and points of view. They impact on the choices about what issues should be thought or talked about, thereby laying conditions for social action.
- *Commodification*. In traditional media, commercials and political propaganda are produced through commercial processes that aim to convince audiences in order to sell. At the same time they also sell the audience to the advertisers. Some forms of audience manipulation rely on principles of packaging, linking, and hiding that change the value or worthiness of information commodities, by creating new needs to know or to inquire.

Other current definitions of 'media literacy', across research fields in education, media studies and IT design, can be taken to set design goals. They still diverge on fundamental questions. For instance, there is no agreement about the existence of a single *literacy* that applies across a range of contemporary media (e.g., Buckingham 1993, Kress 2003, Messaris 1994). Other

questions concern the extent to which media can be seen to embody a form of *language* for which it makes sense to acquire some sort of *literacy*. For example, the controversy about the misleading analogy with print literacy has been addressed in (Buckingham, 1993: Chapter 2, Kress 2003 and Messaris 1994).

Definitions of media literacy range from functionalist to holistic ones. Some definitions, such as the one provided by the Office of Communication (London, <http://www.ofcom.org.uk/> last accessed on 31 August 2007). define media literacy as “the ability to access, understand and create communications in a variety of contexts” (Buckingham 2005, p. 3). These accounts refine access, understanding and creation according to functions of sensory access and specific media sources. At the other extreme, definitions of media literacy, as the one provided by Boles (2002), explain media literacy in terms of an holistic notion of ‘access’. Access is “...the ability of media consumers to respond to the dominant media, in the sense that they are able to produce their own texts and to have those texts acknowledged by the agenda setting media.” (*op. cit.*: 5)

This thesis argues that in the context of HCI research, both types of definitions can be usefully applied. But a grounding notion of inquiry needs to be chosen in advance. Definitions must be chosen to describe collaborative inquiries, in such a way that the descriptions can be attuned to those aspects that discriminate the supporting role of mediating artefacts and the infrastructure. For example, describing collaborative authoring practices needs to take into account the emergence of elements of the *infrastructure*, such as local conventions, procedures and rules. Such descriptions need to take into account their emergence in forms of collaborative inquiries. Then one can better understand the supportive role of technologies and the way technologies are designed together with practices.

Classroom approaches to media literacy

Classroom approaches to media literacy:

- have not taken advantage of interactive tangibles;

- have not explicitly addressed cross media studies;
- have not proposed accounts of *inquiry* that make explicit use of generative concepts and practices from media production;
- have not addressed core concepts from media studies, in a way that crosses disciplines and applied studies of one side to approaches on the other. For example, using rhetorical figures of advertisement in order to better teach documentaries production with tangibles.

Section 2.3 refers to relevant terms in the literature which are needed to address these points in the practical studies in this thesis.

According to the most common vision of media literacy influencing the practices in education institutions, classrooms should become “lively laboratories for critical thinking (analysis) and creative communication (production)” (Thoman 2003: 607). The advocated forms of ‘inquiry learning’ mostly concern the processes involved in creating meaning through media texts construction. It is generally recognised that:

- Media and popular culture, along with their many new and evolving forms and technologies, will necessitate specific tasks.
- Educators’ tasks to provide reasons for users to interpret rhetorical devices, verify sources, analyse, deconstruct.

According to Thoman (2003: 607), “Students know more about their media culture than the teacher does.” “[Teachers’] job is not to give answers but to stimulate more questions – to coach, prop, challenge, and open up an inquiry process that lets the learner discover how to find an answer.” “The power of media literacy lies in figuring out how the construction of any media “text” influences and contributes to the meaning we or others make of it.” These

principles rely on assumptions about education and about how students learn about their world and their role in it.

Models of inquiry

Various sources have proposed structured frameworks to facilitate focused research and critical thinking. Such a model is intended to be applied to various sorts of media texts: “a provocative short film, a television documentary, or an excerpt from a feature-film video that reveals a powerful moral dilemma”.

- a structured framework;
- supporting recognition of basic issues;
- providing strategies for developing subject content;
- helping to stimulate open questioning;
- encouraging to be intellectually curious about the world;
- demanding that learners find the proper tools for meaningful research and discussion.

What has been called³ the ‘inquiry model’ is a structured series of questions leading through the scrutiny of the application of the key concepts (as in Thoman 2003) and decoding exercises.

³ From the introduction to the *Media Literacy Resource Guide* published by the Ontario Ministry of Education in 1989 to guide the implementation of media literacy in language arts in Ontario high schools (URL: www.media-awareness.ca/english/resources/educational/recommended/books/media_lit_resource_guide.cfm last accessed on 31 August 2007).

In conclusion, concerning the views on critical thinking that are considered in classroom approaches to media literacy, several works recognise, as a typical mass-media issue, the blending of intellectual, affective, and moral responses. Hence, a commonly addressed issue in approaches to media literacy is the necessity to move back and forth between opposing points of view. These views have been based on dialogical thinking (Ennis 1962), which involves a dialogue or “extended exchange” between points of view or *frames* of reference.

Because students are immersed in media, the role of the teacher must be that of a facilitator and a co-learner. The teacher must help students to negotiate meaning, engage in inquiry and research, identify patterns, and create their own media productions. The basic method of media studies is that of a “spiral curriculum”, a concept developed by Bruner (1990). The fundamental principle of this method is that the key concepts of any discipline can be taught in some form to students at any level. Thus, concepts initially introduced in simple form at the elementary level are, in successive years, explored, developed, and extended in increasingly sophisticated ways

Media literacy addressed in design research

Research works on interactive systems and design have recently proposed the reliance on the development of ubiquitous computing and tangible interfaces to address selected aspects of media literacy education. In these works, the definition of media literacy is often adapted to the specific application that is designed. Because media literacy is a broad concept, and, in its broadest connotation, it includes digital and computational literacies, the possible interpretations are numerous. Two common types of these interpretations are directed towards digital and computational literacy, and towards interactive narratives. Compared with these cases, the focus of the present thesis is broader and differs in the method.

For example, Reimann et al. (2003) discuss the impact of self-made hybrid learning environments to establish a multidimensional media literacy involving different human senses, aesthetic objects and artefacts. In their case, it is the nature of digital media as “programmed entities” that is developed. Hence, the rationale for media *literacy* primarily concerned the idea

of making transparent informatic modelling. In the present thesis, instead, the technology and the programmed qualities are hidden in the environment. Literacy practices are directed primarily towards acquiring the abilities to uncover the working of the media as audiovisual, screen-based and linear. The set of additional skills, which are developed in order to work in the environment as a multimodal space, for collaboration, fruition and production, are not prescribed in the first place. They are consequent to the practical work.

Another area that has been addressed is that of multimedia storytelling systems, as in (Mazalek et al. 2002). Mazalek et al. coupled a tangible interface with a multiple viewpoint approach to interactive narratives. In that case, based on research on tangible interfaces and interactive narratives, physical objects and augmented surfaces were used as tangible embodiments of different character perspectives in an interactive tale. In the cases of the present thesis, the roles and the couplings between tangible embodiments and digital or conceptual representations are not set in the first place. They are regarded as objects of permanent inquiry and studied as emergent in people's practices.

'Critical' approaches and the form of collective 'inquiries'

In the common terms of media literacy reviewed above, the act of 'decoding' acquired a central character. The problems raised in the cross-media studies put in question the practical relevance of this term. This is, in particular, when such processes as remediation, selectivity, adjustment of ends to media become important in the fruition of the media.

When mentioning 'decoding' or 'encoding', or when defining media codes, the reference is often made to the broadcast media. But in general the term 'decoding' (also referred to as 'deciphering') draws from structuralist studies. The latter address the readership and understanding of the media texts as the interpretation and analysis of 'messages'. In these studies, messages are meant to be encoded by a *transmitter* and 'decoded' by a *receiver*. A relevant instance in the literature addressing broadcast media is the definition of 'aberrant decoding' as given by Eco (1972). However, in the view taken in this thesis, only the presence

of the texts is taken for granted. All the other terms, such as the presence of a message, or the nature and disposition of people involved, are discussed according to the situations.

Critical pedagogy

Perspectives of critical pedagogy have been recently proposed to define ‘critical approaches’ to media literacy. According to Johnson (2002), critical approaches to media literacy address both critical thinking about media in its social context, and technical and aesthetic training.

The main consequences are:

1. to see the aesthetic aspects of literacy and the technology of literacy as inseparable;
2. to interpret images as relative social constructions, and not as intrinsically meaningful;
3. to address communication as the ‘*production*’ of meaning.

The way in which these points are addressed in this thesis relies on two main assumptions, which will also be taken in devising practical tasks in the environment described in this thesis: (1) there is no true, essential meaning, and there can be no exhaustive reading or criticism, which can settle the interpretation of media texts once and for all; (2) we can persist in learning to read media texts differently, and we can help others to do the same by showing the mechanisms that make this possible.

These two assumptions call for an organisation of collective inquiries as negotiational and interactive achievements. They will be addressed in the practice by relying on practical knowledge in the forms of Boal’s interactive theatre (section 2.2). Other links between approaches to practical work in theatre and inspection of collaboration can be found in two themes which are reviewed below. One is Boal’s “theatre of the oppressed”, its roots in critical pedagogy, in particular in Freire’s “pedagogy of the oppressed” (Freire 1970); and in

Koschmann's approach to practice-based descriptions, which refers to a definition of 'inquiry' by John Dewey (Koschmann 2001).

This places an emphasis on the participation of learners in "the formation of the purposes which direct their activities in the learning process" (Dewey 1938: 67), and also on the concept of co-governance (Freire 1970). The foundations of these views can be found in Dewey's definitions on "education", which aimed at increasing the ability to perceive and act on meaning in one's society (Dewey 1916: 76), and prefigured an "epistemic approach to composition". Views on participation and of the active role of learners were developed in Freire's critical pedagogy (Freire and Faundez 1989).

According to Freire, the ethic of mutual development of critical teaching is not a one-way development, not "something done for students or to them" for their own good (*op. cit.*: 34). Rather, it is driven and justified by mutuality and co-governance (1970: 57). The studies described in this thesis take a particular practical approach to address these goals. The approach is derived from the practice of a particular form of participatory theatre, which is linked to Freire's 'pedagogy of the oppressed', which is Boal's (1979) theatre of the oppressed.

In participatory theatre forms such as forum theatre (Boal 1979), as in the present design context, a major goal is to direct a social inquiry through embodied interventions that modify an initial presentation. The perception of the problem and the unfolding of the inquiry must be attuned to the experience of a specific group of people.

The analogy is quite loose. In fact, it is not the principles, nor the procedures, nor the techniques that are applied in the present case. Rather, the guidance comes from a series of practical attitudes to further the collective inquiry through a progressive alteration of a number of *texts* also intended as performances. The main principles are reviewed in section 2.2.

2.3.3 Media ‘access’ as deconstruction and authoring

Media agenda

A technical notion of the term ‘agenda’ is used to refer to what body of debatable knowledge is made accessible through media fruition. Usually, the term agenda also denotes the order of importance among the elements of that body of knowledge. An alternative and more general definition refers to the effect of the broadcast media to the public opinion, thought and debate. Consequently, such ‘agenda’ can be ‘set’ by the media. ‘Agenda setting’, defines the context of mediation. It establishes the terms of reference and the limits of opinion and debate (e.g., Dearing and Rogers 1996).

Deconstruction

In this thesis the term ‘deconstruction’ will serve to describe forms of collaborative inquiries. For a comprehensive definition of deconstruction one should refer to the analysis of the work of Heidegger, Husserl and of western philosophy, as carried out by Derrida (1976).

According to those definitions, deconstructing practices seek to search behind the dominant expressions of texts, regarding these as serving to exclude subordinate terms. It will not be taken as a discipline or, even less, as a methodology. The most relevant aspects that can be imported from its original significance are:

1. the questioning stance it takes towards the most basic aspects of the problem of knowledge;
2. the way it researches interpretations by proceeding *practically* through reorganisations of texts and not by the sole conceptual interpretation of them;

3. its consequent provision of opportunities for motivating and enabling inquiries upon the preferred and the hidden readings of texts.

Deconstruction is not a conceptual work, even if it operates referring to concepts. Rather, it ultimately is a textual work. This is because (D'Agostini 1997):

1. its objects are texts;
2. it largely consists of rearranging them, more than producing new ones from scratch;
3. it interprets texts in the naïve evidence of what they say. Or when it relies on their deeper cultural evidence, it does not conceptualise their meanings, nor their communicative functions;
4. it is realised by the very production of texts by rearranging pre-existing ones.

In the literature on media literacy, the term deconstruction has been often used with a simplified and more practical meaning. Such a meaning is more similar to decomposition or analysis. In many cases it is intended as a conceptual work of analysis and criticism of media texts. An example of deconstruction intended in this way can be found in the advertisements deconstructions posted by the New Mexico Medial Literacy Project⁴.

It should be emphasised that such conceptual critical analyses were practiced long before anyone talked of deconstruction. Instead, a main distinguishing feature of deconstruction, intended according to its original meaning, is that it proceeds by using a text's constituent parts to create meanings, as opposed to formulate a critical interpretation by using other concepts explicitly. Also, it is meant to uncover meanings which are less apparent within the text (i.e.:

⁴ It can be found at: http://www.nmmlp.org/media_literacy/deconstruction_gallery.html (Accessed on 25 April 2007).

non dominant meanings). Because of this, it often results in an ironical practice, because it generates “non intended” interpretations (also called “aberrant interpretations” (Eco 1967)).

It is for these reasons that the term *deconstruction* is particularly inspiring for media literacy practices that are carried out through tasks of decomposition and reassembling of media texts. In this sense, the term is employed here to devise and study similar activities with interactive tangibles. In media studies, the term generally acquired a positive stance. For example, it has been defined as the process by which readers identify the elements that make up the construction of meaning within a (media) text (e.g., Boles 2002).

This is not a standard definition of deconstruction. The same definition could be used to define ‘analysis’, and deconstruction is a form of analysis. But analysis is not a form of deconstruction. One needs to instantiate a definition of deconstruction to the specific terms that are used to address collaborative inquiries mediated by interactive technology. Also, these definitions do not take into account the vast traditions and methods that have developed through history in the media and visual arts.

Different forms of ‘authoring’

By outlining problems and opportunities in practical attempts to devising media deconstruction with tangibles, one can open more the design practice to the contribution of artists in some specific practices in the visual and performing arts.

Ways of describing ‘authoring’ or, in general, literacy competences of participants in this thesis can benefit from the guidance of different terms about forms of media discourse production. The studies are design cases in which media texts are incrementally decomposed and rearranged by the contribution of different people. Hence, the focus will be on forms of participation. The observations will focus on smaller scale activities with which people achieve forms of media ‘access’ and ‘deconstruction’. They will be for example actions of media ‘framing’ or ‘packaging’ in physical environments.

Roles of the ‘media’

The review above shows how the focus of the present thesis is narrower than the project of defining media literacy in the large. As it will be clarified from the next chapter, the focus is narrowed down not only by the choices on terminologies around ‘media’ and ‘literacy’. Also the nature of the available tools which influence what media competences can be facilitated and studied.

The type of working environment addressed in this thesis is only one of the many possible. And certainly it is not identical to those employed in the media industry. It is simplified, and, as such, it is biased. Hence, the ways the environments can work as a support for media literacy must be studied in relation to that bias. Also, the very definition of ‘medium’, or ‘media’ needs to be discussed.

A consequent question is who should be in control of setting the bias. The goal taken in this thesis is that of achieving forms of participation in which an audience of participants can set the media *agenda*. The reason is not only a problem of power and control, or of merely overcoming traditional relationships between teacher and learner. As emphasised in the Introduction, the environment should permit to rely on and attune to the competences which people naturally acquire from media fruition. It should also be open to the evolution and appropriation of media genres and formats.

In the sense of the ‘broadcast media’, mediation refers to the processes of shaping and interpreting occurring between an event and the reporting of it by broadcast channels and formats (the ‘media’). These usually refer to traditional broadcast or news media, such as the press and TV. However, the term mediation is actually used to address also the effects of parts of those processes, such as selection, editing, emphasising, de-emphasising, rephrasing or framing. And these are not necessarily related to the traditional broadcast media.

Media can also refer to artefacts as tools, and their working as ‘extensions’ of man. In conclusion, media and mediation refer to both the *means* to accomplish objectives and to channels, filters, and framing devices or formalisations. As indicated in this review, these

phenomena are dependent on absolute and conventional aspects, and on practice. The definition of practice and participation is the object of the next section.

2.4 The finessed research questions

Ullmer and Ishii's (2000) definition of tangible interfaces emphasised the use of *spatially reconfigurable* physical artefacts as *representations* and *controls* for digital information. As the review has shown, *spatial reconfigurability* and the other two design aspects foregrounded in this definition – that is, *representation* and *control* – can be further detailed in a broad range of ways, in terms of *embodiment* and *manipulation*.

The research reviewed above has identified three main aspects in studying action on and through interactive tangibles. They are concerned with *representational* features, the role of *embodiment* and their relationship with *control*. Representation and control have been coupled and studied in different ways. Some of the relationships which have been addressed are metaphorical. Often they are relationships between the physical and digital representations. Embodiment influences how people focus on the tangible as opposed to on that which it stands for or which it controls.

The possibilities to enable control through tangibles have been researched by designing them purely as control devices, containers, referents of digital information, or as a mix of these. For example, the objects have been referred to as tokens to access information (e.g., Holmquist et al. 1999), or as generic physical objects as *containers* to move information between devices (e.g., Ullmer et al. 1998).

Research on design of interactive tangibles has addressed both the features of individual physical artefacts and the space in which they are used. In the literature reviewed above, which has addressed *embodiment* and *representation*, at least two common concerns are relevant to designing mediating artefacts for collaboration in the context of this thesis:

- interactive tangibles selective on what aspects of *manipulation* are sensed, monitored and mapped to corresponding digital interpretations;
- *reconfigurability* does not concern only forms of movement that are constrained into spatial features of a host device. Also the spatial reconfiguration of physical elements is needed.

In particular, for the case of supporting collaborative inquiries around the authoring and interpretation of media, the following gaps are foregrounded:

- *What practices to devise and study?* There is a need to explicitly discuss what practices can be enabled and supported. In the case of designing tools for media literacy, a relevant question is how design choices impose generalisations or theoretical abstractions over the many, varied and often implicit ways that people create (whether or not they can be said to be authors).
- *How information aggregates can be organised in a way that they can relate to media codes, conventions and formats?* What counts as a digital information ‘element’? The designed artefacts should serve as physical manifestations of what particular kinds of digital media associations? What are the consequences, in relation to collaborative ‘authoring’, of researching associations with specific data or media texts, data aggregates, digital parameters, functions?

In this thesis, the two questions are addressed by applying terms from media studies. In the following chapter, a perspective on media literacy will be discussed both to define what collaborative practices will be researched, and to have a terminology which permits the linking of technical and aesthetic issues when addressing the design problem.

The review of work on tangible interfaces had identified two main orders of problems that still need to be addressed. (1) The first concerns the need to explicitly discuss what practices can be enabled and supported with tangible interfaces. Relevant questions concern how design choices should determine generalisations or theoretical abstractions over the many, varied and often implicit ways that people create. (2) The second set of problems concerns how information aggregates can be organised in a way that they usefully relate to media codes, conventions and formats.

The present thesis will address the first set of questions by devising and studying some informal composition tasks, in chapters 4,5 and 6. The studies will address also the second set of questions by moving from (a) descriptions of some initial design problems when producing tangibles and digital representations to (b) accounts of how students composed digital videos in the physical environment and formed local conventions, defined ‘contents’, and jointly made sense of performed activities of ‘exploration’ and ‘expression’.

Chapter 4 will outline the initial assumptions and questions that motivate the rest of the thesis. The discussion draws from a series of empirical studies, which address different aspects of the design of a tangible environment to manipulate digital videos. The description of the studies is articulated in two steps: (1) establishing links between digital and physical representations, and (2) the nature of the task of composing videos with tangible objects, which will be outlined through the observation of two different pairs of students at work.

The sensible nature of enquiry in the physical environment will open new questions: what is the mutual influence of digital and physical design actions? What is the nature of physical exploration in negotiations? What is the relevance of digital links on physical objects? And what is the nature of ‘framing’ media texts in time and space in the environment?

Chapter 4 will end with the proposition of selected terms that will help shape the study in the rest of the thesis. These will include: ‘quoting’, ‘framing’, ‘packaging’, ‘format’ and ‘genre’. The proposed terminology aims to help focus on what seems relevant for the thesis, and to help abstracting away from a rich context of analysis.

Part of the difficulty is in the fact that different media and processes of mediation interact subtly and dynamically. Any medium facilitates, emphasizes, intensifies, amplifies, enhances or extends certain kinds of use or experience whilst inhibiting, restricting or reducing other kinds. In particular, this chapter will consider the task of composing digital representations using a physical environment as can be studied with any tool for composition work.

Following Postman (1993), “embedded in every tool is an ideological bias, a predisposition to construct the world as one thing rather than another, to value one thing over another, to amplify one sense or skill or attitude more loudly than another” (Postman 1993: 13). Relevant to this fact, the case of composition work with digital videos and the tangibles devised here poses specific questions.

A critical aspect that will be addressed is the collaborative character of the practices that are devised. Such a focus aims to keep a relevance to the problem of addressing media literacy. In fact, media language production is not only a matter of text processing to create a ‘discourse form’. It will be intended as a social practice involving specific activities devoted also to the formation of codes and conventions. According to Bell (1991: 56), these govern expectations, and the access to pre-designed inputs. They are made of minimal reworkings, editing steps and negotiations. The field studies will:

1. restrict the focus of a design task,
2. describe the initial difficulties, and
3. explore wider boundaries of the problem, in such a way that the more focused scope of the thesis can be related to other cases.

Chapter 3

Guiding design with approaches to masked performance

This chapter explains how some traditions in theatre mask work – both how masks are designed and how performances are directed – have been applied in this thesis to interpret ‘participatory design’ with ‘incomplete artefacts’. The help from theatre traditions was necessary because the practical design work in the thesis often consisted in orchestrating collective activities with mock-ups and partial designs. As explained in the following, current literature on design did not provide the right tools. By contrast, the way people actually work in theatre, and in particular in masked performances, provide relevant terms and practical approaches. In fact, as it happens, organising collective action through incomplete designs is a common problem in these contexts in theatre. This applies to masks design and performing activities, both in training and production. The aim of this chapter is to describe how this can be creatively reinterpreted and put in practice in interaction design, and how it has been done practically in the present work.

One of the problems in designing for responsive physical environments for media literacy, that were outlined in the previous chapter, is that of addressing design with ‘incomplete’ or ‘expressive’ designs. This was discussed in relation to the need to devise collective practices and in relation to the need to make the designs evolve according to how participants make sense of them while using them in the tasks. When addressing these design problems in the practice, even before considering matters of appropriateness or correctness of design solutions, questions concerning the available opportunities come to the fore. In particular, how to envision and

structure a space of design alternatives? What design alternatives can be considered in the first place? What activities can be devised with incomplete objects? What possibilities can be considered to introduce variations which sensibly alter the activities?

This chapter presents approaches that can be applied from theatre practice to help addressing these questions. The chapter will end with a description of how such an insight has impacted the practical work in the field studies.

The questions above are not new to design practices. In participatory design, Ehn advocated the use of ‘action-oriented’ design artefacts (Ehn 1992). In particular, the use of ‘mock-ups’ and other incomplete objects has been researched and developed (e.g., Ehn and Kyng 1991, and more recent work cited below).

For the case of this thesis, in the first empirical studies described in the next chapter, two dimensions of exploration for the design of tangibles will be outlined. One dimension is identified by the range of possibilities between ‘incomplete’ and ‘characterised’ artefacts. The other dimension is identified by the range of actions between ‘expressive’ and ‘neutral’.

As observed in the studies, the questions can be informed by three ways of seeing the tangibles:

1. *Tangibles as incomplete designs:* With what degree of completeness should the design of tangibles be implemented? How can this be used in action?
2. *Tangibles as expressive designs:* Tangibles can acquire ‘expressive’ functions. For example, through their pictorial features, or their shape they can create meaningful arrangements or associations. What expressive functions or characterisations should be implemented in tangibles in order to favour performed actions in the environment?
3. *Tangibles as neutral designs:* When researching on alternatives for expressive use, fruitful dimensions for exploration of design alternatives can be found by discussing

‘neutrality’. When neutral versions of expressive artefacts are implemented and tried out, they can show the worthiness and the role of expressive functions. With respect to

developed in theatre for the creation of performances with ‘neutral’, ‘characterised’ and ‘larval’ masks. A more general argument in this chapter is that the project of applying performing arts into interaction design can be usefully extended beyond the boundaries that have so far characterised applications from the performing arts. These have been limited to the direct staging of the performances which are meant to provide the evidence for design inquiries. Instead, design activities can proceed by working in a more indirect way, by researching variations of the achieved performances, and by using multiple performance genres, including masked and stylised ones.

3.1.1 Applying theatre practices in design

Applying performances in design can be a wider project than the adoption of an art form for “the improvement of communication” in design, “the communication of design challenges”, or “the collection of requirements” in product development. More widely, design based on performances can be defined as an art. Designers can extend the alternatives available when transposing artistic practices from different schools, styles and genres. Design inquiries can be a form of production that is articulated and guided by practical approaches from the performing arts. This is one of the motives for using performances or, in general, for achieving illusion or imagination, to express and explore in design.

In redefining design spaces, stylisation can provide an understanding of design issues that is not possible through naturalistic play. In this way, design based on performances can learn from the performing arts. The fundamental drive should not be based simply on acting scenes or embodying movements, nor on any specific performance tradition. The primary reference should be life itself. Through performance work, designers can look at relevant aspects of life.

Masks are tools for representation which move away from naturalistic acting and enable actors to take a distance from reality. The work is done through creating illusions, which ‘give life’ to the mask, an unanimated object. By focusing on specific aesthetic qualities of masks, here a reinterpretation of a terminology from masked performance will be proposed. By

studying how artefacts that acquire a masking role featuring according to their neutrality, expressivity, larval (or incomplete) qualities, some aesthetic aspects can be addressed as practical ones.

3.1.2 The need to direct, constrain, inspire

An important aspect in design activities is how the role of constraints can be developed within collective activities. As summarised in (Jacucci et al. 2005a), one can facilitate creativity in design, as in the performing arts, by carefully introducing constraints in performance activities. To this end, the particular approaches to masked performance described above are an approach to improvised drama which makes an overt use of constraints to practical action. This can be an arbitrary choice to be made among other approaches to devising theatre performances. The practices addressed in this chapter are particular instances of approaches to devising performances that:

- *Are loosely structured.* Consistently with design intents, one wants to achieve the participation of performers without “prescribing” action. The practices described in this chapter provide categories of masks and dimensions for exploration, without prescribing what should be done. At the same time, the terms of mask work structure the space of possible performances. They suggest ways of exploring specific masking roles of the artefacts, which have been proved to be fruitful in performance training.
- *Tend to put meaning at the end of the creative process.* Another need in exploring design issues through performance, as proposed here, is to make meaning emerge from practical action, in such a way that the interpretations are relevant to participants’ life. Consistently, these approaches to mask work aim to not fix meanings in the first place, but to make the performance evolve.

- *Avoid planning and control.* When exercises are planned and controlled, this is done only in order to constrain the explorations within the relevant dimensions of neutrality, expressivity and incompleteness. Within these territories of mask work, the planning and control of the creative contribution of performers is carefully avoided.
- *Aim to achieve 'acting as play', more than favouring cathartic experiences.* The activities are directed as exploratory games, in which the rules serve for motivating the exploration of design features. The performances are not aimed at achieving spectators' identification.

3.2 Previous work on applying performances in design

3.2.1 Staged scenarios and naturalistic acting

Among the various design approaches that instantiated theories, ideas, techniques, strategies, tactics and procedures from the performing arts (e.g., Binder 1999, Brandt and Grunnet, 2000, Dolonen et al. 2003, Dworaczyk et al. 2005, Engeström and Kallinen 1988, Fjuk and Sorensen 1997, Iacucci et al. 2002, Iacucci and Wagner 2005, Iacucci et al. 2005a, Kankainen et al. 2000, Mørch et al. 2004, Read 2005, Salvador and Howells 1998, Strömberg et al. 2004, Turley 1997) little has been done to date to substantially overcome naturalistic acting in staged scenarios. Or, in general, no research works have proposed the comparison of alternative performance genres within the same setting, or overcoming the mere transposition of 'procedures' from theatrical practice.

Those works which systematically introduced variations of performances did so at the level of narrative, plot or character substitutions, as for example Kankainen et al. (2000), Mørch (2004), Strömberg et al. (2004) and Turley (1997), who considered Boal's (1979, 1995) forms. However, no research works have devised performances by crossing genres, decomposing or

constraining movements, comparing different levels of acting, filtering perception, masking, or moulding time with changes of speed, rhythms or interruptions.

3.2.2 The need to introduce variations and to cross genres

Performances have been mostly used to provide the evidence for the actions which were meant to be interpreted in the search for design ideas. However, the most influential and effective approaches to train or to devise in the performing arts devote most of the time to working in an indirect way. Their struggles to relate to life and audiences usually proceed by repeatedly introducing variations and by re-enacting. They explore stylised forms, other than naturalistic ones. Also, the choices about how to inspire, direct or to constrain performers are done explicitly and articulated into exercises.

Research applying performances with objects, even if not explicitly referring to the arts, already entails similar questions. This chapter aims to indicate how these questions can be addressed more explicitly by reinterpreting practical approaches from the performing arts, and in particular, from masked performance. To this end, a first step will spot differences among alternative roles of ‘incompleteness’ in design artefacts among cases reported in the literature. In chapter 6, this will motivate further questions about how to articulate performance inquiries with objects, with reference to cases of performative development of interactive installations.

3.2.3 Performances with incomplete designs

Incomplete designs in the form of props, mock-ups or parts of settings have been employed in different ways. Not only the methods, but also the driving motives have been quite different. For instance, incomplete forms have been created in order to bring design questions near the situations of everyday life, as in the SPES methodology (Iacucci and Kuutti 2002, Iacucci et al., 2002). Here, the incomplete objects were introduced in a person’s every daily life, and came about as forms upon which to project contingent needs in unplanned situations (figure 3.5.a).

Elsewhere, they have been used in the attempt to try out different uses for an interactive tool, for which the design idea was only partly determined, as in (Brandt and Grunnet 2000). In this case, the incomplete objects were applied in the act of matching design ideas with a number of predetermined situations (figure 3.5.b). They have also been used in the creation of a situation for use, as in (Strömberg et al. 2004). Here, behaviours and embodied actions were assessed in order to find more design ideas, with a focus on the staged situation, more than on a design concept embodied by an artefact (figure 3.6.c). And they have been used in the act of inspiring activities by virtue of their symbolic meaning, as Brandt and Grunnet's (2000) "magic tools". Here, the incomplete objects were not the repository of the main idea to be developed, but props for thinking in action (figures 3.6.a and 3.6.b).

In these examples, searching for new design ideas has ranged from introducing a new (even if not completely formed) object in common situations, to creating new situations with objects endowed with ad hoc and familiar features. The search for novelty has ranged from a search for totally new situations and actions with the assumption that *future* requirements and needs are to be invented from scratch, to a search which assumes that novel needs and attitudes are already implicitly present in actual life, and need to be acted out. In all these cases, the creative use of embodied but incomplete artefacts is tightly related to the act of performing. And in all cases, the use of performances has addressed the assumption that novel design ideas need to be created with a concrete reference to familiarity and habits.

3.2.4 New questions

The approach presented in this chapter moves from the observation that, in the cases reviewed above, the application of performances had to couple familiarity and novelty, abstraction and detail, practical accomplishment and symbolic signification, and individuality and universality. Furthermore, if these applications constituted the act of devising a show in an artistic context, the success would depend on the search for a good balance among these terms. This problem has not been addressed explicitly in the literature. Research so far does not provide alternatives

for the exploration of design spaces by introducing variations and for the articulation of rehearsal processes as done in the performing arts.

As mentioned above, those works that reproduced the procedures of Boal's theatre forms are an exception. However, their alterations of the achieved performances are at the level of plot and character substitutions. They do not articulate the performance exercises along dimensions that link expression and exploration through the aesthetic and technical qualities of the designed artefacts. As in the cases mentioned so far, also in theatre there is the need for a balanced orchestration of the use of designs in action. The sources of creativity are both in designs and in skilled use, and there is a co-presence of different driving motives in using objects. Often, in the performing arts, the rehearsal process is articulated with principled approaches to directing which frequently research variations of the forms that have been achieved. An important improvement in the design practices mentioned above can be sought by reinterpreting the ways in which approaches to training and devising performances can proceed by re-enacting and introducing relevant variations. For example, relevant dimensions can be those between neutrality and expressivity, pace and rhythm, incompleteness and characterisation.

In order to clarify what relevant variations can be introduced, it is useful to distinguish different uses that are made of embodied and incomplete objects. In particular, some approaches (e.g., Iacucci et al. 2002, Brandt and Grunnet 2000) devised performances in which the incomplete forms worked purely as props. In these cases, the core of the creative attempt consists of stretching the imagination in order to fill the incompleteness of props, while they are applied in real contexts (figure 3.6). Other approaches use performances within the world of incomplete forms, or in which incomplete forms influence creativity as symbols (e.g., Brandt and Grunnet 2000, Strömberg et al. 2004) (figure 3.6), or in which markers or props are worn, in order to constrain or drive movement, as in the Manipulate Media Worksop (Iacucci et al. 2005a).

In the first instance, the advantages of adopting incomplete forms is that they suggest wider ranges of actions. In this particular way of using performances, performers address their task by

adding details to their actions. These works suggest a number of questions which still need to be addressed in the literature. One order of questions concerns the way in which the work of performers should be facilitated or directed. These include:

1. How can variations be introduced?
2. In particular: what are the relevant dimensions in the definition of props and artefacts for performances and in the definition of performing exercises, along which to try out alterations of achieved performances?

Other questions concern the ways performances should be interpreted and intermediate results expressed. These questions include:

1. How to link exploration and expression?
2. And, in particular: how to frame the evidence which from performances can characterise design ideas and design abstractions?
3. Should performances be understood as being 'reproductions' or 'representations' of aspects of life? And, relevantly to this question, what alternative ways to devise and study them can be learned from the performing arts?

Concerning the last question, as mask work can teach, a distancing and a stylisation of the performance can be induced by using the incomplete objects to deconstruct movement. Before coming to pen and paper reporting, partial results can be created in an embodied form. This can be done not necessarily in one single step, but also in different steps, implementing particulars

along specific dimensions. In the following, these questions will be addressed by transposing specific approaches to masked performance.

3.3 Performing with and through artefacts

Unlike all the artistic practices that have been applied so far in design, approaches to masked performances directly and overtly address the quality of embodied actions in relationship to the qualities of a designed artefact, that is, the mask. Approaches to masked performance link the design of artefacts to qualities of performances. Masks are divided into categories, according to specific modes or levels of acting explorations that they enable. Also, in these practices, different mediating roles of masks are related to design decisions, at different levels of detail or abstraction. Furthermore, design decisions are researched, defined and assessed through *ad hoc* performing exercises. For these reasons, at least in the abstract, practices of masked performance can be perceived as relevant to the general problem of applying performing arts practices in design contexts. However, a transposition from these artistic contexts to interaction design is not simple. In fact, only a few objects of design can directly be considered as masks, and they cannot all be worn, or used as relevant objects in performances.

In this chapter, the interest to reinterpret these practices from performing arts contexts is still motivated by the analogy between design props and masks. The relevance of this analogy can stem from an extensive definition of ‘mask’. Such a definition can comprehend several mediating roles which are acquired in embodied action by objects of interaction design. However, the scope within which this analogy will be interpreted here is restricted. The scope is, in particular, focussed on addressing some specific questions which pertain to masked performance.

The proposition is rooted in the consideration that basic phenomena in the use of masks in theatre – in particular, the working of neutral, expressive and larval masks – are somehow already present in design works which make use of props, mock-ups and other objects in

practical attempts through embodied action. Hence, as outlined in the review above, this chapter will address questions that are already implicitly present in actual design contexts.

3.3.1 Introduction

Lecoq's approach to work with neutral, expressive and larval qualities of masks can help articulate different levels of creative work in design. This will also provide a terminology to understand different aspects of performances in design. In this chapter, they are put in relationship with aesthetic features of artefacts which can acquire the role of masks.

Inquiring by 'neutralising' features

One first aspect is how masked performance can empower research on movement and space that would not be favoured without masks. By covering parts of a performing body, one can achieve a state of inquiry through movement which permits the inquiry to be more economical, neutral, free or focused. This can also simplify a performance and uncover human behaviours and inner traits, which would not be apparent otherwise. This aspect will be related, in particular, to the need to structure the search when exploring a design space. A specific case of the design of interactive installations relating to a similar concept of *neutrality* that is researched with 'neutral masks' will be discussed.

Imposing structures to explore expressivity

A second aspect is that expressive (characterised) masks can help in exploring breadth and focus of embodied action by imposing structures, and facilitating digressions. For example, characters are not neutral, in that they are subject to predefined structures. By researching variations on the expressivity and characterisation of masks, the work is complementary to that

done with neutral masks. One can introduce structures and driving features that are alien to the original context and to the people involved.

Using incompleteness to foster imagination

A third aspect is how masks can extend the exploration of the use of artefacts that retain different degrees of ‘incompleteness’. This can be done by first finding those masks that work well thanks to the fact that they are incomplete but potentially expressive. Then the search can proceed by attuning the levels of detail of the incomplete masks. Important principles can be gathered from performance work with ‘larval’ masks. This points to questions about design done with props and mock-ups. In particular, the practical work that is taught with larval masks shall be transposed to discuss the tension between uniformity and universality with props and mock-ups in design.

3.3.2 Terms for the use of masks and mediating artefacts on stage

There are several ways in which a theatrical mask works as a ‘mediating’ artefact. A mask can have different roles in both driving and inspiring the masked performer and in guiding spectators’ interpretation of her performance. Masks can work as tools for imagination and control. This happens both from the point of view of performers and from that of spectators. For example, with a face-mask an actor’s face disappears and her body becomes far more noticeable. With some types of masks, the performance aims at endowing the mask with life. Moreover, a mask can work as a constraint, a filter, a means and a vehicle. It can *show* a character in its broad outlines, it can *structure* or simplify the playing style, it can *delegate* to the non masked parts of a body the expression of essential attitudes, it can *filter* out the complexities of psychological aspects, and it can impose guiding *attitudes* in embodied actions.

Lecoq (1997) refers to dramatic masks as “those which can serve as vehicles for human qualities, setting up a transposition and thus achieving a certain level of acting”. (Lecoq 1997:

61) “In masked performance, gestures are expanded or reduced and the eyes, so important in psychological playing, are replaced by the head and the hands, which assume great significance”. (Lecoq 1997: 62) Consequently, real objects add so effectively to the power of the performance of expressive masks. Dynamic features of theatrical masks can be applied to studying entities such as media, technologies and ordinary events, which can acquire similar masking roles in life and in design practices. To this end, relevant terms of the working of masks in theatre need to be outlined.

Dualities in working with masks in theatre

A mask can be an active element both for who wears it and for who watches. The act of masking an actor gives rise to a number of ambiguities. In order to take advantage of the approaches to masked performances in design, a relevant terminology must be adopted. Masks introduce several dualities in the practical accomplishment and in the interpretation of performances: inward *vs* outward, showing *vs* hiding, constructing *vs* deconstructing, immobility *vs* movement and reality *vs* illusion. The following definitions can be used in order to detail a description of design objects that are meant to acquire masking roles in performing activities.

- Inward *vs* outward: masks always work in two ways. They project the awareness of a form to the performer and impose limitations to her senses and movement. At the same time, they project images to the audience.
- Showing *vs* hiding: As a particular instance of the inward *vs* outward effect, masks can show and hide. For example, they hide a face and show a different one. Artefacts which only show or only hide, might not work as masks. An example of artefacts that only hide are the white masks used in protest marches (also called ‘dead’ masks). They neither show a character (as expressive masks do), nor an abstraction or an incomplete one (as larval masks), nor do they facilitate performing modes as neutral masks do.

They are designed only with the aim of adhering to faces and hiding them. An example of artefacts which only show are wristwatches, they show a designed figure but usually do not hide a feature which has a significant role in the interpretation of a performing body.

- Constructing vs deconstructing: masks can construct and at the same time deconstruct bodies. They construct the composition of a static figure and a moving body. The construction is meant to result in a uniform body. In fact the disconnection between performer and mask is commonly not supposed to be perceived. Masks can deconstruct bodies by impeding natural movements, or motivating stylised behaviours that acquire significance in relationship with the mask. In fact, masks can be used for the training of deconstructed movements that are functional also to unmasked performances.
- Immobility vs movement: masks are immobile figures, but the whole point in performing with them is to endow them with life, through movement. Hence, mask work always addresses both immobile and moving features, in isolation and in conjunction.
- Reality vs illusion: masks work through two simultaneous worlds. One is the picture displayed by the mask, which is a real object that constantly addresses the audience frontally. The other is an illusion of life, which the performer might succeed in showing for limited amounts of time when wearing the mask. Mask work always addresses both worlds.

Masks as tools for inquiry

In Lecoq's approaches, masked performance became an important step and a tool in the training of actors. Similarly, in design, these practices can be transposed and reinterpreted in order to constitute tools and activities for inquiry, instead of solely leading to a single performance to be staged and used as direct evidence for design. Here the focus will be on

those effects of masked performances which endow masks with their power to work as tools for inquiry.

The ‘design space’ to be explored is the range of ways in which embodied actions mediated by artefacts can be related to life. This relies on how masks can uncover (‘unmask’) human traits and attitudes. In theatre, a major goal in devising masked performances is to give *life* to the mask. The hoped-for effect is that spectators reach the illusion that the mask is alive, and that at times they forget that the performing body belongs to a person. Here, the scope will not be to look solely from the perspective of the audience, nor to give a definitive, even if critical, interpretation of the achievements of performances. The eyes of a director can be more critical than those of spectators. It is along the director’s participative and inquiring look that an object for design can be made to evolve as a consequence of the inquiry.

By exploring the dualities outlined above, training and devising masked performance can be an act of inquiry. Relevantly to design, the object of the inquiry can be both on: (a) the possible roles of (masking) artefacts in life – to be researched through variations of performing exercises – and, (b) on possible traits and attitudes – to be researched through introducing variations in the designed (masking) artefacts, according to relevant categories.

Inquiry and distancing

Masks allow performers to distance themselves from their own personality and even from the role of the characters they play. These distancing effects can articulate the inquiry by transforming action and observation. Through masked performance, essential features of embodied behaviour can be researched in a biased and deconstructed way. For instance, by hiding their face, which usually bears the most observed features of their individuality, performers can acquire an awareness of the significant movement of their body in space. The benefits to design research are twofold. On the one hand, approaches to mask work can provide a practical method to research on aesthetic principles through performances. On the other hand, some specific objects of interaction design, such as artefacts, mock-ups, environments, events,

can be designed, classified, changed according to the terminology and the principles of the mask work approaches considered below. A reconsideration of the definition of ‘mask’ is needed at this point. This will be used to help relate the practical work done in masked performances to the objects of interaction design.

3.3.3 An extensive definition of ‘mask’

Mediating artefacts and technologies can work and acquire roles that are similar to those of theatrical masks. In order to apply approaches to mask work in the performing arts, it is useful to detail definitions of the term ‘mask’ in everyday language. The word ‘mask’ commonly refers to an artefact which covers the whole or part of the face. More generally, it can also refer to a likeness of a face or head, or to a fact or action that conceals traits of humans in a static or dynamic way. In this sense, even a car, a telephone, or a webcam can acquire the roles of masks. Similarly, other artefacts that are objects of design can be considered as having qualities of masks. They can conceal aspects of human behaviours, or, by doing this, they render inner traits more evident, or they add characterising traits.

What matters in this extensive definition of ‘mask’ is the relevance that the five dualities listed above can acquire also with objects which traditionally are not called masks. Some examples are shown in figure 3.1. Other connotations of ‘mask’ come from the fields of surgery, sports, photography, electronics, computing or entomology⁵. Beyond the meaning of ‘a protective covering for the face or head’, masks can include: devices worn to facilitate or prevent contact with environments, shields placed over areas to control exposure, a natural feature or artificial object which conceals features or events from view, material from which a pattern has been cut so that objects can be formed on the exposed areas, a pattern which, by convolution with a second pattern, can be used to isolate a specific set of the second pattern for examination. The actions included in these definitions – such as protecting, examining, isolating, exposing to the environment – point to a variety of applications.

⁵ From the Collins English Dictionary & Thesaurus, 2004 edition.



Figure 3.1: Examples of designed artefacts that, depending on their use, can acquire masking roles.

Figure 3.1 shows examples of designed artefacts which, depending on their use, can acquire masking roles: shooting settings and stages, props and mock-ups used in participatory design – from (Brandt and Grunnet 2000) – interactive tangibles to digital videos of participants – from (Jacucci et al. 2005b).

Several common technologies conceal features of human action, thereby better uncovering human inner traits, personalities and characters. The definition can be extended more explicitly, in order to name those essential features of masked performances that can be found in common objects of interaction design. For example, artefacts and objects of design are used in performances. Among these there are props, mock-ups and mediating tools. These will be addressed in the following with the help of terms of practical methods, neutrality, expressivity, and the incompleteness of larval masks.

3.3.4 Neutral

The work with neutral masks aims to achieve the ‘depersonalisation’ of the performer. The result that is sought are performances endowed with ‘universal’ qualities. That is, a performer wearing a neutral mask tries to achieve a state of neutrality, and moves on to represent traits of

life which belong to everyone. This is only a particular territory for exploration in masked performance. It retains an importance across theatre schools and traditions, and it encompasses styles and cultures. Its definition as a specific practice can be worked out also in design contexts. In fact, similar states of neutrality when acting with or through the objects of interaction design, or the ‘neutral’ qualities of some such objects, are evident in design activities. They can be found, for example, when design seeks universal abstractions by starting from particularities in design sessions.

Two common examples of ‘neutral’ masks are shown in figure 3.2. Traditional neutral masks are not blank. Neutrality is a quality of the masks functioning in performances. The aim of a neutral mask is “to open up an actor to the space around him and to put him in a state of discovery” (Lecoq 1997: 38). But, other than on identifiable formal aspects of the mask, the definition rests also upon the way in which the performance is achieved through that mask.



Figure 3.2: Examples of ‘neutral’ masks

Performances with neutral masks aim to discover movements and behaviours that “belong to everyone”, without imposing specific ‘characters’. An additional effect in training with neutral masks is that, through the search for neutrality, we uncover aspects that are opposite to neutrality. That is, it becomes evident how we are particular and what we want as individuals. The ways these goals can be achieved in theatre is relevant for design practices. In particular, it

is relevant to those which make use of props or artefacts that have effects in performed actions. Some of them can be studied according to how they can be associated to similar definitions of 'neutrality'.

By using the extended definitions of mask given above, important principles from practical work with neutral masks can be reinterpreted. Two relevant points will be addressed here with the intent to guide design:

1. The definition of 'neutrality' as a performance state which is induced by the conjunction of the mask as an artefact and a particular exercise. This constitutes a mode of research which is complementary to explorations based on expressivity and characterisation, and can motivate further inquiries by comparison;
2. The consequent meaning that is acquired by the 'universality' or the 'uniformity' of design features.

Exploring by defining neutrality through performance

In the case of masks, the word neutral can still bear some of the meanings it has in everyday language. Three main connotations are: "being with no distinctive quality", "harmonising" with most other aesthetic forms, and "being indifferent"⁶. But the definition of neutrality for mask work is not purely a quality of the mask as an artefact. It refers to the specific performance work that is done with it. Such practical work can inform design in contexts outside theatre. Improvisations with neutral masks aim to be favoured by a state of openness and freedom to 'receive'. This state is a quality of the performance which stems from the relationships between the performer and the mask.

⁶ From the Collins English Dictionary & Thesaurus, 2004 edition.

In working with neutral masks, the intention is to go back to the origins, and to relate to the most basic elements of life and nature (Lecoq 1997). The neutral mask aims to put us in touch with what belongs to everyone. Getting a person to work on themes with the neutral mask permits the observation of her presence, and her sense of space. In the search for neutrality a director will see whether her movements and her body belong to everyone, if she can find the common denominator of embodied actions, which everybody could recognise. Explorations with neutral masks are articulated in practical exercises which include both discovering the mask as an object and experiencing movements through journeys and identifications. They permit “to watch, to hear, to feel, to touch elementary things with the freshness of beginnings.” (Lecoq 1997: 38) Traditionally, creative exercises with neutral masks include awakenings, journeys, encounters and farewells.

It is not the incidental details in the performance that are retained. Rather, it is the driving motive that these exercise try to bring out that is researched. Also, the motive is intended as not being linked to a particular context or character. There are additional principles that drive movement work based on neutrality as an inquiring tool. On the one hand, such work can provide a series of fulcrum points (i.e., key embodied states) that are essential for embodied actions, but that cannot be researched without the deconstructing function of neutral masks. On the other hand, having experienced balance through work based on neutrality, a performer is better equipped to express a character’s imbalance or conflicts (Lecoq 1997).

Uniformity and universality

The scope of exploring design features through performances based on neutrality is to achieve embodied actions that have a degree of universality. This relates to a major problem in addressing design with performances: how to move away from individual and particular instances and reach ‘design abstractions’ endowed with ‘universal’ qualities? Relating to machinery, to be ‘universal’ includes being designed or adapted for a range of sizes, fittings or uses. More commonly, ‘universal’ qualities of performances and in design are meant to be generalisable or capable of being used and understood by all.

The search for 'universality' can be addressed in different ways. In the arts, and in particular in the performing arts, universality can be sometimes related to 'uniformity'. In this sense, being uniform coincides with being 'regular', 'homogeneous', 'unvarying', 'monotonous', 'lacking diversity'. But uniformity and universality are different aspects of design features. Performance work based on neutrality addresses this issue. The exercises developed for neutral masks foreground the fact that in order to achieve performances that are endowed with universal qualities, one cannot rely solely on uniform aesthetic qualities. For example, the shape of masks must be attuned to individuals and to performance activities in order for them to work as neutral. At the basis of this search there is the study of how humans are different and, at the same time, how they can share experiences helped by the design of mediating artefacts.

Applying the concept of 'neutral' in design

One of the ways in which performances with design artefacts can contribute to design inquiries is through exercises of movement based on neutrality. Such activities explore different aesthetic qualities of the design artefacts, in order to find those which can make them work as neutral masks. The activities also explore universal traits of embodied action, thanks to the functions of neutral masks, if acquired by the design artefacts. According to the principles governing masked performances with neutral masks, the exploration proceeds by trying out alternatives in which those artefacts can guide or constrain embodied action. In order to acquire functions that are similar to those of neutral masks, the artefacts can be mediating tools, physical constraints or framing devices.

The explorations aim to rely on them in order to induce performances which: (1) are characterised by a depersonalisation of the performer, and (2) express traits of action that are understood by all, or that are present to some extent in everyone's action in the same circumstances. This is only a particular performance work that can be used to explore design features with the same artefacts. The inquiry can move on by applying different degrees of expressivity, incompleteness or abstraction, in order to research on other design qualities of the

artefacts or the embodied actions. These are the other practices of masked performance outlined below.

3.3.5 Expressive

Masked performance with expressive masks always depends on a basic structure which is not there in unmasked performance. Expressive masks show characters in their broad outlines. By imposing structures, they order and simplify the playing style (Lecoq 1997: 54). The relevance of these aspects in design can be in the way practical approaches to masked performance link expression and exploration by providing activities to ‘play’ the characterising features. In this case, characters are meant to be defined also by local conventions on personality and plot. The analogy is with the masks of the Commedia dell’Arte, and derived forms, as the example in figure 3.3.



Figure 3.3: Example of a characterised (expressive) mask

Exploring by “playing” characters

An important feature of expressivity and of the term ‘played’, which is usually attached to characterised masks, is the presence of a character. Masks that express traits and characters can drive performers into expressive uses of space. They constrain – more than helping to inquire – what movements give life to the character. More in general, the presence of a character can be intended as the presence of aesthetic motives, which, as with ‘expressive’ masks, impose a structure in the performance. Neutral masks lack this feature.

Explorations with expressive masks can be ‘played’ in the sense that the characterisations present in the embodied artefact (or ‘characters’ for the case of theatrical masks) are used to ‘play’ the situation. However, playing the situation is not the only possible choice. One can choose to work on neutrality instead. The latter use differs from an expressive use in that it uses the artefact’s characters to depersonalise or to induce a state of inquiry. The aim will be to represent universal features of embodied action. Not all embodied artefacts can work as neutral or expressive, and the assessment needs to be tried out with performance exercises.

An important element of design inquiries based on expressive and played features is the choice of amount of detail to be introduced. Also mock-ups used in design, such as those reviewed in Section 3.2, address this aspect. The use of props can be linked to performance work with expressive masks also through the way the inquiry can proceed along the dimension of incompleteness, as with ‘larval’ masks.

Applying the concept of ‘expressive’ in design

One way to explore design issues through performances with embodied artefacts is by following the practices of expressive or ‘played’ masks. These approaches are based on the presence of characterising traits. These either qualify the performer as a character, or introduce a structure in the performance by suggesting motives or ways of using the artefacts.

Expressive (played) or neutral are two particular dimensions along which to introduce variations during rehearsals of performances with and through embodied artefacts. As the next section argues, there is another dimension for exploration. Given a characterising form to be introduced in design, variations in the rehearsal process can be introduced according to specific degrees of ‘incompleteness’.

3.3.6 Larval

Larval masks (exemplified in figure 3.4) were transposed from the Basel Carnival by Jacques Lecoq. Their immediacy and spontaneity is unfiltered by experience and comprehension. They are fascinated by the world, but they do not understand it, and can create powerful research through naïveté and curiosity.

The devising of masked performances with larval masks is usually not directed as with other types of expressive masks. Effective exercises can involve exploration of props and space, and also interaction with more sophisticated characters. Larval masks have peculiar features that enable search by exploiting incompleteness. These activities aim to foster spectators’ imagination. This is a key motive in design based on performance work in general. But larval masks specifically rely on the incompleteness of features.



Figure 3.4: Examples of larval masks

Exploring by the means of incompleteness

The incomplete forms embodied by larval masks enable specific sorts of exploration. They permit to work in two alternative directions. The exploration can proceed either by focusing on how the mask inhabits the situation with its form or by focusing on how the situation can be fitted towards ‘entering into the form’ of the mask (Lecoq 1997: 59). In other words, the focus can be on transposing reality into the mask or on the imaginary realm of the mask itself.

Again, as with neutral masks, this duality can be transposed in design contexts to articulate the inquiries through performance exploration. Also, practical attempts with the same performing activities can be carried out by trying out with different incomplete bodies. By comparison, the qualities of incompleteness can lead to the design of abstract features.

One way to proceed in the exploration is to link the design of the mask to the qualities of the embodied actions. But this is not the only path. Lecoq’s exercises are arranged in separate phases. Working on incompleteness permits the exploration along at least two paths:

- to work towards characters and situations which are caricatured by the form of the mask itself. These situations are transposed on the level of the mask. The cases of figure 3.5 (Iacucci et al. 2002, Brandt and Grunnet 2000) are consistent with this way of performing. That is, performing “with an incomplete form in the world”;
- to search for a dimension of the mask in non realistic settings. The search in this second, imaginary realm, is favoured by the presence of the incomplete body, but its interpretation is just a driving motive. This can be considered as a performance “within the world of the incomplete form”, which is consistent with the cases of figure 3.6 (Brandt and Grunnet 2000, Strömberg et al. 2004).

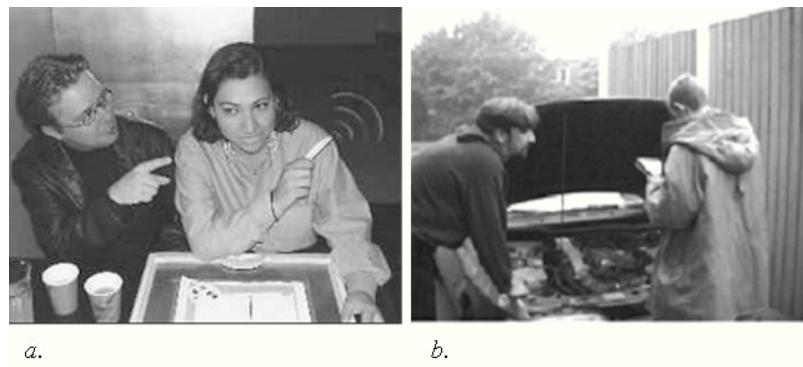


Figure 3.5: Uses of mock-ups in performing activities for design

Figure 3.5 shows uses of mock-ups in performing activities for design. Figure 3.5.a is from (Iacucci et al. 2002). Figure 4.5.b is from (Brandt and Grunnet 2000). In figure 3.5.a: “With the pointer Claudia explores places in one direction. She gets a list of places like a museum, opera, and a shopping centre. She selects the museum. Information is shown about the exhibits. A map is also rendered describing the way.” (Iacucci et al. 2002: 6) In figure 3.5.b: “Joachim operated the ‘Dynabook-prop’ while Mike was searching the engine. The prop became an interactive error-detecting device for car repair.” (Brandt and Grunnet 2000: 6)

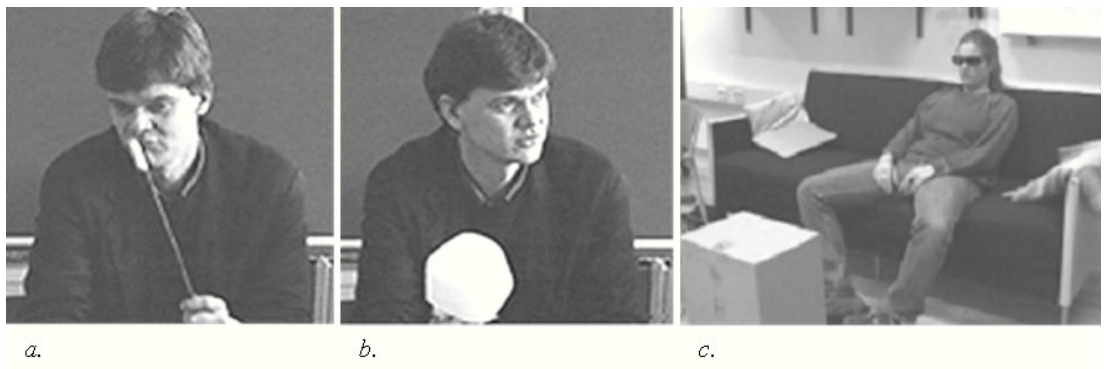


Figure 3.6: Uses of mock-ups in performing activities for design (Brandt and Grunnet 2000)

Brandt and Grunnet (2000) experimented with the use of “dream tools” as props in the design process. Their dream tools (figure 3.6) are taken from the world of fairy tales. They included, for example, a crystal globe “where you could see whatever you wanted”, a magic wand where “you could do whatever you felt like”, and a magic box “where you could store whatever needed”. “Like in the world of theatre and when children play, known objects often change meanings while other objects are created for specific purposes.” (Brandt and Grunnet 2000: 7) In these cases, incomplete artefacts contribute to the creation of situations (an ‘incomplete’ reality), within which performers can explore through “play”.

Applying the concept of ‘larval’ in design

Practical approaches to masked performance with larval masks can be considered to guide design activities which make use of incomplete artefacts under the form of props or mock-ups. Exercises with larval masks are developed to manage incompleteness, abstraction and imagination. These practical approaches can guide design activities which rely on incompleteness of design artefacts. Also, there is a choice between at least two dimension for the search for variations The search can be conducted within the model which stems from the suggestive features of the incomplete form, or within the real world and by suggesting the missing features of the incomplete form.

3.4 The masks paradigm in the rest of the thesis

The approaches to mask performance described in this chapter have not been applied in this thesis directly to media literacy. Rather, their relevance is derived from a practical need to design incomplete objects which had both to be used as tools and as means of expression. The task of engaging participants in collaborating around media production and presentation has called for basic aesthetic principles. As outlined below, some of the principles described in this

chapter can be found in the media literacy environment and in the practices devised in the studies in this thesis.

3.4.1 The masks paradigm as applied in the empirical studies

In the empirical studies that will follow in this thesis, the driving motives which led to taking advantage from practical knowledge of masked performance are:

- The performative achievements of participants is relevant. Participants were engaged in performing in an *incomplete* environment and trying out *novel* practices. At the same time, the *familiarity* of objects from daily life environments were put into use;
- Objects designed in the studies in this thesis can be *tools* and also meaningful *representations* in their own right;
- The way their performance is interpreted depends on whether their behaviour is regarded as having an *expressive* intent or as acting with objects as *neutral*;
- In the search for ways to combine old and new media in practices of authorship and fruition, an array of artefacts had to be designed in an *incomplete* way and then made to evolve through further characterisation.

In particular, in each study, the masks paradigm has a specific role. It has influenced the studies mainly according to the following adapted principles.

The pilot study

A main principle applied from the content of the present chapter will be:

- Introducing variations between expressive and neutral. Once expressive motives are imposed in design features, their possible applications can be researched by trying out variations along different dimensions: expressive (played) or neutral are two particular dimensions;

In the pilot study cards were designed to constitute incomplete referents of digital representations. In the unfolding activities, their further characterisation served both the need for expressive intents – for instance the collages – and for non expressive intents – for instance the negotiations between participants.

The schools studies

Main principles applied from the content of the present chapter, and their consequences are:

- The role of neutrality. Once an artefact has been designed to embody some characteristic features, one does not need to research only through an expressive use of those features. Characterisation can be researched also aiming for neutrality;

In the school studies, tangibles were not only incrementally characterised in order to accommodate expressive or neutral tasks (as done in the pilot study), but were also modified in order to be less characterised in order to express less.

- Introducing variations of incompleteness. Design relying on the incompleteness of artefacts is another dimension and the search for variations can consider both the world suggested by the incomplete form and the working of the incomplete form in the world;

Another novelty in the school studies, compared with the pilot study was the support for both expressive tasks with incomplete objects – such as the composition/decomposition of commercials with tangibles – and abstract/incomplete achievements using expressive

(characterised) elements – such as the understanding of alternatives to video editing with specific video episodes, that is, the use of installations as abstract representations of film making.

The study in the arts museum

The main principles applied from the content of the present chapter, and their consequences are:

- Universality and uniformity. Variations in the design features can be introduced by seeking universality of the actions performed with the mediating artefact. This can mean not only a search for uniformity of the artefacts with familiar features, but also a search of singularities in personal use in order to achieve behaviours that are understood by all;
- Performative guidance in searching for design alternatives. Neutral, expressive (characterised) and incomplete (larval) designs are not defined as such in the abstract. They can be researched by trying them out in different situations, which can be those performing activities in which one looks for universality/uniformity of action and interpretation, played characters, and imaginary features.

Also, in the rest of the thesis, the relevance of the principles above can be found in examples of the dual nature of designs (tools and representations): sections 4.4 and 5.5; in further discussions of artefacts in neutral, larval or characterised performances: section 3.2 and in the discussion of the three installations in chapter 6; further issues concerning the design of embodied, incomplete, familiar or novel artefact, and their mediating or masking role: section 7.3.

3.4.2 The role of ‘masks’ as action-oriented objects in the studies in this thesis

The design of interactive tangibles has been articulated also according to their neutral, larval and expressive character as ‘action-oriented’ design artefacts, according to main principles of participatory design (see chapter 2). In the specific case of the studies in the schools, neutral, larval and expressive (characterise) features are related to three themes identified in the observations of pupils interactions: composition of interactive tangibles; framing and packaging; and abstraction and memory. Such features are summarised in table 3.1. The content of this table will be refined and completed in chapter 7.

Table 3.1: This table points to specific aspects of the studies in the rest of the thesis that have been researched through particular features of the masks paradigm

	<i>Composition work in installations as “building sites”</i>	<i>“Framing” and “packaging” of contents in tangibles</i>	<i>Abstraction and memory in the responsive and physical environment</i>
Neutral	How can interactive tangibles make the construction process more overt?	How to favour a neutral use of tangibles (non expressive actions on them) in order to display their packaged functions?	Neutral use of tangibles and their role in supporting abstraction and memory.
Larval	How to use incompleteness of the tangibles in order to favour concurrency and reiteration in design?	How can incomplete but suggestive character of tangibles be put into use when digital content are framed in them?	How can incompleteness and larvality help to achieve abstraction?
Expressive	How to accommodate the incompleteness of the tangibles with the need for the achievement of expressive tasks?	What will the expressive achievements of participants be in design sessions by the act of characterise tangibles?	What is the role of abstraction in the use tangibles as expressive media?

3.4.3 The masks paradigm in designing constraints

In the traditions of such theatre directors as, for example, Jacques Lecoq, Philippe Gaulier, Keith Johnstone, Peter Brook, Augusto Boal, John Wright, the main concern of a director is to avoid telling performers ‘what to do’, but at the same time to drive the creative process in order to make them work creatively and ‘make things happen’. The problem of avoiding dictating outcomes is common also in many design endeavours. The problem is well known in most approaches to directing in the performing arts, where the major goal is to devise a performance by making it emerge with minimum control, and being ready to take advantage of *the unexpected*. As the theatre director John Wright says, when working through performances, anything is possible and everything has yet to be found. This means that as a director or facilitator you have got to find strategies that are likely to make something happen rather than strategies for getting people to analyse what they think they might do (Wright 2006). A particularly relevant aspect of design activities is how the role of constraints can be developed within collective activities.

As already remarked on by Laurel (1993) the “value of limitations in focusing creativity is recognized in the theory and practice of theatrical improvisation.” In fact, her model of human-computer activity appreciates the role of improvisation within a matrix of constraints. However, there are fundamental differences between the cases in this thesis and the way Laurel applies (implicit, explicit, extrinsic or intrinsic) constraints. Her design of software and computer interfaces addresses how to involve users in the theatre of the electronic space and the action of its applications. Moreover, in Laurel’s cases (*op. cit.*), constraints can either depend on technical capabilities and the limitations of the system, or (preferably) be established through synthetic character and human-machine interaction.

In the cases in this thesis, instead, constraints are not *primarily* researched as features of a computer application, be they desirable qualities or limitations to human engagement with interactive technology. The focus is instead on the role of constraints as a resource that can be used when directing collective creative action during design, in the same way in which they can become resources in improvised performances following specific approaches, as for example,

the practice of Keith Johnstone (1981). Such constraints may also happen to become designed features in a later stage of design. Or, conversely, design features of artefacts and practices they support, may be used as effective constraints in some design trials, as long as they are made to work, as constraints, against a collective drive towards a form of action. But their quality will be researched during the *exploration* of different human relationships and activities with a given set of artefacts, infrastructures and practices.

3.4.4 Extending the case of applying constraints

In order to clarify a way of applying ‘constraints’, some existing practices in theatre can provide useful examples. In particular, specific ways of conceiving work with constraints to foster creativity may use: *space and contiguity*, *sensitivity*, *narrative*, and *masks*.

Space and contiguity

One way to work towards framing interpretation of space and movement in theatre is the building of contiguities. Elements can be set to share a space even if they do not necessarily have foreseeable relationships between each other. The acts of creating contiguities and constraints to the perception of space are common. Often, this is done in order to determine the way in which people will have to actively look, search or participate in a scene. As a clarification, theatrical framing is what cinema often does not need to achieve, as framing in cinema can be researched through camera work, editing and screen projection. Similarly, in everyday life situations, as for example in the streets, people (spectators/participants) cannot perceive everything. They have to make their own ‘editing’ and associations. Accordingly, theatre has developed specific devices to achieve “theatrical framing”. This theme becomes relevant to technology design in physical contexts and through performance development.

Senses

Some theatre practices (e.g., Boal's (1979) work) specifically work on altering participants' senses in order to train group work. They research the conditions for collective action by modifying senses when leading performing exercises. In design tasks with media senses are limited, constrained, impeded, or transformed by interactive technology.

Narrative

Selected theatre practices, improvised drama in particular, provide a key to make narrative relevant in technology design, both as a way of constructing meaning through performances and as ways to describe and make sense of the use of technology. Fostering the creation of narratives follows precise methods and traditions. Approaches to improvised drama aim to develop narratives by the incremental and concurrent contribution of several performers. Directors practising these methods lead improvisations with actors in such a way to highlight the mysteries and promises of narratives. Creating promises and mysteries of narratives by collective action can be directed by introducing media as constraints.

Masks

Mediating technology can enable action just from the effects of *masking* human action. We can learn from ways of performing through a mask and working with characters. In theatre methods in mask work follow specific principles and traditions. But in general, a director working with masked actors is a designer, designing for conditions of use of mediating artefacts. She specifically researches the *human* characters by covering up people with different sorts of artefacts or devices. In these cases the director is looking for ways of making the mediating artefacts in order for the performance to become more *transparent* to actors' inner traits and personality. In theatre this is usually researched in order to create fictional characters relying upon the 'humanity' of a performer. In the present case it becomes a key issue for designing

mediating technology, if the 'human' nature of action is what one addresses when designing technologies.

3.5 Conclusion

This chapter has argued that the principles that hold the training and the creative work done in the tradition developed by Lecoq (1997) with neutral, expressive and larval masks can be extended to practical creative work in design. For instance, they can address design practices with mock-ups and props in participatory design.

Design work can be guided by the concepts of neutrality and expressivity, the search for forms of performance through incompleteness, their pedagogical effects on actors and their relationship with different levels of acting. The neutrality of interactive artefacts, their mock-ups and their design abstraction can be researched and defined in ways that are similar to how neutral masks enable exploration and discovery through performances. In the case of larval masks, similar approaches to creative work can lead to exploring the design space through the study of how incomplete forms feature in the world or create new worlds in order to foster imagination and abstraction. Furthermore, the ways larval or expressive artefacts feature in characterised and played performances can be contrasted with how they work in performance work based on neutrality.

The matter is not so much that the props or mock-ups used in participatory design are incomplete as are the larval masks, nor a novelty that one can use incomplete props in order to perform or imagine. Rather, the practical work done with masks provides a relevant terminology and practical approaches that help articulate further the work with props in design.

Chapter 4

A pilot study on cards and their limits

In chapter 2, the literature review of tangible interfaces had identified two main orders of problems that still need to be addressed. (1) One concerns the need to describe what practices can be practically enabled and supported with tangible interfaces. And, in particular, relevant questions concern how, through design, we should make choices, generalise or make theoretical abstractions over the many, varied and often implicit ways in which people create or collaborate through tangible interfaces. (2) The other concerns how ‘information aggregates’ can be organised in a way that they usefully relate to media codes, conventions and formats.

The present chapter addresses the specific case of interactive cards. It describes a pilot study on cards and their limits. It will address the first set of questions by devising and studying some informal composition tasks. It will address the second set of questions by moving from (a) descriptions of some initial design problems when producing tangibles and digital representations to (b) accounts of how students composed digital videos in the physical environment and formed local conventions, defined ‘contents’, and jointly made sense of performed activities of ‘exploration’ and ‘expression’.

The chapter outlines the initial assumptions and questions that motivate the rest of the thesis. The discussion draws from a series of empirical studies, which address different aspects of the design of a tangible environment to manipulate digital videos. The description of the studies is articulated in two steps: (1) establishing links between digital and physical aspects (first part of the chapter), and (2) the nature of the task of composing videos with tangible

objects, which will be outlined through the observation of two different pairs of students at work (section 4.4).

The sensible nature of enquiry in the physical environment will open new questions: what is the mutual influence of digital and physical design actions? What is the nature of physical exploration in negotiations? What is the relevance of digital links on physical objects? And what is the nature of ‘framing’ media texts in time and space in the environment?

The chapter will end with the proposition of selected terms that will help shape the study in the rest of the thesis. These will include: ‘quoting’, ‘framing’, ‘packaging’, ‘format’ and ‘genre’. The proposed terminology aims to help focus on what seems relevant for the thesis, and to help abstracting away from a rich context of analysis.

Part of the difficulty is in the fact that different media and processes of mediation interact subtly and dynamically. Any medium facilitates, emphasizes, intensifies, amplifies, enhances or extends certain kinds of use or experience whilst inhibiting, restricting or reducing other kinds. In particular, this chapter will consider the task of composing digital representations using a physical environment as can be studied with any tool for composition work.

Following Postman (1993), “embedded in every tool is an ideological bias, a predisposition to construct the world as one thing rather than another, to value one thing over another, to amplify one sense or skill or attitude more loudly than another” (Postman 1993: 13). Relevant to this fact, the case of composition work with digital videos and the tangibles devised here poses specific questions.

A critical aspect that will be addressed is the collaborative character of the practices that are devised. Such a focus aims to keep a relevance to the problem of addressing media literacy. In fact, media language production is not only a matter of text processing to create a ‘discourse form’. It will be intended as a social practice involving specific activities devoted also to the formation of codes and conventions. According to Bell (1991: 56), these govern expectations, and the access to pre-designed inputs. They are made of minimal reworkings, editing steps and negotiations.

Ultimately, the scope of this chapter is to refine the definition of a design problem. This will mean, firstly, restricting the focus of a design task, secondly, describing the initial difficulties, and, thirdly, exploring wider boundaries of the problem, in such a way that the more focused scope of the thesis can be related to other cases.

4.1 Research question

The design task in this thesis involved two main concurrent actions. One is the act of devising collaborative practices. The other is the design of a physical setting, endowed with physical-digital links, digital representations, conventions, rules and procedures. They all enable and drive those practices.

4.1.1 Motivations for transposing digital video composition in the physical world

This section looks at how aesthetic features of digital editing can be transposed into the physical domain and vice versa. In particular, how can one effectively transpose the capabilities of digital video editing suites into a responsive and physical setting to enable the manipulation of digital video? This question will be addressed in this chapter in order to determine problems and opportunities in the design task.

The study is motivated by previous research. The basic principles governing the production of a set of media texts were drawn from a study in a simpler context of spectatorship. In Iacucci et al. (2000), the problem of reusing a set of videos of conversations about a physics theorem had been considered. That case did not involve the study of practical authoring and composition tasks. It focused on aspects of spectatorship. However, that study presented a series of design problems, which are relevant to the study of constructive tasks. They included questions about the ways of editing videos into short episodes, and endow the whole set of edited episodes with

an aesthetic unity. These can be related to the problem of understanding how genres and formats can be favoured in order to frame spectators' experiences in relevant ways for inquiry and discovery.

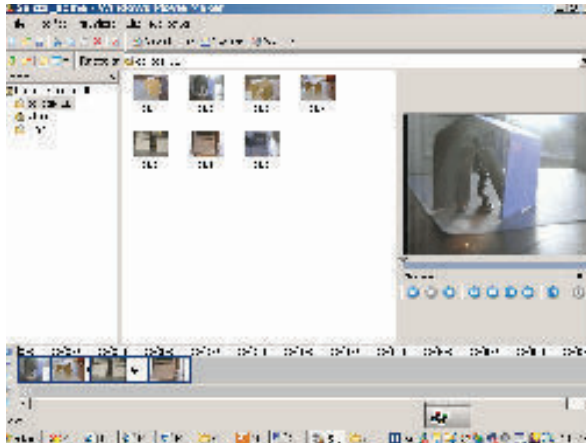
There are many ways of editing streams of recordings into short episodes. There are many alternative editing styles from which to choose. The variables of these styles include: dependency of cuts on verbal aspects rather than on visual features, the highlighting of visual features, the focus on rhetoric, narrative, or diagrams. The whole problem of video editing is not considered in this thesis. This section highlights some of the heuristics that have been chosen to guide the first design actions. In the second part of this chapter, the discussion will also address the way in which some of the aesthetic features of the edited videos have been transposed in the physical domain through the design of physical and visual features of tangibles. Hence, the heuristics will extend to the design of tangibles and of their physical-digital links.

4.1.2 Articulation of a first design question

How can one effectively transpose the capabilities of digital video editing suites into a responsive and physical setting to enable the manipulation of digital video? This question can be articulated by comparing a responsive physical environment that permits the composition of digital video with common digital video editing suites (referring to Figures 3.1.a and 3.1.b). The aim would not be to reproduce all the features of digital editing suites in the physical setting. Rather, the design of the physical setting can be inspired by the features of digital editing suites and enable the devising of different and new constructive tasks in the tangible setting.

If one considers the most common features of commercial digital video editing suites, some contrasting features can be highlighted. Figure 4.1.a shows an example of a common graphical interface to video editing. Video episodes are accessible from a file system, which provides a hierarchical organisation. Sequences can be composed by acting upon a graphical

representation of a sequence that usually permits the representation of video episodes either as ‘items’ (identified by an automatically chosen snapshot) or as segments of a timeline (proportional to their time length).



(a)



(b)

Figure 4.1: (a) an example of a digital editing suite; (b) pupils composing video on a physical environment – from one of the studies described in chapter 5

In contrast, in the setting devised in the present study, and described further in Chapter 5 (figure 4.1.b), video episodes are mostly represented as cards, or embodied by other objects and are displayed on screens or projections. Projections are triggered by scanned barcodes or other sensors attached to physical objects. Each card or ‘charged’ object can represent a particular video episode or an ‘abstraction’ of different possible versions of it. Sequences are composed by creating physical arrangements of objects. A variety of objects, including paper, are augmented with digital properties and can be set to represent digital editing features.

The overall design task includes the creation of tangibles and physical digital links. Some of the design actions have to be done upon digital representations, other ones are necessary in the physical domain. The design actions also include shooting or cropping videos, chunking

video streams in various ways, and annotating or dubbing them. Digital and physical representations and objects are designed concurrently.

4.2 Methods

4.2.1 Empirical studies of forms of inquiry in the physical domain

Empirical studies of video ‘composition tasks’ with charged cards on a table, permitted a further articulation of the design problem of transposing digital video manipulation in the physical domain. In the studies, material ‘tools’ and ‘media’ were constituted by videocards and objects that enable their composition. They were endowed with interactive features, so that digital representations could be triggered by acting on the physical objects. In this setting, the term ‘composition’ stands for the physical arrangement of the objects to represent and give access to compound media texts, such as digital film sequences.

The following description addresses how participants jointly interpreted the task and created local conventions to compose and order the initial material. The focus will be on the nature of their inquiry as a joint accomplishment. The discussion will lead to relevant alternatives for the design of the environment in which they operate. Hence, the design questions will be detailed, and will be related to relevant terminology in media studies and media production practices.

4.2.2 Organisation of the pilot study: elaborating a radio interview on European politics

The study focused on how a task of collaboratively composing digital video developed as a discussion of a spatial exploration of physical architectures. This involved the following steps:

1. recording a 30 minute radio interview about European politics made with an historian;

2. producing a 2 hour videorecording of 4 students in history and sociology who comment on and question the radio interview;
3. producing 4 episodes of the radio interview and about 10 video episodes of commentaries and questions (see figure 4.2), according to the principles described in the previous section,
4. producing one video card for each one of the 14 video and radio episodes;
5. designing other physical objects that can be used to compose videocards in the physical domain. These included dedicated tables, lights, cardboard of different shapes;
6. engaging two pairs of students in exploring the material and the videos provided, and in composing the videocards and the rest of the furniture. Both pairs of students spent about 30 minutes viewing the material provided, including all digital representations;
7. they triggered the digital representations associated with each videocard. Afterwards they composed the materials together. The composition task took between 30 and 40 minutes for both pairs. At the end of such activities the composition was presented as embodying possible alternative editing paths for documentary films about the question addressed.

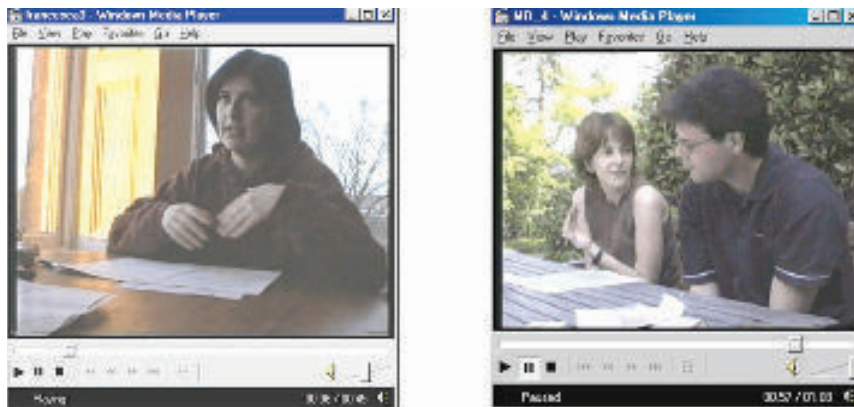


Figure 4.2: Two examples of video episodes from the set of commentaries and questions about the radio interview

The digital recordings that are ‘attached’ to the ‘cards’ include 10 episodes of conversations about the content of a radio interview, along with 4 episodes from the radio interview. All episodes’ length is between 5 and 45 seconds.

First two students (A. and D.) were asked to build a composition. Their composition was later developed by two other students (S. and L.). Both couples have been asked to create an order without doing the actual digital editing of the videos. The four participants in these studies were female undergraduate and postgraduate students of between 20 and 26 years of age. A. and D. were a Scottish and a Swiss student in History. S. and L. were two Italian students in architecture. D. and A. were instructed to create a physical composition which entails video sequences. The composition would later be edited in digital format relying on the structures they put in place. They composed an installation in which digital representations could be accessed through barcodes attached to visual links. In about 40 minutes, A. and D. selected a set of digital recordings from a corpus of 21 recordings of between 5 to 20 seconds from a radio interview. They created a space in which these could be explored. The historical background of the European Union was linked to the post-war re-unification of Germany through a number of issues on politics and economics. The space they created contained a number of architectures that ‘framed’ the recordings through more or less conventionalised

spatial solutions. During the process of establishing an order, the digressions in A. and D.'s conversation take them to identify a set of relevant issues.

4.3 Analytic framework

4.3.1 Concepts for designing the physical environment for inquiry and discovery

Three metaphors can be used in order to transpose design concepts from traditional architectures and *loci* of social action. Here, they have been chosen among others because they were suggested by the way pupils appropriated the environment in the field study described in Chapter 5. They are three stereotypes of spaces structured for exploration, selection and composition: the picture album, the market and the museum (figure 4.3). Each of these traditional environments presents – in all cases for centuries – some peculiar issues concerning flow, inquiry and discovery.

They are not supposed to be taken as mutually exclusive and purely alternative models. Rather, they are considered here as repositories of design models which are rooted in social activities. Some selected aspects and their features can be observed in the unfolding of participants' activities and will inspire ways to address the design problem.



Figure 4.3: A picture album, a market and a museum

The three metaphors suggest alternative concepts for the design of responsive physical environments for handling digital representations.

1. *The environment as a picture album.* Picture albums offer patterns of organisation such as linear or hierarchical. Representations are framed in a discrete way, because slots or pages are assigned to objects (pictures), which have a restricted set of standard sizes. The act of composing tends to be compilative. It produces static, and sequenced discourses, in which contiguities and the act of trying out recombinations acquire a predominant role. Also the act of exploring the composition tends to lead to sequences and linearity.
2. *The environment as a museum.* Museums, as picture albums, usually present linear and hierarchical organisations. Items can be accessed in sequences and spaces such as rooms (pages or books in the picture album) and tend to organise themes into hierarchies. However, museums often offer geographical and embodied manners of exploration. They usually offer paths for exploration. They can be populated and explored in itinerant ways: there are entrances, exits and digressive paths. Furthermore, their comprehensive architectures tend to be closed and favour encyclopaedic, or locally complete arrangements.
3. *The environment as a market.* Markets can be explored as museums, in itinerant ways and following entrances and exits. However, they tend to evolve in spontaneous and chaotic ways. Chaos also characterises the organisation of smaller parts of their architecture, down to the unit of the single retailer, shop or table. They are characterised by redundancy and direct access facilities. These encourage comparison, exchange and polyphony.

4.3.2 Tangibles featuring as neutral, larval or characterised designs

The analytic framework addressed in the previous chapter is employed to describe how participants in the pilot study share the resources in their task, and how the objects feature in different ways with respect to the intents of expressing and performing. In exploring and expressing attempts, tangibles had different manners of featuring in performed actions. In particular the following definitions are inspired by a reinterpretation of expressive, neutral and incomplete artefacts in the practice of designing masks and devising masked performances (see chapter 3).

1. Relying on the *characterisation* of designs. Tangibles such as videocards can be characterised as tokens, containers of digital representations, thanks to the pictorial representation they carry, their shape or their annotations. When used as components of displays, arrangements, or to exchange digital items, they can acquire an expressive role. This can stem from their characterisation as specific types of tangibles that are endowed with specific roles, but also purely from aspects of their outlook.
2. Relying on the *neutrality* of designs. Tangibles can be used in ways that are neutral with respect to the expressive functions mentioned above. For example, cards can be used to express nothing, but just as indexes, token, or utensil. They can be employed solely as a means to access digital representations, or to perform any other action that does not have an expressive achievement.
3. Relying on the *incompleteness* of designs. The competent and effective use of tangibles can also rely on their incompleteness. Some examples of incompleteness are the presence of a single snapshot from a video on the face of a card. This can be regarded as an incomplete representation of a video. More complete representations of that video would be a sequence of pictures displayed on the card.

The relevance and the employment of these terms is discussed further when looking at the findings in the study in section 4.4.

4.3.3 Concepts pertaining to the definition of ‘tangibles’

The analytic framework derived from masked performance makes use, from the present study, of a terminology that refers to interactive tangibles. In particular, the nature of interactive tangibles here is described referring to how they can feature as “tokens”, when they are regarded and used as an individual concrete mark; ‘containers’, when they enable the storage of digital representations, or can be said to be able to be ‘charged’ with digital representations; ‘bricks’ or ‘building blocks’, when they provide opportunities to build up or ‘shape’ a composition; and as ‘utensils’, when they can exercise operations on contents, such as, for example, ‘join’, ‘shrink’, ‘enlarge’, ‘shift’.

4.3.4 Specific design choices pertaining to tangibles

Given the design problem of creating tangibles that permit the transfer of functions of digital editing suites in the physical domain, there are many possibilities. Following the examples considered so far, the following definitions can be drawn. They provide terms that will be addressed in the following chapters.

A tangible or a digital representation should be *manageable* and *versatile*. This can mean being:

- short/small. The size is relative to the environment and the other materials available;
- self contained/self explanatory;
- provide possibilities for being ‘composed’ with others;
- able to provide different ways of being ‘used’. For example, it can provide different ways of being associated to other objects, it can serve rhetoric functions, such as introducing, questioning, concluding.

Other questions concern the different possible ways tangibles can be used to ‘manage’ digital information. These will be addressed by the following subsections and they will influence the priorities in the design task.

The following alternatives are taken from the literature (see section 2.1), and will be defined further in this chapter:

1. *Tangibles as tokens*: enable the access of specific digital representations through minimal associations; How should associations and the physical design of tokens be defined?
2. *Tangibles as containers*: enable the actions of being charged or discharged with digital representations; How should the procedures be defined? What should be the conditions for ‘being charged’ or ‘containing’ digital information?
3. *Tangibles as bricks (or building blocks)*: enable acts of composition in the physical space; How should physical compositions be related to digital compositions?
4. *Tangibles as utensils*: enable functional uses and transformation of digital representations; What skilled use should they enable?

Furthermore, incompleteness or characterisation and expressiveness or neutrality are important themes to be tackled in this study. This is because the design problem is addressed by developing technologies mainly by the action of devising collective practices.

In the practices, the designed objects evolve according to how participants in the tasks make sense of their ‘use’. Hence, there is a consequent problem of addressing design issues with ‘incomplete’ or ‘expressive’ designs.

- *Tangibles as incomplete designs*: With what degree of completeness should the design of tangibles be implemented?
- *Tangibles as expressive designs*: Tangibles can acquire ‘expressive’ functions. For example, through their pictorial features, or their shape they can create meaningful

arrangements or associations. What expressive functions or characterisations should be implemented in tangibles in order to favour performed actions in the environment?

- *Tangibles as neutral designs:* When researching on alternatives for expressive use, a fruitful dimension for exploration of design alternatives is ‘neutrality’. When neutral versions of expressive artefacts are implemented and tried out, they can show the worthiness and the role of expressive functions. With respect to expressive usage, what variations should be implemented in order to contrast expressive with neutral use?

An assumption in this thesis is that these questions need to be addressed with respect to how participants in practical tasks jointly make sense of their work. This will be the object of section 4.4 in this chapter.

4.3.5 Ontology and taxonomy in the designed environment

A part of the conclusions that can be drawn from the first experiences with tangibles are a set of principles about the nature of the entities presupposed by the design problem (ontology) and their classification (taxonomy). Such principles only determine the initial setting in which the study is conducted and they serve to explain how the range of design alternatives considered in the first place has been restricted. In summary, tangibles have been defined as tokens, containers, bricks or utensils. Their nature has been related to how they can relevantly link the digital and the physical worlds. Further discussions in the rest of the thesis must clarify what among these design features is relevant to what aspects of media literacy.

When ordering any set of elements it is a common attitude to establish links between forms. Links between images, words, movements, actions provide devices to group episodes. More in general, pictorial affinities can be established among the diversity of natural and cultural images in physical and digital environments. This seems as relevant as more formalised features of both digital and physical designs. As a consequence, images cannot be imposed by authors and designers ‘top down’. Rather, they need to be cultivated through the act of devising

practices with participants. They arise through opportunistic use from the material that is available. So, there is a process of ‘surfacing’ the selected images from digital representations to material objects in the environment. Those images that are selected and ‘surfaced’ are those that serve a purpose in composition work, when used in conjunction with sound, tangible features and other pictures.

4.4 Findings

4.4.1 Observations from the first collaborative task

This example focuses on an episode taken from the first composition task which was carried out by two History students. The description addresses how they make sense of the composition task by appropriating the media and the tools.

The first part of the task

A. and D. had been asked to select some videocards from a given set, and try and establish an order with which to compose the videocards in order to ‘address’ a specific question they chose. According to the given instructions, the aim of the composition is to map the access to a corpus of recording of comments and accounts about the question. During the first part of their interaction they decide the question should be about the effects of the reunification of Germany in European politics. Throughout the task, A. and D. will articulate the question using the composition. Their composition will be made of a set of videocards they select and arrange.

Figure 4.4 shows A. and D.’s task, in which videocards are composed upon a table. They give access to videos and, as a composed physical arrangement, they give access to film sequences. The last picture in the sequence shows A. and D. at the beginning of the transcript which is reported below.

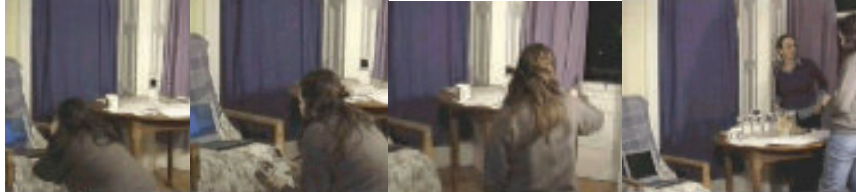


Figure 4.4: A. and D. are shown at the beginning of their composition tasks

A. and D. know that their composition will have to be developed further by two other participants. The latter are two architecture students, who will be asked to develop or redesign parts of the composition in order to create a space for physical exploration. This subsequent tasks will be described in the example of section 4.4.

D. and A. have been asked to organise the corpus of recordings in order to suggest not one single line of argument, but a map of the issues and controversies they can find in a limited time (about 40 minutes). Their task bears some similarities and differences from that of producing a documentary starting from a set of audio-visual recordings. Among these there are the fact that the time and the resources available are much more limited. Also, the most important result is not intended to be a finished sequence (a film) but rather the partial representations from the composition work. A. and D. cannot freely chose what their composed representation will be about. However, the composition will be made upon a set of representations selected from the initial set and framed in the composition. So, their choices are dependent on the material available.

A story within the task

The transcript in table A.1 is taken from a 90 seconds segment from the 40 minutes video recording of A. and D.'s composition activity. The episode contains the first moments of their composition work. In this particular 90 seconds episode, one of the two students modifies the physical layout, and draws some essential lines of the organisation of the final composition.

This gives an opportunity to the other student to develop on that contribution. She creates a wider and more sophisticated paradigm.

4.4.2 The practice of ordering historical accounts

A driving motive of the present composition practice is the need to accommodate, or at least distinguish, different points of view. Also, there are different possible degrees of simplification. In D. and A.'s task, choices about perspectives and simplifications are made, from the beginning to the end of the task. D. and A. implement their choices by using spatial surfaces and layouts to drive and constrain readers' acts of exploration. Their collaboration makes use of various features of the physical environment. On the table they can physically compose pictures from the videos, barcodes (linking to video episodes) and other physical objects that create geometrical structures.

As the transcript shows, by trying out different alternative compositions, they tackle the problem of determining what, among the many aspects and dimensions influencing the historical theme they have chosen, should be displayed. From the beginning of their interaction, A. and D. focus on building a map for the exploration of problems, more than on composing an explanation or a single line of argument. They cope with the presence of multiple voices and the presence of difference genres of textual composition.

Through various attempts they reach the definition of an 'order' with which to present the material. However, their collaboration displays important achievements in designing some basic categories of discourse. These will be consistently integrated and finally embodied by the spatial layouts.

4.4.3 Content: themes and labels

How A. and D. define the 'content' of their composition is dependent on locally organised patterns and formats. Some of these can be described and tracked in embodied discussion.

There are a number of references that describe what the composition is 'about'. Some are made explicit in the environment. Some are a way of referring to each video episode which relies on short labels. They can be named as 'themes', 'factors' or 'dimensions'. But A. and D. don't make any explicit reference to themes or dimensions. However, by looking at their interaction, they make reference to different reasons influencing the facts which are talked about. They back these references in their use of the tangibles and of the space. They mention the 'monetary one' (line 6), 'co-operation' between countries (line 29), 're-unification' (line 14), terrorism (line 33), changes in the geopolitical order, such as 'relations with Russia' (line 37), and the 'switch of balance' (lines 43 and 45).

They address the problem that accounts from different sources can be compared only by making explicit reference to what aspects, factors, dimensions of the account are to be considered at the one time. This common problem in accounting History seems to rule the proliferation of (historical) factors, dimensions and themes, whose references increase in the physical setting. The question A. and D. are addressing in this interaction is "how did the reunification of Germany influence the new political relations between states in the EU". From line 6, they explicitly refer to different dimensions and aspects influencing historical facts. The act of composing these different elements together benefits from how they partly accommodate different views.

The nature of their discussion seems to be heavily influenced by the fact that the whole practice develops through the manipulation of cards. These cards are firstly used as tokens. This is facilitated by the synthetic way A. and D. refer to the video each one of them triggers. What is their relationship to the definition of themes, subjects for discussion and the 'content' of the multimedia composition? The first form of self-contained elements that populate the space are multimedia objects embodied by *cards*. They get labelled with short verbal descriptions of their content. For example, when the content of a recording is indicated, as in '...it's talking about ...' (lines 3 and 8), the synthetic verbal description doesn't only work as an attribute of a recording, it is the actual generation of a item, such as a 'label' that qualifies that object as a token. This seems to amount for a great part of the simplification of the subject that is discussed.

Because videocards need to be readily handled and exchanged, A. and D. tend to condense the content of digital recordings into simplified descriptions. Such descriptions are like ‘labels’. Cards were not provided with such labels, nor were they designed in the first place to suggest one title rather than another. These labels are continuously generated in the interaction. Furthermore, there is an evolution of A. and D.’s way to handle objects in conjunction with negotiating the historical issues. In the initial compositions, each clip (as embodied by a card) becomes framed in a discourse that proceeds by thematic associations. In the subsequent compositions, the organising pattern changes. From line 14 onwards, the themes of reunification and the foundation of the EU are handled as ‘objects’, whereas the other dimensions of the historical treatment are treated as separate spaces within which the question can be articulated.

In summary, these observations point to two main aspects of A. and D.’s composition practice:

1. They increasingly rely on locally conventionalised patterns to ground their discussion. It is those patterns in conjunction with the ‘labelling’ descriptions they introduce that seem to define what the composition is about.
2. Their negotiation repeatedly falls back to the task of agreeing on how to build a sequence of standing cards. But the collaboration takes a number of digressions in exploring alternative architectures. This path in their negotiation leaves a trace in the physical composition.

There are several contributions from A. and D. that display alternative manners of use of space. Such manners have influenced the ways the discursive forms of presentations can be explored by other viewers. In the following, these forms will be described more in detail. They will inform the ways the collaborative tasks are conceived and supported in the rest of the study.

4.4.4 Themes and views: framing texts in physical architectures

Local formats and conventions extend to layered physical architectures. This leads to considering forms of composition that extend beyond sequential framing. The following descriptions lead to considering forms of ‘packaging’.

Once the groupings of themes and views are embodied in space, a reinterpretation is made (from line 20). The opposition between France and Germany is proposed as a predominant aspect. The order (first re-unification, then EU) is re-discussed. After lines 11 to 14, D. and A. repeatedly refer to reasons to create structures. This happens in line 20, when a backward sequence is started, in line 24, when A. indicates an order on a new plane, in line 38, when the suggestion is to create a disposition in which cards are vertical, and in lines 53 and 55, in which their current need seems to create an initial representations which displays a chronological order: “...how things came by...” (line 55). With the themes they follow a sequence. From line 50, the sequence will have been extended on the surface to constitute a ‘J’ shape. Later on, to this shape they will give the meaning of an ‘impasse’ (see figure 4.7). In this form, sequencing is dictated by thematic association.

A. and D. increasingly detail the task of building thematic associations. They do this from line 11, by exploring ways to compose the objects physically, they make a series of alterations of the physical compositions. For example, the following transformations are stated and realised physically: ‘put them on these cards’ (line 17); ‘join things on the same [level]’ (line 23); ‘...should go with ...’ (line 32); ‘putting in relationship ...’ (line 12); ‘that can go there’ (line 10).

D. and A. repeatedly refer to two different meanings of such alterations:

1. On the one hand, they refer to the need to create discursive relations between the recordings;
2. On the other hand, they display the need to accommodate alternative interpretations from the geometries that get displayed in the physical space.

This happens for example in the following transformations: ‘put them on these cards’ (line 17); ‘join things on the same [level]’ (line 23); ‘...should go with ...’ (line 32); ‘putting in relationship ...’ (line 12); ‘that can go there’ (line 10). For instance, in each of the physical transformations, some aspects of the definition of themes and the decision of matters of relevance are discussed. In fact, ‘layering’ provides different dimensions for the discussion of themes in the context of geography. ‘Enveloping’ provides the need to discuss matters of ‘*relevance*’.

In summary, because conventionalised patterns extend beyond two-dimensional planes or sequences, the terminology that media studies employ to describe the integration of media terms into composed programs (e.g., framing) need to be extended to terms that enable the study of physical designs.

4.4.5 The composition from the previous example reworked by other students

In this example, two students in Architecture (figure 4.5) make some simplifications in the language of the videos and in the composition that was made by the previous two students. They rework the arrangements in order to accommodate such simplifications. They contrast them with a different treatment of the historical issues. Their final treatment relies on a different manner of the use of the tools and the media.

A different manner of inquiry with the same setting

S. and L. start by explicitly discussing the alternatives for the whole material’s organisation. The discussion is carried out while manipulating objects and tools. The discussion is prompted by these practical actions.

In the transcript in table A.2, after lines 5 and 6, most cards and their arrangement have represented states opposing each other. From this point S. and L. agree that the composition they have been given poses a too simplistic question. They reorganise the spatial layouts to represent themes and dimensions in a different way.

In lines 8 and 9, this endeavour starts with the exploration of other ways to build physical structures. They do not only rely upon oppositions of cards on a surface. They move to other spatial dimensions. They create different planes, and build layers.

Such alterations are backed up in the conversation. S. and L. do not consider further the historical problem in terms of states as agents creating a narrative, but in terms of a timeless structure that hosts different sorts of operating influences tending either towards union or towards separation. In contrast with A. and D.'s way of working, S. and L. make a richer use of rhetorical figures. Their composition represent abstract aspects with figures such as 'equilibrium' and 'separation'. This is a representation that they use also in their conversation in order to frame categories.



Figure 4.5: S. and L. at work at their composition

These practices rely on the fact that alternative contiguities can be created. This is achieved through recombinations. They display ways of foregrounding features physically and creating contiguities; and ways of determine what is visible and what is not visible.

The new composition

S. and L. build internal and external layers. Their composition can be explored from the inside going outwards, and circling around it. In the centre there are two cards facing each other, around it there are four 'walls' made with pairs of cards, on top of it there is a flat surface made with two cards (Figure 4.6).



Figure 4.6: An arrangement produced by the second pair of students

As a result, S. and L. end up giving a representation of the different facets of the same problem. The following *properties* emerge in the physical space: there are no sequences; the space has two regions: the inside and the outside; the external surface has sides looking in four different directions; the most accessible cards are those of the external surface, there is no suggestion of a point of entry. It has concentric layers and there is a core. The fact that it is in three dimensions instead than in two makes it possible to unpack it. Categories used in the language in the videos get incrementally encrypted in spatial and material features.

Pairs and groups of cards are set to represent dimensions, and this is backed up in the physical organisation of the collage. Then cards get divided into two main groups: 'unifying issues' and 'dividing issues' (lines 11 and 12). These groups are used by S. and L. to refer to the same question, which is about the causes of the shift in political alliances between France and Germany. The grouped cards illustrate aspects of this same theme. The different aspects are geometrically represented as levels and dimensions in the composition.

4.4.6 Emerging design dimensions in the practices, resources and tools

The studies presented above suggest important issues for the design of a responsive physical environment for the support to some specific approaches to media literacy. The present discussion will ask how a responsive physical environment can open the production of media texts to inquiry. This is related to investigating how the environment can be used to engage participants in exploring the effects of their alterations.

In order to address this design, terminology relating to the production and interpretation of ‘media texts’ needs to be outlined. This will be the scope of the last part of this chapter. The terms that will be clarified – e.g., genre, authorship, quotation, framing and packaging – will mainly refer to the literature on media studies. They will be redefined according to the observations reported above.

4.4.7 The nature of the tasks in this setting

The collaborative practices that emerge from the empirical studies described here are collaborative and fragmented. Authorship and spectatorship are difficult to locate. However, some local activities that articulate the composition process can be identified.

About the products

In the work described above, the products of participants’ composing activities are aggregate designs of audiovisual materials. They are presented as aggregates, and they display different modalities. Digital representations attached to tangibles can be accessed only if ‘evoked’. They are rendered visible and audible to others within different selectable degrees of accessibility in the domain.

As a result of the activities, the composition in the physical domain has become as important as the digital video composition. An important difference between the two domains is that whereas the physical composition is actually created, the digital composition remains a virtual arrangement. The latter can be shown by a sequence of triggering actions, or can eventually be produced in the form of a finished video through traditional video editing actions.

About the practices

Participants' tasks turned out to be largely constituted by negotiations about creating an order. Participants also display concerns about how to make viewers "interested" viewers, and how to give access to "meaningfully organised" contents. The practical accomplishments of this task are related to the craft of product packaging or advertisement, in which representations are arranged in order to create needs to inquire more.

The results provide relevant insights about the nature of the 'infrastructure' that enables the practices. 'Infrastructure' is intended as in (Leigh Star 1999). Accordingly, the problem of devising and studying participants at work extends beyond designing the media texts, the software, and the physical/digital mappings. Also the categorisation (of objects and representations), the rules and the conventions governing the tasks are central to the study. They arise from the observations as critical features to be addressed in designing the environment.

Participants have adopted the environment both as a composition tool and as a discourse form. That is, they have used this environment as a space for designing a historical or political visual treatment, as a collaborative information space (shared memory device) and as an archiving device. Their joint work sets from scratch some objectives and definitions on matters of exhaustiveness, consistency and the nature of the particular discourse they create. These are not present in the initial environment. In particular, the very essence of what constitutes a *theme* or a *relevant issue* need to be redefined.

The example provided by A. and D.'s task indicates a type of authoring practice. The composition task is dependent on some specific capabilities of the elements that can be composed. Participants explored the historical problem by creating spaces in the form of layers, sequences, and by relying on the possibilities of physically moving within them.

They indicated qualities of the content by accommodating condensed description of video episodes with the ways they have been arranged together. They displayed contrasting associations (also called enigmas in the description above) which require videos to be triggered in order to be solved. They revealed partial solution for those enigmas by designing discoveries under the composition's surface.

In practices described above:

- there are multiple originators: authoring contributions come from designers prior the composing practices, and are added by participants both synchronously and asynchronously.
- audiences are varied: audiences who access the compositions are not homogeneous, they are fragmented and not always simultaneous.
- also reading is fragmented: the reception of discourse is as fragmented as its production.

Similar features have been described when addressing the production of media language. For example, according to Bell (1991), media language production is not only a matter of text processing to create a 'discourse form'. It is a social practice involving specific activities devoted to the formation of particular kinds of discourse. These are the access to pre-designed inputs, minimal reworkings, editing steps. (Bell 1991: 56).

As in the production of news media language (for example, as described in: Heat and Luff 2000), "...competent use of the system necessarily involves socially organised resources through which text is written, read and co-ordinated with the contributions of others; contributions which are both synchronous and asynchronous." (*Op. cit.*: 63)

Also, there is a tension between the richness of the semantic content of the texts and the simplicity of geometrical arrangements. When a geometrical solution is tried out, the simplification becomes apparent, calling for balancing the simplification to recapture the complexity. Ambiguities in the meaning of spatial layouts, and the necessity to create an agreement, actually offer resources for negotiation and the creation of new arrangements.

The environment does not support the real-time and ‘from scratch’ collaborative production of textual material. Nor does it allow participants to do the digital editing of the media texts.

The emerging need for a terminology to address the design problem

The study reported in this thesis evolved this tangible environment and provided instances of specific practices that can be hosted in it. Some words and concepts adopted so far can be now discussed according to the observations of A. and D.’s example. After the first examples, more articulated definitions can be provided of such terms as: the ‘physical setting’, ‘inquiry’, ‘order’, ‘authoring’, ‘content’ and ‘container’, ‘literacy’ as ‘exploration’ and ‘expression’.

In general, definitions of ‘literacy’ refer to definitions of ‘reading’ and ‘writing’, which here are intended in their larger meaning. In turn, definitions of reading usually refer to such terms as ‘scrutiny’, ‘examination’, ‘recognition’; definitions of writing refer to terms among which are ‘indicating’, ‘showing’, ‘fitting’, ‘composing’, ‘qualifying’.

In order to set a relevant definition for these terms, one needs to look at how participants carry out actions that can be related to literacy as a competence of “reading” and “writing”. Reading and writing can be considered as terms to discuss possible definitions of ‘spectating’ and ‘authoring’. But authorship and spectatorship are only partly appropriate to address the present environment. In fact, even if “spectating” and “authoring” have provided an initial point to define and discuss media literacy, their definition is grounded in the production and fruition of more traditional media. Hence, the two sets of terms leading to ‘reading’ and ‘writing’ here will be used to detail two more general terms: ‘exploration’ and ‘expression’. These will be primarily intended as discussed in (Rogers and Muller 2005). More in general, exploration and

expression, in the responsive physical setting addressed in this study, are related through ‘performance’, as in (Iacucci et al. 2002). Further questions have become relevant in attuning the design problem to the case of media literacy are:

- Is there a specified media content to be understood?
- Are there instead contents to be discovered, selected and framed by pupils as audiences before they can talk about them?
- If yes, what is the ability to understand? What does understand mean in that case?

Relevantly to these questions, the aim of this discussion is to spot those terms which will permit the integration of media studies (and production practices) and tangible interface design. The next sections will redefine common terms which permit the addressing of the relationships between contents and containers, authoring and interpreting. The acts of reading and writing, composing, analysing and synthesising need to be reconsidered. This will be done by reviewing the definition of selected terms in order to appropriately treat composition work with tangible artefacts that give access to digital representations. As in the production of media texts, such activities are organised in formats, packages, embedded or quoted discourse. Their openness must be appropriately treated, and their contents framed. The terms ‘packaging’, ‘genre’, ‘format’, ‘embedding’, ‘quoting’, ‘authoring’, ‘framing’ will be considered in the next sections according to the results of the empirical studies described above.

4.4.8 Media texts get ‘framed’ in time and space

The act of *framing* temporal recordings in the physical installation is constrained by the possibilities that are available for building architectural compositions. For instance, in some places, A. and D.’s composition stresses the one-dimensionality of time. Other structures ‘spread’ time and alternative paths in two dimensions. Because it is an environment which, at the same time, hosts social events and time-based media texts, time must be considered.

There are different timelines that can be taken into consideration. There is the time of the recordings' timeline, and there is the time of the development of composition work or spectators' explorations. In A. and D.'s composition these different timelines are not always distinguishable. They overlap. They end up being locally bound (as in the J sequence, see figure 4.7), and leave their traces in the representation.

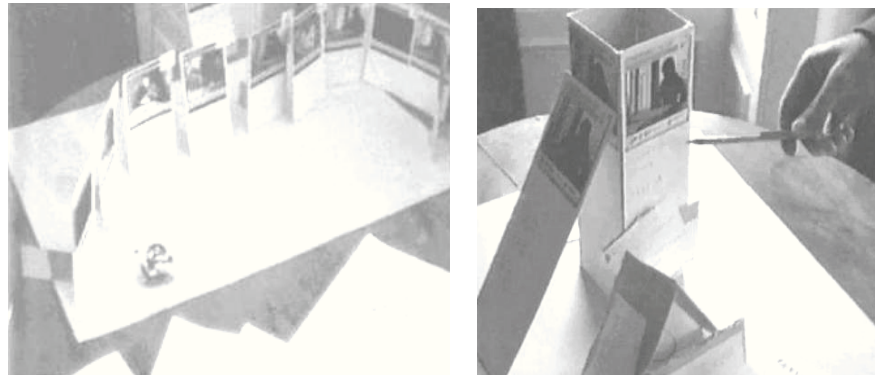


Figure 4.7: Details of the composition: a J-shaped sequence, and a tower shape

A. and D. display different ways to relate space and time. As the following observations suggest, some of the methods they display are particularly relevant because the multimedia material they work with is largely made of time-based recordings.

A visual arts example

A similar variety of alternatives to lay down time in space can be exemplified by an artwork by Howard Larkin in figure 4.8.

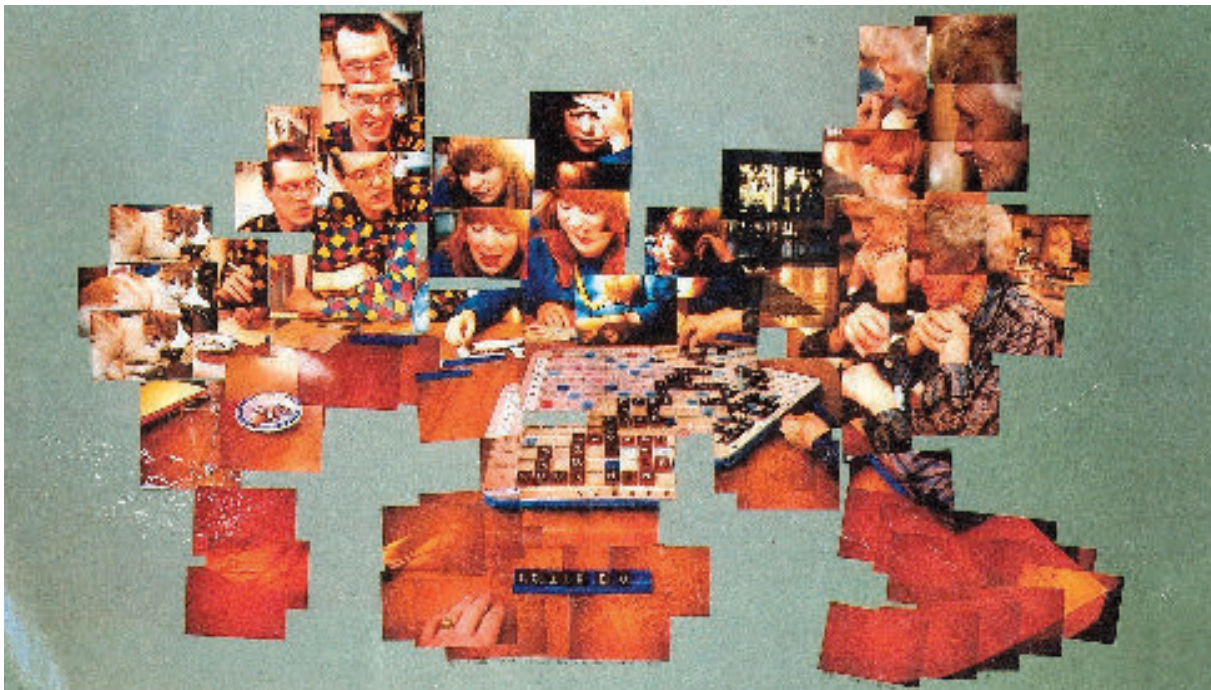


Figure 4.8: *Scrabble* by Howard Larkin

A difference with A. and D.'s composition is that Larkin's picture is bi-dimensional. However, also in this composition:

1. space hosts alternative timelines,
2. different timelines can cross or overlap,
3. frames along the same timeline are used to multiply alternatives,
4. all timelines converge to a point that has space/time consistency, which is used to access and link together different parts of the composition,
5. salience depends heavily on selection. In fact, many pictorial elements are just left out. So a critical part of the composition tasks is the initial selection of elements.

Examining time in A. and D.'s composition

In the present description 'space' will stand for the physical and three dimensional space which hosts A. and D.'s compositions. The word 'time' here will be used to refer to two main timelines. One is the time experienced in a viewer's exploration of parts of the compositions. The other one is the time experienced when orderly triggering and viewing one by one all the videos attached cards in a composed sequence.

The latter time is deterministic. It can also be seen as equivalent to the timeline of an edited video sequence (or film). In this sense it that can be said to be 'embedded' in the composition. By contrast, the former is subjective. It is the time 'experienced' by a viewer when exploring the composition. The relevance of the distinction between these two timelines is that the sort of spatial layouts that tend to be produced by these practices *embodies* references to both timelines. It is a hybrid representation of deterministic and subjective time: the timelines of produced films and the time of exploration.

A. and D. make reference to a sequential order, as in: "...should go towards the end..." (line 2), and "...where do you think we should start?" (line 53). In between these two lines, they make discoveries and definitions about the dimensions and the structure of space. At the end of the 90 second episode, one finds other references to the sequential order: they refer to the act of 'leading' and the existence of 'paths'. For instance, in line 31, 'This one ... seems to lead to ...', gives a rhetorical meaning of a directing physical line. This is a decision that needs to be marked further in the architecture in order to provide a method for exploration. It is a simple labelling of rhetorical functions: 'is a good introduction' (line 43), or 'a good way to start off' (line 46).

A. and D. also find how to use the same space to explore different alternatives, some of which are sequences for possible films. Beside the organisation of adjacent pictures, that represent a given subject over different moments in time, there are multiple versions of those pictures. In relation to the representation of time in space, more seemingly important functions of this environments are emerging. It can serve:

1. to enable composition practices by embodying representations that can be installed in everyday life environments;
2. to provide multiple points of entry in different timelines to a specific problem;
3. to highlight the functioning of the language of some media such as television by disrupting their order, by showing alternative, even if inconsistent, relationships between pictures and time;
4. to provide a representation of stages in film composition which traditional editing suites show only in schematic ways.

4.4.9 From framing to ‘packaging’

In the act of framing media texts in time and space, participants also used physical inclusion and other features which can lead to forms of “packaging”. This is different from sequential organisation and can be developed further looking at design for packaging. The word ‘packaging’ in this study will stand for a collected number of elements that are bound, wrapped, fitted, sealed or simply physically grouped. The significance of using the word ‘pack’ or ‘package’ here comes also from the meaning it has in the design of the packaging for commodities or services to be ‘sold’. This is a skilled and creative practice of creating needs for an audience to inquire more and to engage into a search beneath the surface (or wrap). The surface will be intended as the part which is immediately accessible. ‘Access’ will be intended here as the media literacy term (see section 2.1). Hence, it is intended as the possibility of an interpretive act, not only in the physical sense.

The final compositions offer different physical paths to explore the multimedia material. In particular, they offer multiple points of ‘entry’ to a subject matter. In the case of A. and D.’s task, the subject matter had been expressed in terms of a specific question. As mentioned earlier, the question they have chosen is: “How did the reunification of Germany influence the new political relations between states in the EU?”. Relevant terms for this question can be

found in the final composition. By following a path from the outside to the inside the search can be experienced as a way of ‘unwrapping’ the question. The essential aspect of an unwrapping action here is the exploration of the composition from the outside.

The problem can also be referred to as an ‘enigma’. This can be defined as non interpreted association, or, more in general, as a need to inquire more. Relevantly to this process, A. and D.’s composition partly solves or articulates those enigmas by ‘revealing’ something relevant if explored. Also, it provides devices for ‘discovery’, such as organising patterns or paths. These considerations question in what ways the composition can be said to be ‘packaged’.

The particular type of design efforts to create a package will be defined further. For now, and relating to A. and D.’s composition, it is important to note that it is also a design process that can share some practical approaches with the field of advertisements in spatial layouts and in moving pictures. In particular, there are relevant practices in which creating packages that inspire needs to inquiry more by unwrapping and discovering is the essence of the practical accomplishments of designing and composing some given elements (that create ‘commodities’).

An essential aspect of the problem of creating commodities is the problem of looking for or creating new needs. When composing multimedia material in the physical space, this acquires specific ways of working creatively. In this environment, the needs to inquire more seem to be fostered by physical movement and performance. These considerations question whether a definition of ‘packaging’ in this setting can establish a useful definition of *content*.

4.5 Discussion

4.5.1 Interpretation through the framework from masks

The way S. and L. share the resources in their task shows that the physical objects can be adapted to different uses. The objects feature in different ways with respect to the intents of

expressing and performing. In exploring and expressing attempts, tangibles had different manners of featuring in performed actions. The following considerations are inspired by a reinterpretation of expressive, neutral and incomplete artefacts in the practice of designing masks and devising masked performances as taught by Lecoq (1997). These are discussed further in chapter 3.

1. A manner that relies on the *characterisation* of designs. Tangibles such as videocards can be characterised as tokens, containers of digital representations, thanks to the pictorial representation they carry, their shape or their annotations. When used as components of displays, arrangements, or to exchange digital items, they can acquire an expressive role. This can stem from their characterisation as specific types of tangibles that are endowed with specific roles, but also purely from aspects of their outlook.
2. A manner that relies on the *neutrality* of designs. Tangibles can be used in ways that are neutral with respect to the expressive functions mentioned above. For example, cards can be used to express nothing, but just as indexes, token, or utensil. They can be employed solely as a means to access digital representations, or to perform any other action that does not have an expressive achievement.
3. A manner that relies on the *incompleteness* of designs. The competent and effective use of tangibles can also rely on their incompleteness. Some examples of incompleteness are the presence of a single snapshot from a video on the face of a card. This can be regarded as an incomplete representation of a video. More complete representations of that video would be a sequence of pictures displayed on the card.

The role of incompleteness lies in different possible achievements. Some tend towards expressiveness, some tend towards neutrality. Incompleteness provides possibilities for integration with other objects to create the expressiveness of collages and compositions. Incompleteness can also enable performed actions that are non characterised but neutral with

respect to the supposed role of the type of the given tangible. The description of how some students displayed their shared understanding of some collaborative tasks led to ground some definitions of the words ‘explore’, ‘express’, ‘compose’ in terms of ‘neutral’, ‘incomplete’ and ‘characterised’ designs.

In S. and L.’s composition activity, resources are ‘appropriated’, media and objects are physically shared, both S. and L. repeatedly take objects from the hands of the other. In some cases, they undo work done by the other. In summary, there is a need to address characterised, neutral and incomplete design. The motivations lie mainly in:

- Versatility. The same tangibles might be used to perform different types of tasks. Some are more expressive and rely on the characterisation of tangibles;
- Characterisation and ontology. Characterisation can be achieved for example within the initially proposed taxonomy of tangibles (tokens, containers, bricks and utensils);
- Every expressive use suggests a neutral one. Some performed actions with the tangibles are ‘neutral’ with respect to the intended expressive functions of the tangible types;
- An expressive role of incompleteness. There is a need to design tangibles endowed with different kinds of incomplete features because this makes them versatile (this will lead to discuss abstraction);
- An evolutionary role of incompleteness. There is a need to design incomplete tangibles also because they need to evolve through open ended tasks in which participants in the design sessions appropriate and interpret the tangibles (this will lead to discuss the design of incomplete tangibles following the approaches to design ‘larval’ masks in chapter 3).

4.5.2 Refinement of the definition of ‘tangibles’

Tangibles as tokens

According to the considerations above, a tangible can be a token in the sense that it is regarded and used as an individual concrete mark. It can refer to one or more given elements, and not to a generically defined *class* of elements. For example, a video card becomes a token when referring to a specific edited version of a video episode. The main design principle that is used in this case is to create a minimal embodiment. That is, the design of a physical token linking to a digital representation will tend to be minimal in comparison with its real worth or what is expected. Furthermore, it will stand for a ‘nominal’ representation for an element or event to be triggered.

Chapter 5 will also address the design of tokens in conjunction with the act of devising practices. This will lead to addressing different questions regarding tokens: the alternatives available to physically design an object that can be used as a token, and the ‘sealed’ or dynamic ways of allowing for its attributions to digital representations.

Tangibles as containers

A tangible becomes a container when it enables the storage of digital representations. In other words, a tangible as container can be said to be able to be ‘charged’ with digital representations. So, the definition of token is not only more specific: another difference is that the definition of a container entails the possibility of performing such actions as charging and emptying.

However, the word ‘containing’ will be used in a narrower sense than the common one. For example, in the cases considered so far, a container’s function is to lodge the representations, more than to comprise, to include or to keep within bounds. In fact, no reference is made about capacity or boundaries. So, the essential feature of the tangibles as containers is the way they incorporate or embody digital elements.

Several questions concerning containers in the present environment remain open at this stage. They will be addressed further starting from chapter 5. How should a container collect, unite, or condense the contents? What should be manifest, and what should be hidden of the contained contents? How should a container strengthen or improve one's control over the contained (hosted) elements? How should be contents be received and taken in?

Tangibles as bricks (or building blocks)

A tangible as a brick must provide opportunities to build up in order to 'shape' or display a composition. Such opportunities can include to fit, to mount, to join, to combine blocks, to shape by use of a block. They enable putting in place, positioning, and setting up and 'installing'. Hence, according to the definitions so far, bricks can be tokens or containers that have some specific physical features. They must enable to 'formulation' and exhibiting through the action of assembling physically.

Tangibles as utensils

Tangible objects or features of the physical environment can be 'charged' with digital properties. These properties can be representations, such as streams of digital recording or pictures. In general, they can also be operators, such as 'join', 'shrink', 'enlarge', 'shift'. The nature of these operators or utensils will be addressed in Chapter 5. They need to be ready for 'practical use'. So, they are concerned also with experience and actual use, not just with a theoretic use. This opens other practical capabilities for tangibles. They might need to be adapted or adaptable for use.

Hence, such tangibles are *implements* that can be used as means of performing an operation or achieving an end. In other words, they can acquire specific functions. This can lead to *associating* one or more ways of proceeding. They might require or naturally suggest an *orderliness* of action. These can be discussed and assessed along different dimensions: functional (in the sense of operative with respect to a function), sensible (with respect of

perceptible aspects), feasible (in the sense of achievable, viable goals), and skilled (in relation to competences, dexterity, inclination, readiness).

4.5.3 Reinterpretation of concepts from media studies

‘Quoting’ and ‘embedding’

In the practical tasks devised so far in this study, by the nature of this practice, participants are prompted to choose an interpretation and display a point of view. But the elementary objects are chosen by a designer ‘a priori’. This is a considerable limitation in participants’ authoring activity. It limits their access to the “a priori” conditions. As a consequence, they are primarily engaged in framing and annotating the initial media texts, in order to achieve a point of view and maybe favour a ‘desired reading’.

In such an endeavour, embedding and quoting media texts have become frequent actions. Similar operations have been studied in the case of news media language production (e.g., Bell 1991). In the context of this thesis, to ‘embed’ will mean to insert or introduce a media text (a scene, a passage, a conversation, etc.) into another. This also includes making additions. The case of embedding speech is special. As it has been noted in news media language production (Bell 1991), the embedding process is influenced by the ways technology makes overt the embedded events (Bell 1991: 52-55):

- quotations generate a tension between the original integrity of the video episode and the possibility of reintegration,
- quotations work as traces or breaches. They engage readers in speculative activities to reconstruct the original context and the intended interpretation, or
- they can focus readers’ attention on textual functioning rather than on media texts’ ‘intended’ or ‘desired’ meaning.

Eventually, this can be an act of 'interpolation'. To interpolate will mean to falsify or alter a text by the later addition of material, including spurious or valueless passages.

'Framing'

One of the products of the composing practices addressed above are specific open structures in which media texts are 'fitted'. Such structures can have enclosing borders, or provide slots or paths in which the composition gets 'compiled'. More generally, they are a system that hosts the representations that are provided in the first place. Such systematic way of composing has the effect of 'framing' media texts. That is, the open structure, which can be called 'frame', organises the act of composing. The resulting view of the world which is represented is biased.

At the same time, the causes for such a bias might result from accidental or arbitrary technical choices. A desired effect of the practices in the environment is to increase awareness of such effects. This is why the term 'framing' is relevant and its definition needs to be articulated according to the observations of how participants work. The term 'frame', as used here, is borrowed from the vocabulary found in the media studies literature. In those contexts, the meaning of frame is twofold. 'Frame' addresses the framework within which media texts are embedded, in order to produce the broadcasted programme, as for example the news. This can involve a wide range of devices, such as narrative, argumentative, and pictorial and technical details. At the same time, 'frame' can refer to the resulting (framed) view on reality.

For example, referring to the TV news, Watson and Hill's (2006) Dictionary acknowledges the existence of a 'real world' and of a 'frame': "there is the world and 20 minutes to put it in the frame". The latter connotation can be discussed only by assuming the possibility to discern a real world from the fictive one. This is why, in the context of this thesis, 'frame' will be used only according to the first of the two connotations. Still, the term 'framing' here acquires specific meanings and is produced by specific courses of action. The following discussion provides questions that will motivate the subsequent studies, in order to better understand what frame can mean, and how activities of framing can be enabled and supported.

As seen in the empirical trials described above, framing can be not only a narrative device. There are specific ways of using space and objects. Also, the observations lead to discuss how framing in these practices operates in different activities in the task: the act of composing, the act of viewing (exploring), the act of developing a media text. The act of framing includes creative constructions, techniques, locations and conventions. Here ‘frame’ can be conceived in different ways. It can be interpreted as a:

- *framework*: an open structure that gives shape and support to media texts;
- *configured space or compilation slot*: an enclosing border into which media texts can be fitted;
- *paradigm*: more generally, it can be the system around which biased ways of interpreting media texts is built.

Framing can be used in this context to unify different acts, techniques and strategies, that have a common effect of organising authorship and spectatorship. Still, there is a diversity among these. The study of framing will not rely on the sole presence of a final composition. It will take into consideration the collaborative acts of composing and reading. Framing influences *selection* and *salience*. It can refer to framing *events* or framing *representations*. At a practical level, framing is governed by professional conventions and by ritual (deadlines, showing times, headlines, music, ...). Each ritual reinforces or diminishes the salience of the frame, its dominance over alternative frames. A related term will be ‘counterframing’. That is, the practice of calling the ritual frames into question by ‘analysing’ them in the light of possible alternative frames.

‘Packaging’

Understanding the integration of digital and physical features in participants’ joint productions requires an hybrid terminology. This should enable the treatment of matters of physical arrangement, the formatting of digital representations and the act of discovery by actively and

physically exploring. One of the terms proposed above, in order to describe participants' composition, is 'packaging'. This is not only because of its definitions in practical methods in the media industry. The definition of this term will stem also from more mundane interpretations in the local observations of instance of work that have been outlined above.

An important aspect that emerged in the studies described above are particular ways of creating arrangements that need to be acted upon, in order to be explored. Some of these ways of composing physical and digital material can be related to the act of orchestrating specific forms of discovery. Viewers have opportunities to make discoveries by physically exploring and rearranging the material available. In particular, the compositions of A. and D., and of S. and L. have locally acquired some of the following properties:

- *They need to be unwrapped.* Their exploration requires the act of moving through outer surfaces or boundaries. External parts need to be removed. Or in general, what is found under the immediately accessible outlook is not accessible from the outside, and needs to be discovered.
- *They provide 'enigmas'.* For example, they provide associations that are not explained. They provide insights about problems, which usually are about finding ways to accommodate the contiguity of unrelated material.
- *They partly solve those enigmas by 'revealing' if explored.* The act of evoking the digital representations that are attached to physical objects reveals features that partly explain the contiguities or the disposition of objects.
- *They provide other devices for 'discovery', such as organising patterns or paths.* They provide sequences, narratives, or other organising patterns that can be followed when exploring the composition.

In these and other ways, to be discussed further, forms of collaborative inquiry are realised through the act of producing 'packages'. The relevance of the word 'package' comes also from the 'packaging' of commodities. This is a skilled creative practice in the fields of advertisement

and marketing. The production of relevant packages is a feature of advertisements in space and in the moving pictures. In particular, these design practices aim at creating packages which foster curiosity and inquiry by skilfully wrapping and covering up. When commodities are created, they supposedly foster curiosity and discovery. They carefully show information that foster the need to inquiry more, while hiding important aspect to be discovered if ‘unwrapped’. The practical accomplishment of designing and composing some given elements in order to make up ‘packages’ is a particular way of creating an order which is commonly present in media consumption. The possibility of exercising with such practical activities bears a relevance for media literacy.

In media studies the word ‘packaging’ has different connotations. It can refer to the style and the framework with which TV programmes are presented on screen (Watson and Hill 2000). More in general, it is said to refer to “any form of image making for a media product” (Watson and Hill 2000: 225). In a connotation more related to common language, a package is a proposition or a thing in which separate items are offered together as a single or inclusive *unit*. In many ways, this involves wrapping, grouping and compiling.

According to these terminologies, other ways in which packaging can be achieved are by tailoring programmes to suitable *formats*. This gives an emphasis to the connection between the manufacture and the distribution of packages. The *making* is connected with the *presentation* of ‘media products’.

Such a view of the collaborative practices suggests a number of questions. According to the possible meanings of *packaging* that have been reviewed above, the following chapters will investigate the practical meaning and relevance of ‘inclusiveness’; the nature of ‘unity’ in the production of a ‘package’; the practical meaning of packaging, in the sense of ‘compiling’, ‘formatting’ and ‘codifying’. However, the terms ‘code’ or ‘format’ can be used along a different dimension for analysis in the present thesis. That is, the local creation of conventions and ‘genres’.

‘Codes’, ‘formats’ and ‘genres’

When organising collaborative activities, it is necessary to impose conventions and standards, in order to achieve a shared way of working among participants. On the other hand, one might leave participants free of deciding about what conventions should be adopted. The interest is in leaving the creative thrust in the hands of participants.

About the act of seeking unity, the main activities in which participants are engaged aim to create unity and coherence among a given set of multimedia items. For instance, more low-level activities aim to isolate those items for which causal or associative links of some type can be found or established with others. However, this is not the only paradigm through which learners seek *unity*. It depends on the genre of presentation, and in order to share an understanding of the activity, the genre itself must be negotiated.

Genres guide participants in activities of creation, readership and criticism. They can function as: (1) composition paradigms providing a framework for organising stylistic elements; (2) sets of precepts and expectations for audiences to organise their viewing; (3) critical frameworks for reviewers to arbitrate between the distinctiveness and putative success of the product and the taste of its implied audience.

Defining and recognising ‘genres’ has implications on the present study: production, spectatorship and criticism. To authors it gives stylistic guidelines. It also provides composition reviewers with tactical means of evaluating a composition’s merits in terms of the way it affords particular effects by extending, usurping, challenging or reworking particular generic elements.

4.5.4 Conclusion

As emerging from the first empirical studies described in this chapter, the environment and the tools designed in this study can work as a means to address media literacy aspects from media production and fruition. It can do this at least in two different ways. One is by providing

rhetorical figures in space of such aspects as packaging. The other way is by being an authoring device in its own way, detached from and indifferent to the manners of production in the media industry, and endowed with its own efficiencies and expressive power.

In the following chapter, the study borrows even more practical and conceptual approaches for the creation and fruition of media from production practices in professional contexts in media production and visual arts. However, those contexts differ from the cases treated in this thesis. For instance, they are guided by competencies, conventions and policies of writing and publishing. The educational practices addressed here, instead, are not institutionalised. In addition they are realised through small scale empirical studies.

The studies described in the chapter 5 will follow the results from the first empirical studies and lead the discussion further. It will address the questions raised in the present chapter and refine the design of the environment, the practices, together with rules, conventions and categories that guide them.

Chapter 5

Media literacy in responsive physical environments in two primary schools

In this chapter, the terms proposed so far are implemented in design choices and developed further in two field studies in primary schools. The act of devising work sessions with primary school pupils meant that the collaborative tasks had to be organised more and made sufficiently clear. At the same time, they needed to be open ended enough in order for pupils' work to contribute to the evolution of the design concepts. Hence, because the study needed to be adapted to the environment of the schools, some more design choices needed to be made in advance. Also, educational goals and assumptions had to be defined in advance. As a result, the initial environment in which pupils operated had been partly designed in the first place. However, the main focus of the study remains on the evolution of the initial design choices. They were made to evolve according to pupils' creative contributions through their effort of making sense of the instructions and of the tasks.

Even if this work is inspired by ethnomethodological interests – as the description of how pupils make their ways of working accountable to each other – it does not consist of an ethnomethodological study. It is influenced by practices in HCI which are called ethnographic.

The results of the study include the definition of a series of collaborative and constructive tasks. The work in the schools was initially presented to pupils as a series of collaborative tasks for the 'production of films'. The responsive physical environment that supported such

practices progressively stretched from tables to the environment of the classroom, which was endowed with interactive features.

The description that is given here focuses on a set of design problems. They concern the definition of simple interactive technologies together with resources and the infrastructure. As in the rest of the thesis, the object of design is not a self contained model or system. Rather, what is developed and described is the integration of conceptual tools, rules, categories, conventions, digital-physical links and part of the rest of the furniture.

The first half of this chapter is devoted to describing how the environment was organised in the first place, and how the activities were instructed and supported. This will lead to describing a range of design choices, from physical/digital couplings and designs to the establishment of rules, conventions and categories that work as an infrastructure for pupils' work. The second half of the chapter – from section 5.6 – will describe how pupils' work unfolded. The observations are grouped around five themes: (1) composing films in physical installations, (2) framing and packaging media texts, (3) motives from evasion and stall in pupils' practices, (4) transposition of TV genres in the working environment, and (5) issues concerning the dealing with abstraction and memory.

An important consequence of the practical trials is that the initial definitions of the practices and of the infrastructure evolved taking different paths. In particular, two different styles of designing an infrastructure to address media literacy in physical environments emerged. One is 'combinatorial', 'dissembled' and 'sealed', and one is 'furnished', 'installed' and 'permeable'. These two styles are used as a ground to compare design concepts. Some of the results from the studies in the school were developed further in building interactive installations in an art museum, as described in chapter 6.

5.1 Goals

The present studies are interpretative and design oriented. Hence, finding the research and the design objectives is part of the results in each study. However, each study started with some explicit goals. In order to uncover some initial preconceptions, and in order to place the relevant design choices in context, this section summarises the initial goals.

The two studies described in the following were both carried out as a series of work sessions with pupils in two primary schools in Edinburgh. The work sessions took place between May 2003 and June 2005.

Pupils worked at a number of tasks to rearrange, produce and modify media texts in order to create different genres of video compositions, from documentaries to news and advertisement. By manipulating physical artefacts endowed with interactive features they selected, edited, produced or deconstructed audiovisual material in digital formats. These will be referred as collaborative authoring and deconstruction practices.

A series of collaborative tasks of reading, scripting, interpreting, annotating, editing, video-shooting, and composing were devised. They were made to evolve with the intent to attune them to pupils' way of working. A particular interest was placed in the role of digitally augmented tangible objects and surfaces.

5.1.1 Goals of the activities as part of pupils' experiences

An underlying assumption of the studies in the schools is that abilities to critically *read* media texts cannot be addressed fully without favouring also the acquisition of *expressive* abilities of *authoring* with the same sort of media texts. In this sense, a major aim has been to turn the knowledge of media languages that pupils acquire in their daily life into a resource. Integrating responsive features in the physical environment aimed at providing opportunities to apply such a resource to tasks of critical reading and composition of documentaries, trailers, interviews, TV commercials, reviews and other media genres.

The activities with the pupils were integrated with some of the activities in which they were engaged in as a normal day at school in class. The goal was to provide them with skills and resources that enable them to ‘access’, ‘deconstruct’ and ‘author’ some specific genres of media compositions. Another concern was to develop activities that provided different modalities of representations about the taught subjects, such as history (at the First primary school) and geography (at the Second primary school).

5.1.2 Goals of the activities as part of the present research

In relation to the research interests, the goals of devising practical activities with pupils were to study the design problem in the terms reached with the pilot study of chapter 4. Accordingly, the main goals can be summarised as follows. The activities addressing media literacy in the responsive physical environment aimed at understanding:

- in what ways pupils can make sense of the practice of composing a film concerning a subject that is taught in their class and using:
 - tangibles that have pictorial representations of videos and can be charged with them;
 - an environment that enables the building of installations in which they are integrated and made accessible;
- what specific steps, among the various activities that can be found in professional media production, should be considered; also, what other or different steps should be introduced in order to make the practice flow; and what steps should be simplified in pupils’ work, or just done by designers altogether, because not every action for media production could be made available in the environment;
- what composition paradigms pupils put in place in such a way that are meaningful in the local organisation achieved within their group. And, in particular:

- what forms *framing* and *packaging* take in their activities;
- what uses of tangibles as *tokens*, *containers*, *bricks* and *utensils* are meaningfully put in place;
- what *neutral* and *expressive* actions pupils perform;
- and what forms of *incompleteness* (and *larval* features) of the designed objects can become functional to devising the practices.

5.2 First study: research question

5.2.1 Two types of activities in the settings

As outlined above, the field studies involved the organisation of a range of activities with pupils and teachers. Two main activities emerged amongst others. They became increasingly formalised and articulated thanks to participants contributions. One is the construction of films in a physical building site ('building films in space'). The other one is the deconstruction of advertisements, propaganda and TV news.

These two activities had not been considered as self contained and distinguished tasks in the first place. They emerged through the practical work in the schools and constitute contributions of this study. They increasingly became characterised as distributed work practices, and became endowed with a set of conventions and design choices. The two activities are enabled by two different tool kits – the *film installations kit* and the *advert kit*. These were researched by being integrated in different ways in the environment of the classroom.

The construction kits are outlined below. Additional figures on the material are in the Appendix: figures A.1 to A.7. The construction kits address the decomposition and composition in space of two kinds of media texts endowed with specific properties. They both aim to make a

proficient use of the possibilities to organise and formalise physical/digital links. They also aim to make use of space to help understand the working of different media types.

Activities building films through spatial composition

Building films in space consisted of the construction of an interactive installation (figure 5.2), from which video sequences were located (figure 5.3). The act of embodying digital films in an installation is the initial driving motive of the activity. So, in some groups of pupils they start building the composition with an idea of film sequences in mind. However, during the practice, the act of finding alternative and unexpected sequences is a common step. An example of a video sequence which has been instantiated from an installation is presented in figure 5.3.

The activity also includes deciding on what material is missing ('tailoring', in figure 5.6) and producing it. The use of space and tangible objects includes spatial reasoning and finding metaphorical relationships between physical composition and digital representations or their manipulations (figure 5.6). The activities of building films in space were tried out with different genres. Figure 5.3 presented an example of interviews and documentary making in which the spoken word was predominant, whereas figure 5.20 (page 243) presents an example of visual narrative. These activities addressed sets of media texts which:

- integrate material from different sources – i.e., school library, television, pupils' made interviews, lecture notes;
- different organising patterns for developing the content – i.e., categorical, rhetorical, abstract, associational forms;
- offer different types of access on selected contents – i.e., indexed, hierarchical, or different degrees of detail.

The activity of building films in space included the construction of interactive installations. In these installations, audiovisual material was embodied by different tangibles (figures 5.1, 5.2

and A1 to A.8). The activity included the act of framing them spatially, and also the addition of missing representations (figure 5.6).



a.

b.

Figure 5.1: The activity of building films in space included the construction of interactive installations

In figure 5.10 (page 213), video sequences are found in the installation by tracing paths. These are abstract representations of digital editing choices. How abstract they should be and according to what conventions has been researched through the study of practical activities with pupils.



Figure 5.2: Video sequences are found in the installation by tracing paths

Were you punished for

being the wrong religion?

C. *(voice over)* So, did the king ever punish people for being protestant?

Why?

B. The king was in charge of the church, so he could have changed it to the Catholic religion.

A. Scotland and England were protestant whereas Bonnie Prince Charlie was catholic, and that would mean if he was king he could have changed the whole country from being protestant to catholic.

B. Were the catholic feared because the king was catholic and he had so much power?

C. Yes, the catholic were feared, and they thought they must do something about it, and they were feared terribly because of the king's power over the country

B. The main religion in Britain was protestant

C. *(voice over)* And why was it protestant, and was there any fears about any other religion?

B. Well, there was fears about the catholic, because the king was catholic and he had so much power.

Figure 5.3: A schematic representation of a video sequence composed by one of the groups in the first study

Figure 5.3 shows a schematic representation of a video sequence composed by one of the groups in the first study. The sequence is a particular instance of the different possible ways of editing the media texts along one path embodied by the installation (from the study at the First primary school).

The activities consisted in the composition and decomposition of such media texts. The evolution of the design of the film installations addressed different needs that emerged in pupils work from the first study:

- *the need for providing and attuning examples.* Explorations needed to take place also in discrete domains, such as sets of pre-edited sequences. This needed to be prepared in advance in order to motivate pupils work through showing examples that give a quick idea of what is possible to do with the material provided;
- *the need for enabling evolution.* Incremental contributions had to be enabled, and this required a set of conventions about what modifying actions were permitted, and how they were supposed to be followed;
- *the need for permeability to the surroundings.* The activities were aimed at adapting to the cultural contexts in which pupils operated. For example, media texts from the lecture notes and the school library were integrated, and pupils could take advantage of the fortuitous presence in the school of a storyteller, whose stories and comments became part of the contents. This aspect has shown to be critical in pupils' work and poses specific design goals.

Activities deconstructing commercials, propaganda and TV news

The activities deconstructing advertisements addressed advertisement or propaganda intended as media texts which:

- have an 'intended' or 'preferred' reading;

- rely on rhetorical strategies which use clear conceptual oppositions which can eventually be inverted (in the example of the Doritos commercial – figure 5.4 – these are, for example: good/evil, smart/dumb, pleasant/painful, skilled/clumsy);
- have to be edited in compact formats.

Two examples of the original material are in figure 5.4. Although the two kits evolved during the sessions while addressing specific examples, they aim to serve a more generalised use, and are not meant to be alternative nor complementary to each other.

These activities relied mainly on the use of a glass table upon which blocks could be selected and composed to produce sequences of videoclips from two original adverts. The initial design of the software of the interactive surface for the advertisements kit was developed in collaboration with Thomas Psik for another project: the Manipulate Media Workshop, held in Glasgow in July 2005, just after the field study in the Second primary school (see chapter 6).



a.



b.

Figure 5.4: Two of the TV commercials used in the composition tasks with the tagged blocks: a commercial of crisps (a), using an advertisement about healthy eating (b) (from the study at the second primary school)

5.2.2 Moving from the findings in the pilot study: defining tangibles

Tangibles as tokens

This study also addresses the design of tokens in conjunction with the act of devising practices. The pilot study opened different questions regarding tokens: what alternatives are available to physically design an object that can be used as a token. In the following study, ‘sealed’ or dynamic ways of allowing for its attributions to digital representations will be proposed.

Tangibles as bricks (or building blocks)

In chapter 4, tangibles as a bricks were defined as providing opportunities to build up in order to ‘shape’ or display a composition. In this chapter, the definition will be articulated further, by considering how such opportunities can include to fit, to mount, to join, to combine blocks, to shape by use of a block. In particular, the present study addresses how they can enable putting in place, positioning, and setting up and ‘installing’. In other words, how can they enable the ‘formulation’ and exhibiting through the action of assembling physically?

5.2.3 Other design choices from the pilot study

Categories introduced from the pilot study

The initial choices to design the environment and organise the activities were made on the basis of the initial problems encountered and on the basis of the questions raised in chapter 4. The initial design choices – especially the categories listed in section 4.3 – including conventions and rules for the activities, evolved and were adapted to participants’ own ways of making sense of the activities.

Definitions in introducing new objects and tools

A major first motive of the whole design activities is the physical embodiment of digital representations and of their properties. The main entity addressed by the initial design was the single ‘video episode’. In both field studies, video episodes were mostly represented and made available in the physical environment in the form of tagged objects which could be “charged” with digital content. Two examples of such objects are the *videocards* and the *blocks*. But also a variety of objects, including paper, were subsequently augmented with digital links, via barcodes and were set to represent also digital editing features.

Montage, editing and framing are proposed in this chapter as broad categories for addressing the study. This is a consequence of the fact that the tasks were introduced, instructed and supported in the schools as transpositions of video editing work, as done in the media industry. However, a number of design abstractions were not set in the first place. They developed during the practical work and are described in the second part of this chapter.

Procedures in working with pupils

In the primary schools, designing the an environment and devising the activities posed a trade off between free and constrained ways to devise pupils’ activities. In fact, pupils needed some freedom to be creative and explore new applications. But, at the same time, they needed to be constrained in order to be both guided and inspired. A priority in the design work was to encourage cooperation, in order for participants to reach a shared understanding of the tasks. Accordingly, in the practical tasks details of the definitions of types of activities were added incrementally.

Other problems concern the difficulties of bringing together different disciplines. In fact, the methods that were applied draw from practical approaches of visual and performing arts, and practices of media production, such as advertisement and news. These practices had to be tutored, with an explicit reference in the design of the environment. Also, time and the resources for work were organised in order to enable different groups to work at the same time.

5.2.4 Questions concerning ‘framing’ and ‘packaging’

The observations described above motivate a discussion of some of the themes introduced in chapter 4. As discussed, one of the main concepts of traditional approaches to media literacy, that is, ‘framing’ or media texts, can be supported by interactive tangibles in a specific way. After the first empirical studies, ‘framing’ had been intended in different ways depending on whether it works as an open structure that gives shape and support to media texts, an enclosing border into which media texts can be fitted, or a system around which biased ways of interpreting media texts is built up.

Developing on the ways of achieving framing in the physical environment, in chapter 4, some possible definitions of ‘packaging’ were proposed. ‘Packaging’ seemed a relevant concept to be used where framing falls short. That is, in enabling and describing the ways media texts were integrated in wrapped structures, which needed to be physically explored, and which were able to impose specific paths to embodied discoveries. Both terms acquired a specific relevance in the school setting. The following descriptions focus on the specific way in which in the scenario presented above, pupils achieved forms of framing and packaging. This will point to a specific role for technology and to possible developments for the design decisions.

The ‘original’ selection

Working with physically embodied containers and tokens of digital representations strongly characterises the activities from the very first step. In all practices, the first step of framing and packaging media texts in the physical environment is a practice of selection of elements from which to start composing. The fact that this is carried out by physically appropriating a set of elements makes the practice visible and socially shared. It also directly creates an identity of the composition in each group. Such an identity is induced by the set of elements the group has appropriated. It introduces motives to share and exchange objects, as every original element has been designed to be unique.



Figure 5.5: A group of pupils selects sets of embodied elements which will be used to compare different interactive installations

In figure 5.5, the original selection of groups of embodied elements to compose different interactive installations is carried out on physical objects. In the scenario represented in the picture, the selection happened through a quick negotiation in which each party tried to appropriate the “best ones”. The way the negotiation was carried out was influenced by design choices concerning the availability, uniqueness, singularity of their digital counterparts, and also the relationships and mutual dependencies between them.

Selection leads to tailoring

The way pupils select the material which they will later compose has a major influence on the whole practice and is specific to the designs in the physical building site. How pupils make the selection and share the results in a tangible way characterises and sometimes alters each element that is physically selected.

According to the instructions, pupils have to select a restricted set of video material from a given set of tangibles. In this step, pupils take the objects provided one by one, trigger each corresponding video, and then either include the object in their composition or discard it. Also, selected objects can be modified. That is, shaped, fitted, glued together or annotated (figure 5.6). The tangibles ‘containing’ the episodes that are not selected, are set aside in an area from which they can be retrieved later. The way in which the first selection was made evolved into

an organised practice of exploration. It increasingly gained importance as it influenced the whole practice of composition. Because of its emerging organisation and the role of technology, it is worth describing it as a relevant step in the practice.



Figure 5.6: Objects are tailored to their use. For example, they are physically annotated, reshaped, coloured or joined together

It is through the act of selecting every tangible that pupils assign ‘titles’. A specific feature of these titles is that even though they refer to video episodes, they are assigned to tangibles. This act became the first and necessary step to start the practice. That is, according to the later organisation, groups did not start composing until a selection was made.

Qualification and ‘functioning’ of tangibles in relation to their ‘contents’

As argued in chapter 2, an important problem of media literacy is understanding how to treat contents as opposed to containers. This also includes understanding whether, according to situations, such an opposition can have a practical relevance. As observed in pupils’ work, and also in the studies in chapter 3, this problem is frequently displayed when participants work on

a particular composition and ask each other what ‘this is about’. In answering such questions, both the nature of the physical artefact and of the media texts ‘charged’ on it become relevant.

The answer will depend on what actions are enabled to further characterise or modify them. Hence, design choices need to be made to define ways of systematically relating contents to containers. And the action of linking tangibles to digital representations is only a possible way. In order to consider more possibilities, the opposition of contents to containers is addressed in the large. The following considerations rely on the terms ‘mapping’ and ‘function’ and describe how pupils made the responsive physical environment to *function* in their work.

A motive in these considerations is that, to this end, the word (physical-digital) ‘mapping’, which is found in the literature, is too generic (see section 2.3). In the present environment it acquired more specific meanings, so it needs to be detailed further.

5.3 First study: methods

The first study consisted of a series of collaborative authoring practices that were devised with three groups composed of 3 or 4 pupils. Pupils collaborated in a physical building site to rearrange, produce and modify digital videos in order to create different genres of media texts. The interactive links attached to tangibles in this first study relied on the use of barcodes. Whereas, in the second study described below, interactive devices included the use of camera recognition of visual markers.

Tangible objects endowed with interactive features were initially used to ‘charge’ audiovisual material on cards. This included material from documentaries, interviews and discussions. Examples are presented in figures 5.1, 5.2 and A.1 to A.7. The design of these objects needed to encompass rules and conventions for action, in order for these to work as containers, tokens, bricks or utensils to manipulate digital representations. Figure 5.1.b shows the example of videocards. More examples are shown below – in figures 5.2 to 5.10. Towards

the end of the practices, also spatial areas and other objects became endowed with interactive features. The conventions to organise physical digital links evolved further in the second study.

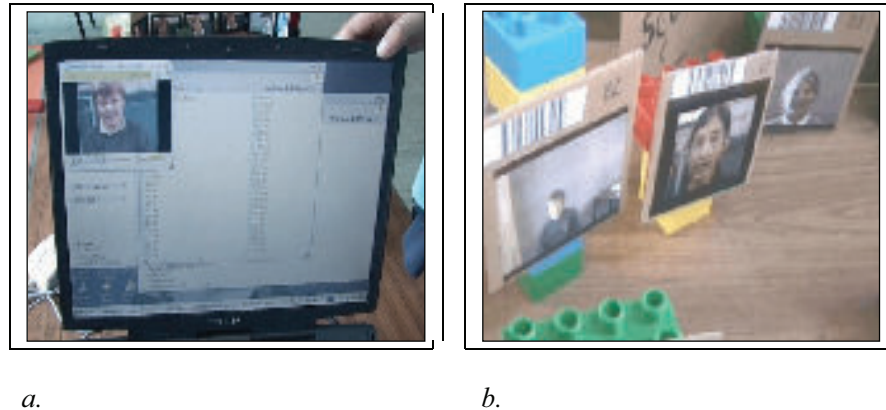


Figure 5.7: Audiovisual material, which was initially stored in files was made available in the physical environment in the form of embodied objects

The media texts that were changed or composed by pupils in the First primary school ranged from documentaries to news and advertisement. They included a number of alternative versions. That is, shortened versions, trailers and differently edited versions to represent alternatives to editing and framing. The multimedia material was taken from lecture notes and the school's multimedia library. As part of the work with pupils, the material was later extended to include videos of an interview pupils made with a storyteller and footage of pupils' commentaries shot by other pupils.

The original selection of the audiovisual material was informed by an interview with one of the teachers. The selection was made to address a particular historical theme which was being taught at the time in the class. The theme was the Jacobites rebellions in England and Scotland. Among the material were pictures, videos, texts and music from a variety of sources: educational documentaries from schools' and TV archives, interviews with historians, a storyteller, teachers and other pupils.

Procedural organisation

The tasks had been organised and was presented to pupils in the form of a series of activities leading to the production of films. In fact, at the end of the series of work sessions, edited films that had been composed by pupils were put together in a traditional editing suite and presented to a larger audience of pupils. The work with pupils was done during four sessions lasting between two and four hours during a period of three weeks. Designing and editing work had to be done between sessions with the pupils in order to adapt the environment to the emerging need and evolve all the material to carry out the phases of the work. The study was articulated in the following steps in chronological order:

1. preliminary investigation and initial design:
 - Meeting with the teacher and interview about her method and pre-existing activities;
 - Search, selection and editing of multimedia material matching teaching interests about the subject of history in the class. Sources: lecture notes, a BBC documentary, first school's video library, Scottish TV program about the theme of Jacobites in another Scottish school;
 - Design of tangibles: videocards with barcodes, barcode reader and software to enable triggering videos by scanning videocards. The software was provided by Giulio Jacucci, who implemented it in the Atelier project (e.g., Binder *et al.* 2004);
 - Design of other physical objects enabling acts of composition of videocards.
2. first work session with pupils: training and introduction.
 - Examples of media texts and editing alternatives were presented and commented on with the 11 pupils:

- a) differently edited interviews, introducing the effects of changing the order or the editing points of the original streams of recordings when editing an interview;
 - b) different versions of a trailer to synthesise the same video, introducing the possibilities of variations on time and effects of selection and salience.
- Introduction to the environment: explanation of instructions and tools.
3. A second work session with pupils: exploration and production of the audiovisual material.
- Pupils explored the digital videos and annotated the cards,
 - Pupils produced new videos mainly by interviewing a storyteller who happened to be present in the school, and by interviewing each other.
4. Design work: video editing and creation of thematic sets of short episodes.
- A set of about 30 episodes was created in order to give a balanced representation of the issues related to the teaching of the Jacobite rebellions in the class. The set of episodes aimed at being clear and short enough (between 5 and 40 seconds each) and at enabling groupings that could lead to different themes within that knowledge domain. Examples of these are religion, economic issues, succession rules, specific battles and rebellions.
5. A third work session with pupils: composition tasks.
- Three groups were formed around three themes that emerged by a particular grouping of the tangibles,

- The first composition tasks suggested the need to extend the use of barcodes from their use to solely link one card to one video to their use to render other objects, blank cards, surfaces and furniture interactive tangibles.
 - The ways in which pupils worked suggested the possibilities to use cards and physical compositions as abstractions representing specific classes of videos, edited sequences, and ideologically biased versions of the same ordered sequence.
6. More design work: more editing and redesign of parts of the environment.
- Extension of barcode link from videocard to other types of tangibles;
 - Redesign of barcode-objects associations;
 - Implementation of access to a larger set of video episode through sequences of scanning actions. This has to be done in order to enable an organised access to media texts which were derived from the original version, through sorting by alteration type. For example, it was made possible to trigger alternative version of the same video by associating two scanning actions, the first on a videocard and a second on a version type, such as ‘short’ or ‘titled’.
7. A fourth work session with pupils: location of film sequences in their physical architectures.
- Groups completed their composition work by identifying final film sequences in their installations.
8. Final design work: final editing. This included the production with a digital video editing suite of edited videos from the physical compositions done by pupils in the physical environment.
9. Final meeting with the pupils: presentation of the installation and of the finished films.

Sources of the audiovisual material

The video material was partly taken from several broadcast media sources. The remaining part was produced by pupils during the working sessions. All videos were chunked in segments and elaborated in alternative versions with annotations, sounds, voice-overs, titles and sometimes partially arranged in montage sequences. Different physical objects were employed in the setting, in order to provide a tangible access to digital operations and retrieval. Such objects included: mouldable material, such as plasticine, Lego bricks and papercard signs.

Digital representations, including videos, sounds and still images were displayed through either computer screens or projections. In a preliminary phase, prior the start of the design sessions with pupils, pupils were trained in basic skills on critically reading and re-editing interviews. Also video interviews were shot among pupils, teachers, and a storyteller, in such a way that the overall multimedia material had “absorbed” representations from the cultural context of the school in which the project was taking place.

Instructing open-ended tasks

As part of the participatory design approach of this study, the instructions given to pupils aimed at describing open-ended tasks. However, it was necessary that participants in the project were not disorientated and were able to focus, to some extent, on the same kind of resources and activities. When working in the primary schools this issue became critical. The defined instructions and the rules aimed at the same time at constraining and inspiring pupils’ tasks. The overall task was instructed as a film-making exercise, in which *“each group of pupils will build an interactive installation. This will be done by selecting, annotating and putting together the objects provided.”*

Initial instructions on building installations

The instructions given when starting a task were given with the terminology described above. They entailed the following design abstractions and categorisations. Installations were defined as physical constructions composed with ‘charged objects’. They were supposed to address a theme. In the first study, they were defined as spaces that visitors could explore by following paths with a barcode scanner. Such exploration triggered the projection of sequences of digital representations. Hence, installations were defined as displaying paths which visitors can follow. Installations were supposed to be built in a way that the sequences of projections which could be triggered along their paths lead to film sequences.

Supporting the evolution of smaller and digressive tasks

Important design interventions were aimed at facilitating and identifying subtasks. This influenced the ways participants could be trained and supported. In most tasks a central problem is to find a shared definition of the content of temporal representations. Participants are motivated to make choices concerning relevance and points of view. Subtasks that could be identified include:

- indicating alternative ways of segmenting a set of video episodes made accessible through a set of objects;
- operations of video alteration and modulation, such as titling, shortening, adding voiceovers;
- sub-tasks of composition, e.g., establish rhetorical functions or relationships between episodes;
- subtasks creating procedures for comparison, such as identifying salient verbal features in the episodes and visualising spoken words, finding different episodes to introduce a videoed statement;

- shortening a given sequence of video episode by a half;
- creating alternative trailers.

Imposing constraints

As discussed in section 3.4.3, some virtuous effects of imposing constraints to action can foster creativity and participation in the design process (Iacucci *et al.* 2002). The limits posed by the media and tools employed in the setting needed to be formulated into directions that made constraints more effective as resources for creativity.

Examples of constraints to the compositions' paradigm			
<i>Media constraint</i>	<i>Limited outcome observed</i>	<i>Formulation of instruction</i>	<i>Creative solutions observed</i>
Cards display a picture (chosen by the designer) from their video episode	The features manipulated by pupils are static. They contrast with the time-based content	Compose a collage using the static pictures	Branching structures suggest video sequences. Rhetorical figures link spatial to temporal aspects: e.g., small place to scan trailers (timely short)
Changes to the editing of video can be indicated only by verbal annotations	Suggestions about changes to dynamic aspects become encrypted and not easily shareable	Instruct the editor by annotating objects	The composition format (or genre), embodies editing aspects: e.g., using spatial predominance (tower) to suggest features redundancy in the edited sequence

Table 5.1. The way of imposing constraints on the compositions' paradigm was adapted to local outcomes, as exemplified with two cases.

The goal of this approach is to direct the design sessions as a series of creative activities in which participants are helped in their imaginative effort. In this case, pupils participated in design primarily by creatively interpreting and making sense of

our instructions and displaying a shared understanding of what they were doing. It is by inspecting how they put together the different elements in the work setting (representations, tools, rules, procedures, conventions) that emerging practices are described here in terms of skilled behaviour and outcomes. Tables 5.3 and 5.4 give examples of constraints. The design proceeded from the recognition of a constraining action of the media, to its reformulation in the form of an instruction which takes advantage of the named constraint.

Examples of constraints to the compositions' syntagm			
<i>Media constraint</i>	<i>Limited outcome observed</i>	<i>Formulation of instruction</i>	<i>Creative solutions observed</i>
Barcodes need to be pointed at to be scanned; scanning is easier if the barcode is near the picture	Sequences of static pictures in compositions become predominant structures	Display pictures openly	The one-sided nature of the cards is exploited to create architecture types that invite physical exploration, turning around and move: as in town, or museum formats
Scanning different objects with the same barcode reader triggers projections on the same screen	Exploring an installation by acting with a scanner became the screening of an improvised film	Identify possible paths to explore the installation with beginning and an end	New conventions for shaping some genres as graphs in the space: multiple points of entry and multiple points of exit, but linked by paths inducing sequences

Table 5.2. The way of imposing constraints on the compositions' syntagm was adapted to local outcomes, as exemplified with two cases.

5.4 First study: analytic framework

The environment in which the studies were carried out had to be constructed. This section lists the main design categories, abstractions, conventions and rules which were introduced in the

first place. The description aims to detail how the set in which the work with pupils and teachers took place had been partially structured in advance. Such a description will also aim to foreground what aspects were designed through the practical work with pupils. section 5.6 and 5.7 describe how these initial features evolved.

5.4.1 Initial and explicit categories, rules, procedures

The initial configuration of the environment includes a set of conventions and rules, along with a terminology and some procedures. These inevitably entail a categorisation of actions, events and objects. This section will describe the initial conventions. The aim is not so much to trace causal relations between the initial design choices and any of the outcomes. Rather, the following description aims to distinguish what features in the final design of the environment were designed prior to any contribution of pupils' work.

Figure 5.8 shows the act of triggering the projection of an episode by scanning an object in conjunction with a location or with other objects. All the designs with the barcode scanner were implemented in the first study, while those with the glass table were implemented in the second study.

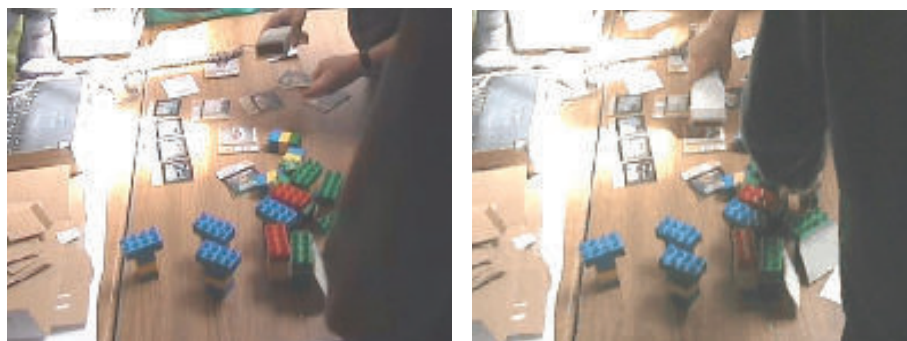


Figure 5.8: The act of triggering video projections by scanning objects

The initial set of design choices included the following definitions. Table 5.3 makes a distinction between the definitions that were acquired in the two types of activities. Since these definitions were implemented in order to provide initial setting, they include some arbitrary choices. All choices are informed and motivated by the previous work, including the first empirical studies (chapter 4). They were then researched relying on pupils’ interpretations. The rest of this chapter is dedicated to describing how they have evolved by devising the tasks and observing how pupils worked.

Table 5.3: Initial and explicit categories

	<i>Synthesis of general definitions in the setting (and distinction between the two types of activities).</i>	
	Building films in spatial compositions	Deconstructing commercials
Charged object	Physical artefacts were said to be ‘charged’ when they were endowed with a digital trigger which directly gives access to a media text. Two examples of these are the videocards and the blocks.	
	When building films in space, charged objects were initially defined as ‘building blocks’. Later on, they acquired the capacity of being charged with multiple media texts. The set of media texts charged on a physical object was attuned to the need to provide authoring alternatives.	When deconstructing commercials, physical objects were charged with different media texts in order to permit combinatorial explorations. The first step was the creation of the ‘blocks’ described below, which evolved into the two solutions for combinatorial explorations described in section 6.4.
Videocard	A videocard was defined as having the following features: 1. it displays a pictorial representation which is associated with one or more media texts. 2. it carries a digital link to a media text or a set of them; 3. it can bear a space for annotations.	

	The digital content was set to be a picture, sound or video in digital format. The association between the digital content and the physical outlook of the card aimed to be a straightforward link. Examples of associations are: the picture is a key frame in the video the card refers to, it is a drawing of a character appearing in a set of video episodes the card refers to, it is a picture of a quality shared in a set of video episodes the card refers to;	The digital content was set to be a segment of one of the original adverts. The association between the digital content and the physical outlook was not a straightforward link. It aimed at disengaging the segment from its original and intended interpretation.
Episode	The definition of episode which was employed relied on <i>time</i> and made no reference to aspects of <i>relevance</i> , <i>integrity</i> or <i>coherence</i> of content. An episode was defined to be an audiovisual recording (video, still picture recorded as a video, or a sound file). The time limit was set because of practical constraints of editing in space with physical objects. Most episodes were shorter than 7 seconds.	
	Episodes were intended to be appropriate to be used as a proposition in documentary making. The choices made when selecting the start and end points when chunking out episodes aimed to open possibilities for composition.	Episodes were taken from media texts that were constructed in advance. The definition of episode needed to be consistent with the particular advert from which the episode is taken. The choices made when selecting the start and end points when chunking out episodes aimed to dismiss its original function.
Physical edit	Physical edits were physical paths going from one ‘element’ to the next. They embodied one particular way of aggregating digital representations. For example, they could be a particular editing solution that develops along a timeline, and is accessible on the same device (normally a projection). The question of what should be the nature of those ‘elements’ is addressed differently within the different design approaches discussed below. There is a range of possible ways to define ‘elements’: from physical/digital triggers to visual references.	
	The physical edit needed to be explored by operating through the actions performed by a viewer. Physical edits corresponded to films.	Physical edits were not supposed to constitute a self contained film. They referred back to the original material (usually, television commercials).
Version	In the initial definitions, the term ‘version’ was intended as a copy of some of the original episodes. That is, a reproduction of any of those episodes, which is tailored to specific uses. This definition evolved during the practices.	
	The proliferation of versions mostly accommodated practical needs. For example, common versions were subtitled versions and short versions, such as trailers.	Alternative versions were used mainly to show specific editing choices and try out their rhetorical effects.

Phase	Both types of activities were carried out through explicitly defined phases. They were: (1) <i>exploration</i> – in which each group views a set of media texts, which are physically linked on objects and places, and alters the physical objects through changing the pictorial representations, annotating cards and objects with directions for the designer/editor; (2) <i>composition</i> – in which each group is given a limited amount of time to create compositions in spaces such as tables, boards or whole rooms; and (3) <i>production</i> – in which each group creates new recordings or captures by interviewing or cropping video episodes from external sources.
Media text	All representations in digital format which could be projected on screen or reproduced on audio were referred to as media texts. ‘Textual’ is intended in the larger sense, as meaning any “signifying structure composed of signs and codes” (e.g., Watson and Hill 2000), and which can take a variety of forms, for example film, speech, writing, painting, records. The word ‘media’ is used to indicate that that particular text can be integrated in the set of mediated representations, following the composition rules and procedures and accessed through those channels. In the school and in the practices, those were called the ‘media’, with reference to the broadcast media.

5.4.2 Forum theatre reconsidered for intervening in the present setting

The principles and methods of Boal’s theatre outlined in section 2.2.2 are applied here to a different context of work, which is the work with pupils in the schools. It should be emphasised that such an application is a free transposition of methods and attitudes learnt in Boal’s theatre. In fact, forum theatre is not mediated, it relies on physical work and performances, and does not rely on recordings. Furthermore, it has been developed and is practised with the specific objective of raising people’s voice and action, particularly in those cases in which this is prevented by forms of social oppression. In this thesis, such a theatre practice has inspired ways for eliciting pupils’ participation in the creation and modification of representations of human interaction. The following points give some references to how Boal’s forum theatre has been reinterpreted in the context of this thesis, and in particular in the work in the schools.

Leading a forum theatre creation and staging is analogous to the instruction, tutoring and direction of the tasks with pupils in many ways. The practices are directed as social events by people. There is no prescribed end to the process. The main activities are organised and led as an *event*, during which a number of (media) texts evolve by the interventions of participants. In

the case of forum theatre, the *texts* are short plays, in the case of practices in the schools, texts are media texts, which mostly depicted people speaking and interacting. Directing the process means devising an event in which (media) texts are presented to participants. There are events in which participants are trained on selected activities, and others in which they act to modify (media) texts. The practice does not tend to the production of a definitive authored text, but it reaches partial texts which serve in the evolution of a common interpretation of the contents. Participants are encouraged and facilitated in the actions through which they alter media texts. Initial versions of texts are prepared in advance in order to attune them to the experience of the same audience of participants. Also, texts have one or more implicit or explicit questions to pose to their audiences. The goals from the practical work of the joker, detailed section 2.2.2, inspired the following ones in the studies in the schools:

1. Favour awareness of uncertainty in interpreting and undermine a deterministic view of *reading*;
2. Favour the recognition of ‘polysemy’ of images;
3. Rely on participants’ interpretive habits, which usually are rooted in their fruition of broadcast media;
4. Challenge these habits;
5. Support the emergence and evolution of genres created by participants;
6. Elicit and resonate multiple interpretations from the audience. It is in this multiplicity of interpretations and opinions that *precision* is sought. This is because the inquiry aims to be attuned to the experience of the particular group with whom the work is carried out.

Consequently, the practice relies on multiple interpretations both to show the multiplicity of interpretive alternatives and to negotiate a definitive “meaning” of texts. This naturally leads to tying different readings with different audiences groups. Also, the images created must retain

their polysemy. In fact, this practice is not aimed at choosing one definitive interpretation. The goal is not to *explain*, but to offer multiple points of reference.

5.5 First study: findings

Drawing from observations, the design evolved towards unpredicted forms of construction and deconstruction of media texts. The first description focuses on emerging procedures in pupils' work. The following ones will consider other scenarios of pupils' work. They will point to difficulties and achievements. Their discussion will lead to uncovering some of the roles of technology and to motivate further evolutions of the design decisions.

As explained in the Introduction, this study does not aim to track the reasons for pupils' choices in their work. Rather, the study focuses on describing the ways in which pupils' work unfolds. It is drawing from these descriptions that design principles are discussed, in order to relate to how pupils displayed ways of making sense of the tasks. It is within the scope of such an "*how*" question, rather than addressing a "*why*" question, that features of the environment's design are discussed.

5.5.1 Example of transposition of a TV genre in the setting

The combination of physical design and digital frame formats created a specific epistemological approach to the inquiries with the multimedia material. This example describes one of pupils' genres. The description will lead to a discussion about how the genre relates to TV news or documentary interviews, and how the genre was related to physical designs. This created a way to work and organise inquiries in the environment.

The TV news and the 'vision of order'

As argued in the literature on media studies, many instances of TV news can be inscribed in a specific genre. As accounted in (Bell 1991, Matheson 2005), TV announcements of TV news are a genre of representation which is in many ways synthetic and incomplete. In particular, they are obtrusive for all those concerns which cannot be represented in its compact formats and included in its agenda.



Figure 5.9. Common instances of media texts produced by pupils share features with the genre of TV news.

TV news tend to be impersonal accounts, even if they often rely on specific footage and on personal narratives. They can often be described as a sequence of unrelated propositions. Most news announcements favour a particular epistemology which is known as 'vision of order' (Hartley 1992, Watson and Hill 2000). Accordingly, the revelation of truth to audience is a process of 'envisioning'. They tend to visualise the world in terms of an order, which is delivered through a sequence of synthetic statements and emblematic images. The order relies on oppositions of concepts, for example: good/bad, we/they, etc. Such an ordered view is influenced by the fact that the main topic treated by the TV news are *news*. News generally acquire their relevance because of their novelty.

On the other hand, novelty is most often a matter of disrupting a previously established order. The role of the TV announcer is that of putting the new and disruptive aspect of reality in an ordered exposition, in which images and other ‘vivid’ representations of the world are interpreted. In this sense, what is given is a ‘vision’ of the world: what the TV news render visible through a carefully constructed format are visions of an order (Hartley 1992).

The ‘vision of order’ in pupils’ inquiries

Within such a genre of TV news, especially when they rely only on images of the TV announcer, videos are difficult to mark, chunk and retrieve on the basis of visual aspects. The fact that their verbal content tends to be made of propositions, favours specific ways of chunking the recording and organising the chunks for retrieval. These videos tend to be analysed by relying on verbal content and relying on propositions and simple logical connectives, such as ‘and’, ‘but’, ‘not’, ‘or’.

According to those concepts, if one finds a way to represent proposition ‘A’ – in this instance it would be a segment of the TV news announcer’s recordings, which, by its nature, resembles a series of propositions – at least one has created the possibility of talking about, if not representing, the proposition ‘not A’.

At the same time, one has foregrounded the problem that, in the language of TV media, the most powerful device is not to decide whether ‘A’ or ‘not A’ is the *true* instance. Rather, the TV news genre, both in TV and in the observed pupils’ practices, has its most effective influence through a process of selection and creation of salience. This is how it decides what would most probably inform public opinion. In fact, reality is represented in terms of the propositions, such as ‘A’, which entail the possibility of easily talking about ‘not A’. The medium has given a ‘vision of order’, which contain a set of propositions with which the audience can think and talk about the world. To think and to talk about what is not available in the representation is in general more energy consuming, as it has to be represented or verbalised from scratch.

The application of interactive tangibles acquired a role in addressing media literacy by the support they gave in rendering these mechanisms evident. The tools pupils were provided with became relevant as tools which, by a process of elimination and emphasis, framed a vision of order. Both in the study of the interface as mediating collaborative inquiries, and in devising the practices with pupils. The focus is on what does appear in the frame and on what does not appear.

The ‘vision of order’ and the design of interactive tangibles

There are different ways of using the TV news announcer format in the physical domain. In particular, TV announcements and the consequent vision of order rely on the presence of *propositions*. Certain formats and design principles came from how pupils conducted inquiries. The observations of pupils work suggested a design of tangibles which enable the making of the working of the vision of order more evident. The first principle was derived by a simple consideration of how representing the world in propositional form, more directly suggests an (intentional) *agenda* (see section 2.1). The material at hand (such as the propositions framed in TV news) is more likely to determine the agenda.

For instance, the use of double-sided cards which show on opposite sides representations of ‘truth and its negative’ can, on the basis of the working of the TV news announcer format, support the same ontology of the media discourse or create a new one presenting different oppositions. This can make its mechanisms more overt. At the same time, this can support the deconstruction of a logic of oppositions. For example, the use of double sided cards gives a space (a slot to be compiled) for the representation of the negative of supposedly true representations. According to those concepts, if one finds a way to represent proposition ‘A’⁷, at least one has created the possibility of handling and talking about, if not representing in video, the proposition ‘not A’.

⁷ In this instance, the representation would be a segment of the TV news announcer’s recordings, which, by its nature, resembles a collection of propositions.

5.5.2 An example of ordered composition work

As the transcript in table A.3 exemplifies, tasks of composition, in spite of often constituting meandering discussions, at times: (1) display division of labour, (2) are characterized by conventional (or regular) procedures, (3) are characterized by alternative methods of reference to the multimedia material.

(1) Division of labor is exemplified by the fact that A. triggers videos, F. does the main contributions in arranging the cards, and J. takes care of referring back to the cards left behind or already placed in the composition. (2) Procedures are exemplified by the following sequence of actions which are critical in the aforementioned transcript: (a) pupils view and number a card, (b) they give it a conventionalized content description, (c) they place it in a provisory order and lying on the table, (d) view its video again together with the videos of the cards preceding and following it in the provisory arrangement, and (e) only then give it a position in the collage (e.g., standing, overlooking, sideways, or behind). (3) Two main alternative methods for the reference to cards and their contents are: numbers (advocated by J. in the transcript above) and conventionalized expression of their content (employed by A. in the transcript above).

5.5.3 Lessons from evasion and stall in pupils' inquiries

Pupils also display ways to evade the project of composing a film in space and the coordinated work described above. Moments of evasion and stall can be related to the selectivity of the responsive environment. These suggest principles to address media literacy. In the examples considered so far, observations of pupils' work included ordered and coordinated work. The setting presents a multiplicity of tasks that can be addressed in parallel in a group. At times, the group might reach a shared perception of what the 'problem' to be addressed is. In the example considered below, observations also include practices which tend towards fragmentation, and in which the group does not display concern of a 'problem' to be addressed. In these cases, interruptions and disorder are characterised by specific features.

The transcript in table A.4 is taken from a recording of a composition task. This example is reported with the aim of exemplifying some of the ways in which pupils might not engage with the material, and not share an understanding of what their work is about. In this sense, they sometimes act in an evasive way. At the same time, the aim of this example is to show some of the creative solutions observed in pupils' work.

In this example, pupils display a recurrent need to decide what representations are 'about'. They also are concerned with the problem of sharing an understanding of what should be done next. They do not engage as much as they could with the content pertaining the historical accounts. Also, they do not coordinate their actions in a way that the film installation composition is brought forward.

They 'evade' both from the matters pertaining a critical understanding of historical accounts of the Jacobites rebellions, and from the project of building films in space. Fragmentation characterises their work in the sense that their activities and contributions are at times detached and incomplete. Their work lacks coordination in the sense that at times they deviate from the conventional goals, they disarrange partial achievements, interrupt actions or interfere with each other.

Stalls happen in relationship to locally organised courses of action that promise to lead to a shared achievement. But these do not reach completion. Stall happens also with respect to the explicitly instructed goal. That is, the goal to build an installation in which different films can be found by triggering digital videos in sequences. In these evasive actions, stall, and fragmented or disordered work, pupils have interpreted two main open features of the environment. One is its being *unstructured* for what concerns relevant interactive possibilities. The other is its *selectivity* as medium in the accomplishment of specific tasks.

Evolution

The example above provided motivations to evolve the design further. In fact, they show a particular need for more structured and focused tasks. In response to this, the study took two

different paths, which are described more in detail in section 5.7. The new implementations followed the motivation of examples such as that presented above along at least two directions. These are the search for more structure and for more appropriate selectivity of the media:

1. *Motives from lack of structure:* The observations from the above transcript suggest addressing some specific matters in the environment's lack of a formal structure or a systematic organisation. The environment is also not tailored to certain activities. That is, in relation with specific tasks performed by pupils, it does not lead to preferred courses of action, and it is untailored or 'loose'. Some pedantic attitudes, such as those concerned chiefly with unnecessary detail, can arise from a lack of local goals. Accordingly, organisation and structuring of tasks can be addressed by introducing more structure, such as classifications, combinations, film types, and interrelation between parts.
2. *Motives from inappropriate selectivity:* Some specific design choices on physical-digital mappings, visual features, or the terminology employed with pupils, characterise the environment's selectivity and mediating bias. Such choices discriminate what is invisible and what are the patterns available in order to provide slots and combinations (for example in the use of cubes). Considering *tangibles as containers*, cards display one picture, so the card is judged as one stable and one sole content. Considering *tangibles as bricks*, they favour incremental composition, one by one, therefore there is no space for associational explorations.

Developing from these considerations, one of the paths drew on pupils interest in discovering the association of objects. This led to combinatorial explorations (the "CODIS" style – described in section 5.10.3). The other path drew from pupils' creative way of installing objects in the act of creating tangibles. This led to devising a furnished and installed approach (the "FINPE" style – described in section 5.10.4). Both paths are studied further in a different context in chapter 6.

5.5.4 How the environment evolved dealing with detail and memory

One of the problems that were faced in evolving the design of the physical environment was the need for enabling abstract representations and for allowing the environment to forget detail. Attempts to address these needs clashed with the general goal of making the construction process overt. It was also difficult to find a balance between the need for abstraction in composition work and the need for reversibility. Here ‘abstraction’ refers to the abstract features of tangible representations. That is, their qualities and abilities to refer to specific media texts. ‘Memory’ is intended as the memory *of the environment*. That is, its state and abilities to retain or to discard some specific representations. Hence, memory will not refer to mental processes.

As reviewed in the following, these problems were addressed by taking advantages of some creative solutions which were found in pupils’ work. These design problems were addressed by enabling the environment to forget. This was done by more structuring and by taking advantage of physical and spatial use of the media.

Detailing vs abstracting, remembering vs forgetting

In pupils’ practices, keeping track of the trajectory of composition work required a considerable amount of work. In fact, preserving all partial results in editing and composition rendered the environment overloaded with discarded ‘versions’ of video episodes and with unnecessary details. This was due also to the fact that, as part of their activities, pupils did not only need to select and rearrange original elements. As part of the process, they also needed to tailor the elements that were provided in the first place. (As explained in section 5.4, editing alterations on the digital recordings could be obtained through annotation, and digital editing was not carried out by pupils.) One of the consequences of the need to alter the initial material is the proliferation of ‘versions’. Some of the versions needed to be retained because of the practical need of using them immediately and also in order to avoid forgetting the original alternatives.

Both goals are motivated by the broader educational objective of making the construction process overt, in such a way that other pupils could participate.

Regarding the advantages of employing a physical environment to author media texts, the visibility of reversible actions proved to be functional. For instance, some modifying actions that affected digital features of the 'edited versions', such as 'shrink this edited sequence', were rendered visible in the environment. In order to retain a memory of the original configuration, before these actions, the physical environment must be endowed with specific devices. They pose the problem of how to hide complexity and unnecessary details. This opened the broader problem of designing the environment in order to *enable it to forget*.

One of the devices that were employed was a particular way of organising space and interaction grammars in order to achieve abstraction. In order for tangibles and installations to acquire abstraction, specificity and detail were moved into locations and actions divided into steps.

Abstraction and memory in the practices building films in space

One of the conventions that emerged in the practice was the convention of 'abstracting' video episode versions. That is, the same physical object was used to represent different versions of the same video episode. Figure 5.17 showed the object representing many versions of a video episode. In conjunction with this habit, the physical compositions increasingly became abstract representations of the same digital compositions. In the case of a short film created from the installation in figure 5.4, the sequence was taken from an easily explorable area of the collage: a linear sequence. In the original form of the installations the projection of a similar short film can be triggered by scanning those elements in sequence. The pictures are taken from figure 5.5.



a.

b.

c.

Figure 5.10. Sequences from an area of a physical composition of multimedia objects, which represents different possible alternatives of editing the same documentary.

However, in the digital version some of the contextualising features of the collage are lost. Formal features of the environment which are present in the digital and in the physical domain call for participation of pupils in negotiating how representations should cross the boundaries between digital and physical media, in order to retain relevant features.

While the tasks were carried out, certain aspects of compositions' form, and in particular, variations, motifs, and parallelisms became encoded 'under the physical surface' of the physical compositions. In other words, physical compositions became representations of the different possible ways of editing the film that uses those particular multimedia objects in the sequences physically displayed. Relevantly to this practice, the fact of transposing digital recordings into tangibles has specific practical consequences.

One of the activities is the transposition of a physical linear sequence into a digitally edited video. Installations increasingly became abstract representations of differently edited films. The act of triggering a sequence of clips by running through the installation with a barcode scanner can count as the 'instantiation' of a film. When *instantiating* a film from an installation, a sequence of episodes that can be found in the installation, is presented into another medium. That is, the video screen or a projection.

Pupils could choose a sequence within the collage to constitute a short film. In following the path by scanning the cards sequence in the collage, they explicitly referred to different

possible edits of the video episode by addressing the same physical card. This suggested the making of different versions available as different digital clips to be triggered through the same physical card. The group then started using a card to refer to different versions of a clip. For example, different versions of a same clip were:

- a long version (see transcript L below),
- a shortened version which was edited in such a way to represent the view of the BBC documentary speaker (see transcript S1 below),
- a shortened version of the same long episode, which was edited in such a way to represent the view of the lecture notes (see transcript S2 below).

An abstraction of the episode would comprise all the specific edited versions of it. As explained above, by allowing abstract representations, the intention was to retain the access to the specific instances, at least at the level of the single tangibles. In this case, this was made possible by using additional tangibles to give access to specific types of instances. Types of instances in this cases were: specific ‘biased version’ (assigned to an additional card, recognised by a specific barcode) and ‘full version’ (assigned just to the tangible charged with that episode).

In particular, the three versions above were made accessible through a sequence of two actions. Here is the syntax of the solution that was implemented. The second action has several possibilities:

1. Scan the tangible bearing that particular episode (in this case, this is still a card), and
 - 2.a Wait > yields the full episode version
 - 2.b Scan the barcode upon the ‘BBC bias’ card > yields the BBC biased version
 - 2.c Scan the barcode upon the ‘lecture notes bias’ card > yields the lecture notes biased version

Another alternative that was tried out is the assignment of biased versions to places.

2.d Scan the barcode in the 'BBC bias' special place > yields the BBC biased version

2.e Scan the barcode in the 'lecture notes bias' place > yields the lecture notes biased version

Figure 5.16 showed the card and an example of special objects in which tangibles can be associated with types of versions. There are different consequences of introducing these alternatives.

1. Versions types increase across the space. Among them are:

- '*shortened version*' for synthesis (film '*trailer*');
- ideological '*bias*' (a distinction that became popular is the distinction between the way of telling of a BBC documentary and the one of the lecture notes);
- different genres versions, such as the same 'content' of an episode told by the '*storyteller*';
- '*contrasting*' version ('contrasting' was broadly intended simply to mean 'not agreeing with');
- The '*main film*' currently attached to an episode. That is, a composed film that currently exemplifies the 'use' of a given episode.

2. Rhetorical figures can be assigned to spaces or objects in order to yield associated kinds of versions:

- A *small* table with its barcode was used to trigger the trailer (*small* version) of episodes and films;

- Windows with a barcode each were assigned to biases (here meaning ‘*views*’) and used to trigger specific biased versions.

As a consequence, versions types become digital properties to be retrieved from spatial features and locations. Also, installations acquire different kinds of abstract characters. An installation represents the basic structure that is shared among different films (they share the same selection of the core episodes and their rough sequence). It can be an ordered index which gives access to specific episodes versions.

5.6 First study: discussion

5.6.1 Evolution of the masks framework

In the activities addressed in the pilot study in chapter 4, resources were ‘appropriated’, media and objects are physically shared. The study addressed characterised, neutral and incomplete design. The study opened questions pertaining to the interpretation of the terms ‘neutral’, ‘characterised’ and ‘incomplete’ in the design of interactive tangibles for media literacy.

- *Versatility.* The same tangibles might be used to perform different types of tasks. Some are more expressive and rely on the characterisation of tangibles;
- *Characterisation and ontology.* Characterisation can be achieved for example within the initially proposed taxonomy of tangibles (tokens, containers, bricks and utensils);
- *Every expressive use suggests a neutral one.* Some performed actions with the tangibles are ‘neutral’ with respect to the intended expressive functions of the tangible types;
- *An expressive role of incompleteness.* There is a need to design tangibles endowed with different kinds of incomplete features because this makes them versatile (this will lead to discuss abstraction);
- *An evolutionary role of incompleteness.* There is a need to design incomplete tangibles also because they need to evolve through open ended tasks in which participants in the design sessions appropriate and interpret the tangibles.



Figure 5.11: A group of three pupils building a physical collage. They are selecting videocards, attaching digital links to them, and making both joint and solitary contributions to the furthering of the composition. These 8 pictures are taken in chronological order from 11 seconds of video

5.6.2 Selecting and framing tangibles: relevance for media literacy

These aspects of the practice have a specific role in media literacy. They regard relevant alternatives over the paradigmatic dimension of media texts. As discussed in chapter 4, and as discussed further in chapter 7, this is a critical issue in media literacy, and, in the fruition of broadcast media is usually difficult to access. The authoring environment in which pupils

operated increasingly became organised in a way that such alternatives could be retrieved. In a media literacy application, the advantage of having possibilities to challenge the initial ‘paradigmatic’ selection of media texts can contribute to training critical skills by modifying and comparing.

The following descriptions address the main principles which emerged in the design session in the two schools. The consequences for the organisation and the methodology in the practice are the following.

1. *Selection and identity.* The initial selection works in the practice as a first shared interpretation of what the whole composition task will be about. The selected set of elements already gives an identity to the composition and can be fruitfully contrasted to what has been excluded. The first selection not only strongly identifies the scope of the composition. It also excludes whole ranges of issues by not making the discarded objects visible. During the design with pupils, it became clear that participants and audiences could gain a richer perspective by knowing what material had been excluded from media texts.

This was described as if TV news said ‘these is the news and this is what we decided to leave out’, which would show even more the act of constructing what is to be regarded as ‘relevant news’. The richer perspective was recognised to be both on the issues that are treated and on the role of authors. In the physical environment, this aspect was recognised and supported. In the physical environment of the school, it became clear that also discarded objects must become part of the *identity* of compositions. They too are a determining authoring choice, and also an ‘expressive’ one. Hence, the design session with pupils explicitly rendered the composition’s identity double. Each composition had both a visible and an invisible identity. The ‘invisible’ identity was embodied by a set of discarded items in a related area of the space.

2. *Qualifications and attributions.* When selected, each tangible is judged. Such judgement can take different forms. It can be a ‘synthetic description’ of its content, a

‘qualification’ of a particular function in the composition (e.g., starting point, the main theme, a question), the ‘attribution’ of a particular form, to fit parts of the composition physically, without a verbal explanation

In other words, if transposed to the digital domain, this step corresponded to a simple selection of audiovisual material. In the physical domain, selection was coupled with acts of attribution and qualification of the existing objects. Hence, it is an act of tailoring that operates on the physical environment in order to have a better ‘grasp’ on the digital environment.

5.7 Second study: research question

5.7.1 Moving from the findings in the pilot study: defining tangibles

Tangibles as containers

In chapter 4, the word ‘containing’ was used to point to tangibles’ functions, according to which they ‘lodge’ the representations, and the ways they incorporate or embody digital elements. Several questions concerning containers in the present environment were open in the pilot study. They will be addressed further in this study. How should a container collect, unite, or condense the contents? What should be manifest, and what should be hidden of the contained contents? How should a container strengthen or improve one’s control over the contained (hosted) elements? How should be contents be received and taken in?

Tangibles as utensils

Tangible objects or features of the physical environment can be ‘charged’ with digital properties. These properties can be representations, such as streams of digital recording or

pictures. The pilot study in chapter 4 opened question regarding the use of tangibles for the implementation of ‘operations’ in the physical world, such as ‘join’, ‘shrink’, ‘enlarge’, ‘shift’. The nature of these operators or ‘utensils’ will be addressed further in the present study. Because, in this view, tangibles need to be ready for ‘practical use’, they are concerned also with experience and actual use, not just with a theoretic use. This opened the quest for practical capabilities for tangibles, and they might need to be adapted or adaptable for use.

5.7.2 Moving from the first study: building and deconstructing films

Activities building films through spatial composition

The activities building films through spatial composition that emerged in the first study were supported with new design paradigms in the second study. The evolution of the design of the film installations addressed further needs that emerged in pupils work from the first study:

- *the need for easily trying out combinations.* One of the main exploratory actions carried out in these tasks consisted of exploring the effect of changing the selection and the sequencing of the media texts provided. Combinatorial explorations needed to be enabled. But while when authoring a film one often aims to have a flexible tool – able to accommodate a continuous range of possibilities – with combinatorial explorations one might want to experiment with a set of discrete possibilities (the combinations). This influenced the design of the tools;
- *the need for representing syntagm and paradigm.* A critical aspect that emerged in pupils’ work in the environment is the advantage of making visible the alternatives that are available. In particular, making visible two different types of choices to alter the films compositions became apparent. That is, the choices are available at any one time to modify their syntagmatic or their paradigmatic structures;

- *the need for abstraction.* Abstraction was required to organise the many editing or composing alternatives;

Activities deconstructing commercials, propaganda and TV news

In the case of the study in the second primary school, the glass table was used to deconstruct two original TV commercials, broken into parts. By selecting and combining those parts, one can research new meanings from the material of the originals. These were the main actions that enabled the deconstruction tasks. The aim of such deconstructing practice is to apply the potential of tangible interfaces to give a practical experience of the unstable structures that govern the working of media genres, such as advertisements. The research questions that arise concern how, by disrupting the original order, one can practically experience the mechanisms underlying both the technical and the aesthetic aspects of media compositions.

5.7.3 Moving from the first study: tangibles as embodying ‘functions’ and ‘contents’

The substance ‘contents’ are made of

As noted in the first study, one of the most recurring and critical events in pupils’ work are the situations in which they discuss what objects and configurations are *about*. They were observed in the work of all groups. They frequently interrupted the ongoing activities, and triggered discussions about the nature of contents. Also the definition of *containers* became problematic in the practices. This relates to an aspect of media literacy that was discussed in chapter 2. That is, the fact that the terms content and container need to be understood in their dialectical relationship. They need to be addressed by *locally* resolving the differences between them, instead of establishing them once and for all as consistent definitions.

The ultimate aim is not to equip pupils with normative descriptions of contents and containers. Rather, the design choices aim to attune the objects and the tools to how pupils make sense of their work. The ways pupils attribute ‘contents’ to tangibles are specific to this practice. And acts of attribution and qualification, such as those described in the previous section, are frequent in the whole composition task. But they vary through the different steps in the task of film composition. Along the way, different possible definitions of ‘content’ can be collected.

Besides, the act of charging objects with digital representations is accompanied by other kinds of attributions. During pupils work, tangibles have been rendered *receptive of* annotations, roles, conventions and allegories. Partly favoured by design needs, and partly under pupils’ effort to simplify their work, these features became increasingly inscribed into ‘systematic’ ways of working. That is, through the reiteration of rituals and through simplifications, they became characterised by some degree of order and planning. This proved to be functional to the achievement of a shared understanding of the work groups were carrying out. Here is a brief description of some of the explored paths towards systematisation.

Two different approaches

Through the observations of pupils’ work, this study identified two main approaches, within which ‘contents’ acquire a defined nature. The one approach stems from the need of abstracting. Pupils showed a need to formulate generalised representations. That is, they needed to abstract away from the particular instances found in the environment in its initial configuration, in order to refer to generic aspects of the material, such as ‘short/long’, ‘Scottish perspective’, ‘unified theme’. The relevance for the design program of this study is that this need did not regard only verbal expressions, but also physical objects and their use.

The other approach was initially motivated by the technical need to map digital representations into embodied actions, or into physical features of the environment. This needed to be done in order to make digital representations accessible from the physical

environment. Concerning these two approaches, the following description is a particular interpretation of the concept of ‘digital-physical mapping’, which was reviewed in chapter 2. Whereas a description of how the use of tangibles was accommodated to different degrees of abstraction is addressed in section 5.5.4.

From ‘mapping’ to ‘functioning’

If the word ‘content’ is taken as referring to a specific chunk of audiovisual recording, then contents can be said to have been ‘mapped’ by designers into objects in the environment’s initial configuration. This was only a first step. It consisted also of saying that contents are chunks of recording and they can be mapped into the physical environment in different ways for a number of practical reasons. But later in the study, and through pupils’ work, it turned out that pupils needed to name ‘contents’ in different and unpredicted ways.

Here, the word ‘mapping’ is employed to retain a link with recent literature on tangible interfaces (chapter 2). ‘Mapping’ is intended as a relation between two sets, which associates one or more elements of the second set with each element of the first set. But the word mapping proved to be too generic and equivocal in order to be used to design pupils’ environment. A first useful simplification was introduced by implementing many-to-one relationships, and naming them according to their practical relevance within the tasks.

Following a terminology used in mathematics, these particular mappings (many-to-one) can be called ‘functions’. More in detail, the terminology names other elements involved in the functioning of a function: the first set mentioned above is called the ‘domain’ and the second is called the ‘range’. The former element is said to be the ‘value’, and the latter element is the ‘argument’.

This terminology is potentially relevant to the present setting. But it needs to be reinterpreted according to pupils’ work. In particular, the physical environment enforces some particular asymmetries. The ‘range’ and the ‘domain’ might be named differently because they are *substantially* different, and not only because the function is a many-to-one and not a one-to-

many relationship. The 'domain' is available to manipulation in the physical environment, and the 'range' is digital and needs to be 'evoked' through embodied actions. Other constraints, such as distinctions and asymmetries, can be pointed out about 'arguments' and 'values'. In these asymmetries, a useful opposition of contents to containers can be found.

5.8 Second study: methods

A new procedural organisation

The study at the Second primary school consisted of two work sessions with 15 pupils. The two work sessions were carried out one week apart, in order to allow for a week of redesign and editing work in preparation for the second session.

As in the first study, pupils were engaged in practices of authorship and deconstruction of media texts of different genres and formats. However, in the second study, a number of design choices concerning the tasks and the artefacts had been formalised, thanks to the first study. These difference are summarised, along with other ones in table 5.4.

The second study also introduced interactive properties into the physical environment which were not present in the first study. These are the glass surface, working with the camera recognition and the visual markers, and the blocks. They are described in section 5.3. The study was articulated in the following two steps:

1. A first work session with pupils:
 - collective viewing and discussion of media texts.
2. Design and editing work:
 - segmentation of the audiovisual material,
 - tangibles' charging.

3. A second work session with pupils: tasks in the physical environment.

- tasks of film composition in space,
- tasks of deconstruction of propaganda and advertisement.

The second study was informed by the lessons learnt in the first, in which the activities were more exploratory, the tasks were more open ended and lasted more time. In the second study, the tasks were more formalised, the interactive links, and digital augmentation were more flexible and the sets of video episodes more compact.

Table 5.4: Differences in the organisation of the two studies, described along three dimensions

	First study (First primary school)	Second study (Second primary school)
Introducing traditional as well as new ways of working Degree of separation between ways of composing and deconstructing media texts with traditional media and the new ways which were introduced in the work sessions	In this study, the authoring and deconstruction practices in the physical environment were introduced at the beginning. Examples with traditional means were used only for the training of specific skills and not for the creation of a common understanding of what is traditional and what is new	In this study, the distinction was made explicit. The first work session exemplified composition and deconstruction with traditional media (demonstrations with a digital editing suite and collective video viewing followed by a discussion). The second work session introduced the use of the responsive physical environment, to address similar tasks
Distinctiveness and formalisation of two emerging types of activities: 1. Composing films in space and 2. Deconstructing commercials and propaganda	In this study, the nature and the distinctiveness between these two different types of activities was emergent in pupils work. They had not been recognised as distinct and as in need of specific support in the environment	The two types of activities had emerged in the first study and in this study they were supported in two well distinguished tasks
Use of space	Pupils mainly worked in groups around a table, having one table per group	Activities took over in the whole space, using architectural features of the building as <i>loci</i> of interaction and access of the media texts (e.g., windows, a variety of spatial areas, walls)

Table 5.4 summarises these differences by describing them along three dimensions. The first pertains to explicit separation between old and new. That is, the differentiation between traditional forms of media access and the new forms which were introduced. One lesson learned in the first study was that the introduction of the new ways of composing/decomposing media in the physical space can more easily be brought forward with pupils if first there is an explicit and exemplified common understanding of what we all mean by the traditional ways.

The second dimension is the distinctiveness and formalisation of the two emerging types of activities. These are: (1) the activities of building films in space and (2) the activities of deconstructing advertisements. The way of distinctively designing these two types of activities emerged in the first study and a major contribution of the second was to propose them in more formalised and selective ways.

The third dimension is the use of space that was made in the activities. Thanks to a number of creative solutions observed in pupils' work the use of space became increasingly free. The initial designs introduced in the second study had taken those insights and developed them further during the work session with pupils.

Initial instructions on using the glass surface

Figure 5.12 shows the first design of the interactive features of the glass surface, which permits the composition of media texts that are attached to objects along two overlapping timelines. The upper one refers to the video track of the object placed in its area, the lower one refers to the audio track of the object placed in its area.

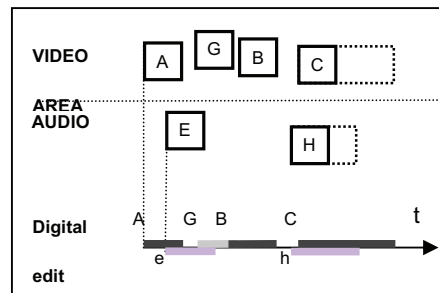


Figure 5.12: The first design of the interactive features of the glass surface

In the glass table, the reproduction of the video/audio starts correspondingly to the position of the object on the physical timeline. The reproduction ends just when the digital recording does. Physical objects were not designed to have a size proportional to the length of the recording charged on them. This is exemplified in the objects C and H in the Figure, for which the length of their recording (dotted in the Figure) is longer than their physical size on the timeline. Hence, placing objects too near each other one could cause the reproduction of their recording to overlap. In which case the system would automatically chose to reproduce the latest.

Each block displays snapshots of associated clips on the sides and, opposite each snapshot-side, there is a visual marker. A camera under the glass surface permits the tracking of the presence, identity, and arrangement of blocks on the limited surface. Once a composition is layed out, an additional marker can be placed on the surface in order to trigger the projection of the correspondingly composed video. The following alternatives for charging the physical objects with media texts have been tried out.

A block can either represent: a set of clips displaying the same image (crunching noises and images, eating, joyful experience), a set of clips from the same original media text (one of the adverts), different versions of the same clip (edited or shortened in different ways). Given a composition of blocks on the surface, the following two alternatives have been tried out: either the screening action caused the discrete composition of clips, each corresponding to one block, or a discrete number of pre-edited video sequences is associated with a small number (6) combinations of blocks sequences. The combinations that are not included in that small set do

not trigger any projection. As a consequence, the latter mode of use constituted a search for those combinations that had been prepared. And the search was led by a visual interpretation of the snapshots displayed on the blocks.

5.9 Second study: analytic framework

5.9.1 Discrete and combinatorial use of tangibles

Figure 5.13 shows one of the videoblocks. A visual marker is placed opposite to (hence associated with) each picture. This block has two pictures (hence two visual markers). But blocks carry up to three pictures (visual markers), as they have six faces.



Figure 5.13: One of the videoblocks

Figure 5.14 shows the glass table, which permitted the composition of media texts that were charged on physical objects. A webcam under the glass permits the tracking of the position of objects that have a visual marker attached under them. The first example of such objects are the blocks (figure 5.13). In the second study in the school, the evolution of the interaction design of this system followed two main steps. The first one is described in figure 5.12, the second in

figure 5.18. Subsequently, the glass surface was developed further in the study in the modern art museum (described in chapter 6).



Figure 5.14: The glass table

Table 5.5: More categories introduced or evolved moving from the first study

	<i>Synthesis of general definitions in the setting (and distinction between the two types of activities).</i>	
	Building films in spatial compositions	Deconstructing commercials
Charged object	In the first study, physical artefacts were simply said to be ‘charged’ when they were endowed with a digital trigger which directly gives access to a media text. In the case of the blocks, introduced in the second study, the way tangibles were ‘charged’ with digital content depended on the need to address ‘abstraction’ as explained in section 5.5.4.	
Block	Blocks, the objects used to compose video on the glass surface, were also used in other tasks, as they have links to 1, 2 or 3 digital representations. One to three sides were covered with a visual marker. Opposite to each visual marker, a corresponding pictorial representation is displayed, with the same kind of association as for video cards. Blocks were used to represent groupings of 2 or 3 media texts, with the purpose of physically embodying an abstract feature, a detail or a theme which groups the elements in set.	

5.9.2 Moving from the first study: abstraction and memory

The ways discursive structures get articulated in the installations depended on what the physical tools and objects suggested one can ‘do’ with them. Pupils accommodated differently mediated ways of authoring. One of these drifted from the original use and became a more abstract and ‘discrete’ form of authoring. It suggested that the focus be on small sets of about three episodes and see what films one can build by keeping the constraint of using just that set. This suggested that the focus be on ‘combinations’. The interface with which this practice evolved is the glass table.

A specific way to provide abstraction and organise the increasing partial results of the authoring practice was provided in the use of the glass surface to enable combinatorial explorations. As described in section 5.3, physical compositions of video episodes could also be made by arranging blocks on the glass surface. Figure 5.12 showed the first description of the glass surface. Handling the blocks to select and compose video episodes called for the definition of the following features:

1. What does a block stand for:
 - Between one and three different episodes about the same theme. This solution enabled grouping of episodes into themes or types. In this case, blocks became embodiments of these groupings.
 - Three different versions of the same episode. This solution was suggested by the need to explore alternative editing details. In this case, blocks embodied a given episode (and a selection of its possible versions).
 - A selection of three unrelated episodes. This solution was employed in the combinatorial exploration: the system has a list of pre-edited film sequences which need to be found by trying different combinations of blocks sequences.

- A point of view, according to which three episodes have been edited. With this solution, blocks embodied views or statements that were supported or exemplified by the videos charged on it.
2. What should be associated with a composition of blocks on the glass surface:
- A linear sequence, that is, an edited video. This is the solution employed for the continuous film editing (see section 5.10.4).
 - An associated media text which is pre-prepared and triggered by a given grouping of three blocks. This is the solution employed for the combinatorial film explorations (see section 5.10.3).

5.10 Second study: findings

5.10.1 The design of tangibles as containers and utensils

Packaging and framing as articulating functions

Some design principles can be evinced by discussing the relevance of these terms to media literacy. For instance, one could say that there is a *domain* of tangibles (a set of embodied objects or actions), which, as *arguments* of a particular digital-physical mapping (if it is a *function*) ‘yield’ some specific *values* (digital representations) in a particular *range* (e.g., a set of elements or issues within a subject, a theme, etc.).

The acts of media framing and packaging, which were introduced in chapter 4 can be articulated in the act of organising functions, their domains and their range. In such an

approach, the design question does not only regard the definition of the function in the abstract. The terminology related to functions suggests to articulate design choices into:

- a practical organisation of the *domain*, in such a way that it can be usefully recognised within the physical world;
- a way of making the *values* visible and recognisable as such; and a way of enabling the physical action of applying the function on them;
- a way of embodying a *function* in a manifest way, and especially relating it to how it embodies arguments.

These points are exemplified below, according to different solutions which have been tried out. The dichotomies domain/range and value/argument, compared, for example to physical/digital, help describing some particular ways of defining ‘content’ in pupils work. This interest calls for definitions rooted in observing how pupils worked.

The mathematical analogy helps addressing the content/container dichotomy in a way that is relevant to the observed way of working, according to the following terms:

1. *Functions*. In the practice, mappings ended up being many-to-many relations. This was due to many reasons that led to linking videos and objects. The word ‘function’ was adopted because pupils understood the use of objects when many-to-one relationships between tangibles and videos were implemented. Instead, when one-to-many or many-to-many relationships were implemented, access was less understood.

Hence, starting from a preliminary many-to-many relationship between tangibles and videos, an important design step was the identification of easily understandable and practically meaningful ‘functions’. The practicality of functions can be related in different ways to the needs of media literacy. For example, some of these functions can be defined to make the achievement of abstractions practical.

2. Domain. The domain is the set of elements which is a source for the function's argument. It is the set of arguments for which the functional value exists. This emphasises that every time one thinks of a 'function' in the responsive physical environment, then one can think of a set of tangibles or embodied actions to be done on them for which that function will yield something. This set is generally only a part of the environment
3. Range. The range can be made manifest in a particular medium. In the case of digital representations, the medium was a screen or a video-projection. Discussions with pupils regarding the nature of the range concerned the perception of what kind of media texts can be composed. The existence of different ranges, defined by different functions, was useful also to discuss the nature of genres. Defining genres as particular ranges had the advantage of emphasising how media texts in the same domain, but used according to different functions in the environment, can lead to different genres

These design features are explained further in the alternatives considered in the following examples from the two studies in the schools.

Example of the function 'show'

One of the solutions which were tried out is to enable the triggering of no more than one video from each one tangible. Hence, in this case, the mapping is a function. An example is shown in figure 5.15. The domain is clearly distinguishable in the environment, as it is made of tangibles (in this case: videocards). So, the domain is a subset of the physical environment. Also the range is easy to identify: it is made of video episodes.

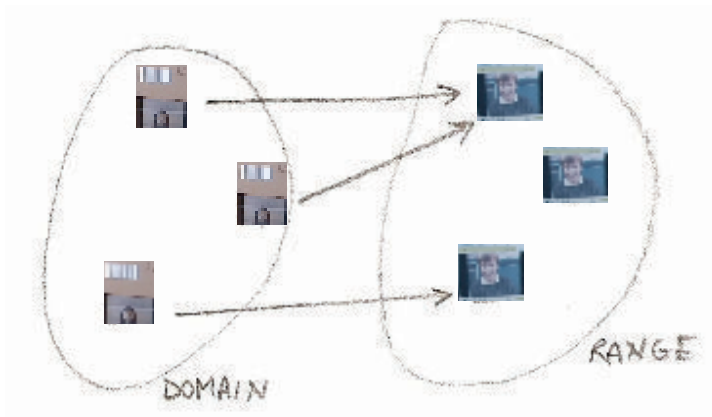


Figure 5.15: A function: each element of the domain is associated with no more than one element in the range. In this case, the function is 'show'

Examples of differentiation of functions

Other solutions that were implemented are the function of *shortening* and the function of *biasing* a given episode or video sequence (figure 5.16). These examples are shown in figure 5.16, where the domain is made of couples of elements to be scanned in sequence in order to issue that function. The second element is an object used to identify the function: 'shorten' was a barcode attached to a small table. 'Bias' has been a barcode glued near a window, and a barcode attached to a book representing the Scottish view on the Jacobites rebellions. In these cases the mappings are still functions, and the domain is still a part of the physical environment. But it is less easily identifiable, as in this case, the domain is made of couples of objects that are to be joined together by the action of scanning their barcodes in order to *use* the function. One element is the tangible charged with a particular video/sequence and the other one is a tagged object which identifies that function. For example, the second element can be 'shorten' to issue a trailer, or 'bias' to issue a biased version (as in the figure below).

Other functions that were tried out were issuing titled versions, functions which issued a synthesis of contrasting elements in the content of two videos by joining their two videocards

together. Even if the domain is still a subset of the physical environment, it is not made solely of videocards, as in the example above. In this case, the second element of each couple can also be a table, a paper note, a window etc..., according to what rhetorical figure is used to embed the meaning of the function in the physical environment. As in the previous example, the range is made of video episodes.

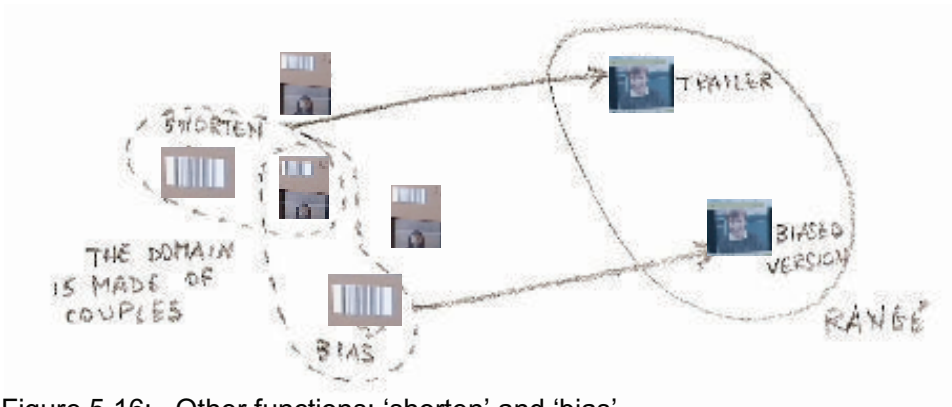


Figure 5.16: Other functions: 'shorten' and 'bias'

Example of non functions

Another possible way to map digital representations to objects is to design mappings that are not functions. That is, each element of the domain can lead to more than one element in the range. These alternatives can be relevant for the video cubes. For example, a cube can hold up to three pictures and one visual marker for each of them (upon its 6 faces). So, if each picture is *charged* with a video, then one of these cubes can lead to 3 different videos.

This and other similar alternatives were implemented to try out different ways of working. Some practical problems arose. For example: what should the domain be? Should it be made of cubes or of faces of cubes? As learned from the practical work with pupils, all depends on how the environment and the composing tasks are perceived by them. The relevance of these definitions in how pupils make sense of their actions depends on matters of convention and on how the environment is presented to them.

Some useful ways of defining the mappings were designed by relying on the need for abstraction. For example, a cube can be perceived as one element in the range of tangibles, but leading to different values. Hence the mapping is not a function. However, the range is clearly distinguishable.

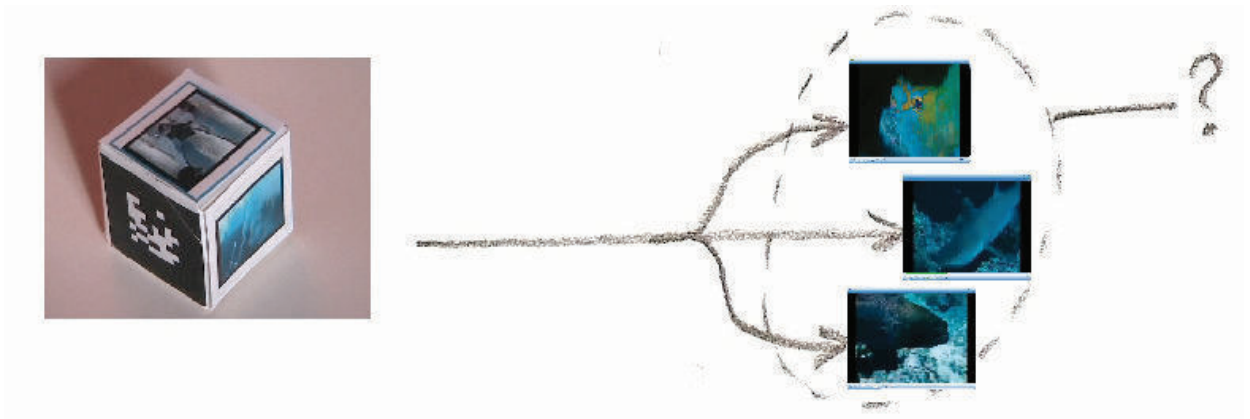


Figure 5.17. The problem of creating associations for blocks.

When the mapping is not a *function*, then it needs to be accommodated by some other way of coupling behaviour and representation. Should the domain be conceived as a set of faces or as a set of cubes? Should the range made of videos or of sets of them? In these cases the ways of coupling representations and the behaviour of the responsive environment were mostly designed according to the need for abstraction. For example, cubes (figure 5.17) often stood for abstract features. In the work with pupils these solutions were researched through practical reasoning and not by posing the problem in the abstract. One of the most common solutions found in groups drew from the need of abstraction: the different videos which can be triggered by the faces of a cube are grouped together under the name of a feature which will identify that cube. For example, a cube can represent different instances of media texts in which: the same idea is represented, the same person appears, the same music sorts different effects.

The solutions found arose from their utility. For example, specific needs for abstraction arose during composition work, when video episode versions proliferate. Abstraction is also needed when different editing strategies are tried out to combine different elements, such as music, themes, narratives, characters or specific images.

.5.10.2 Two styles to organise the responsive environment that emerged in the second study

As reviewed so far, different design categories were researched by observing pupils' response in the practice, different categories of analysis were identified to locally describe particular ways of working. In order to discuss media literacy as distinguishable tasks to be carried out in the responsive physical environments, some of the local solution were integrated into more compound design styles. Two of these are described here as constituting specific design paradigms. They emerged during the work by the contribution of both pupils and designers.

The two approaches are not meant to constitute two complementary paradigms. Neither do they intend to comprise an exhaustive set of design possibilities. They are described separately because each one seems to lead to a set of design principles which is consistent to a mode of collaboration and inquiry that was observed in the setting.

5.10.3 Combinatory, dissembled and sealed (CODIS)

When supported in *combinatorial* explorations in the montage of media texts, by exploring different arrangements of objects in the physical domain pupils could have a practical experience of upending the unstable structures that govern the working of media genres, such as genres of advertisements or news. By disrupting the original order, and by trying out different structures, they could practically experience the mechanisms underlying both the technical and the aesthetic aspects of media compositions.

One way this was researched is by supporting a mode of exploration and composition which relies on pre-edited episodes. The tasks are based on actions of 'combinatorial' exploration. That is, the environment permits the creation of different arrangements of the parts, in relation to each other and to the whole. A small set of effective examples are edited and charged on a corresponding set of arrangements (an example is the combination A,B,C in figure 5.18). All the other arrangements do not trigger the small set of prepared examples, but trigger the projection of a simple composition, as displayed in the space (in Figure 5.18, the arrangement on the surface corresponds to the edited digital sequence). The Figure shows one of the special combinations (the grey blocks ABC), which is associated with a pre-edited sequence dedicated to a chosen development of versions of A, B and C. It is one among a small set of examples to be discovered through attempts to compose edits in the physical domain. Physical blocks with visual markers and snapshots allowing the composition of video episodes on the glass surface, or the search for pre-edited sequences that are associated with given combinations.

In most tasks addressed in this study, parts get assembled together to try out alternative ways of editing the material. But, in the CODIS style, in particular, physical objects are containers of the elements into which the original media texts have been disassembled. Different recombinations identify different edited versions just by the order in which they are laid down. In this sense, in the environment designed in the CODIS style, physical objects are mainly used to research and rearrange media texts in a *combinatorial* way.

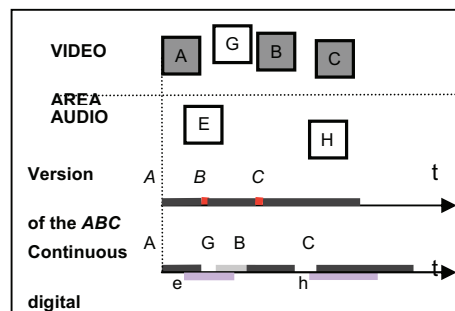


Figure 5.18. The documentary kit and the advertisement kit attuned to the combinatory, dissembled and sealed mode.

The dissembling nature of physical objects, as containers or links to digital information, was put into use to create enigmas, or rise expectations. It is with respect to these that discoveries were made. This was researched according to a principle that often holds in the design of visual and tangible advertisement: their design should ‘create new *needs*’ (Berger 1977), calling for attention and for reconciliation. Such needs are often researched by putting constraints to perception, or by creating conflicting representations or enigmas. Accordingly, a specific feature of the CODIS design style was that charged physical objects were set to *dissemble* the content they triggered. They have to mask or disguise a content, which will give rise to different forms or meanings, when recombined with different contents.

In the case of pupils’ practices these designs enabled activities of composition and decomposition which privileged pre-existent texts. For instance, voices and images from the surrounding environment could not be integrated in the environment. In this sense the designs – including the physical/digital couplings – were *sealed*. The media texts were encoded as properties ‘under the surface’ of the physical objects. The design decisions taken to create this mode can be described further and grouped around the definitions of ‘arrangements’, ‘parts’ and ‘events’.

Definitions evolved

What does it mean to ‘arrange’, and in such an endeavour, what constitutes a ‘part’? In the case of the CODIS designs, the creation of effective examples of editing emerged as a major issue. It also identified relevant features to define the terms ‘part’ and ‘arrangement’.

Arrangement One can produce an arrangement by selection, combination and ordering by spatial association. The example tried out in the field studies, and the definition below, relate to the interactive surface in the example of section 5.4. The main two dimensions for composition are the ordering on the timeline and the audio and visual assortments. In this mode, one design principle is that objects must be designed in such a way that they can allow combinatorial explorations. Some specific arrangements are combinations determined by the ordering of 2 or 3 blocks, as blocks A, B and C in figure 5.18. Such arrangements trigger special edited versions. In this case, the edited versions are produced in advance to create effective examples. They provide efficient or emblematic montages using the 2 or 3 episodes associated with the blocks. More rough edited versions can eventually be explored by working on the interactive surface in a *continuous* mode, as timeline t” in figure 5.18, which is not CODIS.

Part The main features of a part are: it is a (1) physically embodied object digitally linked to (2) an element or a set of elements from one of the original media texts to be deconstructed, and (3) it has a physical or pictorial reference to it (them). For example, a block can either represent: a set of clips displaying the same image, a set of clips from the same original media text (one of the adverts), different version of the same clip (edited or shortened in different ways). Still, there are several alternatives to define what constitutes a part in this sense. The main decisions taken in this setting are: (4) the partition of a media text into elements does not need to be done along the timeline (e.g. an element

can be a segment of a time-based recording, but also a feature such as character, tune, objects...); (5) the parts can acquire different forms depending on what other objects they are composed with; (6) in the physical domain they can have a disguised nature in that they do not necessarily manifest the media text they stand for. In this way, the nature of the reference must be discovered through practical attempts. Consequently, physical objects give a 'dissembled' reference to digital information.

5.10.4 Furnished, installed and permeable (FINPE)

A different design approach is one that permits the use of physical properties of environments of daily life and use them as working sets in which media texts are embedded, organised, composed and accessed. The practical attempts in the field studies led to a specific set of design principles which supported a mode of collaboration in an 'equipped' everyday environment. The environment was made to be permeable to the recordings of voices and events locally occurring.

Figure 5.19 shows spatial representations with bricks, which enable the representation of branching, circularity, prominence, double-sidedness, and other features which can be explored through spatial reasoning when collectively building a film in space. Then several steps in the activities were taken to provide means to interpret these geometrical features into digital editing of film sequences.



Figure 5.19: Spatial representations with 'bricks'



Figure 5.20: Example of one of the video sequences instantiated from a physical installation

The example of video sequence represented in figure 5.20 was instantiated from a physical installation. The one there represented belongs is a visual narrative (from the study at the second primary school), different from other genres of compositions, such as propaganda, TV news, documentaries or interviews.

In this case ‘installation’ is defined as a location specific design. The emphasis is on how to *install*. Hence, it involves the *placing* in the right position and *connect* and *adjust* for ‘use’. In order for these actions to become *steps* in the collective inquiries, and, in particular, in the practical attempts of devising composition tasks, this definition evolved further. It also attuned to specific aspects of the practices of film production. It detailed the concept of ‘installation’ by focusing on an understanding of ‘development’.

The working definition taken to support the practices became:

- a. A finished interactive installation has a form provided with some *unity*, it contains one or more start points, and displays paths that can be explored by a visitor;
- b. Such paths are sequential organisations of the elements (also referred to as the ‘syntagmatic structure’), and can be of different types (for example, rhetoric, associational, categorical);
- c. There are prescribed rules constraining the *relations* between the physically accessible features of an object and the digital representation it triggers. Such relations can be a resemblance (iconic), a matter of convention (symbolic), or an index set even unintentionally or by common sense;
- d. Such *relations* and the other terms mentioned in the previous points are the scope of instructions and questioning in addressing *spectators’ expectations, closure, openness, and critical reading* of the media texts produced in the tasks. This definition is attuned to a variety of tasks to be enabled and supported.

Definitions evolved

- Charged** The act of charging embodied objects used also rhetorical figures to link qualities of the digital representations with their embodied qualities. The “special places” described below are an example of this.
- Object** The objects became equipped and furnished with features that permit them to be embedded in the environment.
- Version** In this environment the number of versions of certain media texts tended to increase quickly because a small set of popular episodes were required to serve different purposes in different compositions. The number of versions needed to be cut down or their organisation simplified. This was done mainly through two strategies. One is to prefer physical editing methods over digital processing, in order to achieve similar editing effects. The other one is the creation of special places (see below). Nevertheless, a definition of what should be called a version was needed to clarify how distinct media objects are intended to be separate entities, and which ones are meant to be a *version* of which. Definition: a ‘version’ of a media text, with respect to a particular ‘use’, is what one can obtain by altering it, in a way that the essential features of the original, which one needs for that use, are retained. Hence, while working at a composition addressing a specific theme, we call a ‘short version’ of an episode the chunked segment which displays a *key utterance* or *key image* for that theme, for another use we might call it a ‘part’ or consider it a different episode altogether. Having a definition of *version* dependent on *use* proved to be useful to explicitly address the organisation of the environment according to the activities. It foregrounded at least two aspects. One is that organising media texts in versions tends to hierarchically structure the corpus of digital media, thereby giving a biased or selective view of it. In fact it gives relevance or at least prominence to higher nodes. The other one is the influence of this

selective view on the perception of the tasks at hand: practical ends get adapted to the available means also according to how versions are organised.

Special place Some marked surfaces, areas and pieces of furniture have been marked and endowed with a digital link in order to access a special version of the media texts ‘charged’ on objects that get moved near that area. One example is a very small table with a barcode, if objects charged with a video edit are scanned in conjunction with the (barcode of the) small table, a shortened version of the edit (its trailer) is projected. Another example is constituted by opposite windows. If objects charged with a video edit are scanned in conjunction with the (barcode of the) window, a biased version of the edit (one of the possible views) is projected. Other conventional features of special places evolved further in the tasks. For example, windows displayed images relating to the particular ideological view or bias they were providing to objects scanned in their place.

Phases The phases have been reiterated at least twice in each study. The organisation of the activities into phases served different purposes. Beyond the practical needs of setting a scheduled and organised work to support three groups that work in parallel and share resources, an important effect was that, at the beginning and at the end of each phase, the attention of participants was coordinated towards specific events of collective viewing and exposition.

New modes of composition and decomposition in the setting

Different ways of framing and packaging media texts evolved into specific formats. They realised a method for both organising and exploring either physical or digital elements and representations. Three examples are:

- a. the 'museum' format, in which the video-cards and objects divided the space into different thematic areas, and had an entrance and an exit, applying common metaphors from the architecture of museums (an example is in figure 5.6);
- b. the 'town' format, in which the space was organised into streets and avenues, and included the use of architectures enabling interactions such as towers, doors, and backyards (an example is in figure 5.11);
- c. the 'geometric or abstract' format, applying abstract geometrical shapes as circle, radial, or the square, which displays and exploits the architecture of 'opposite sides'.

Different formats favoured different forms of organising and exploring the digital representations through the physical environment. The museum format favoured an encyclopaedic style; the town format favoured a geographical style, in which exploring can be associated with travelling and arriving; the geometric/abstract favoured an argumentative style, in which the lack of rhetorical figures calls for connectives of argumentation: 'therefore', 'but', 'for example', 'and'.

As argued below, the creation of such formats is one aspect of the creation of 'genres' for authoring and participation. These formats facilitated the integration of installations in wider environments. In fact, the rhetorical figures and architectural explorations could, in a later stage, leave the table and be adapted to the wider environment. Dimensions of exploration through spatial montage were discovered by pupils who created parallelisms with the environment of everyday life. These were of two types: (1) framing multimedia features *into* the daily environment, or (2) embedding features in the dedicated installation *from* the daily environment. As examples of (1), rooms acquired *themes*, and opposed windows, being associated with different episodes, alternative *views*. As examples of (2), exploring town shapes generated branching film architectures or sub-narratives, thematic areas, or architectural spaces built as towers and 'gardens'.

5.11 Second study: discussion

5.11.1 Evolution of the masks framework

Design relying on *characterisation*

As addressed in the pilot study (see chapter 4), tangibles such as videocards can be characterised as tokens, containers of digital representations, thanks to the pictorial representation they carry, their shape or their annotations. The second study in the school addressed how, when used as components of displays, arrangements, or to exchange digital items, they can acquire an expressive role. This was researched as arising from their characterisation as specific types of tangibles that are endowed with specific roles.

Design relying on *neutrality*

Pertaining to the ‘neutrality’ of objects, as defined in chapter 3, the second study in the school addressed how tangibles can be used in ways that are neutral with respect to the expressive functions mentioned above. In chapter 4, cards could be used to express nothing, but just as indexes, token, or utensil. They could be employed solely as a means to access digital representations, or to perform any other action that does not have an expressive achievement. Here, these features were extended to a more complex case. Cards were used in ‘installations’, and neutral features were extended to their interactive character, with the use of barcodes.

Design relying on *incompleteness*

In the pilot study in chapter 4, examples of incompleteness were the presence of a single snapshot from a video on the face of a card. This could be regarded as an incomplete representation of a video. More complete representations of that video would be a sequence of

pictures displayed on the card. In the present study, the description of how some pupils display their shared understanding of some collaborative tasks will articulate further the definitions of ‘explore’, ‘express’, ‘compose’ in terms of ‘neutral’, ‘incomplete’ and ‘characterised’ designs.

5.11.2 The media literacy perspective

One of the problems of addressing media literacy in primary schools is that if one tries to engage pupils in practical work leading to the composition of media texts, then, if they use traditional tools (videocameras and commercially available digital editing suites), they always have to make authoring decisions very soon. There is a need for intermediate representations, which pupils can share in order to experience richer collective inquiries about the interpretation and the making of the media. Also, when pupils collaborate in activities of video composition or decomposition in digital video editing suites, a great part of their inquiries is not overt, as many actions happen inside the GUI, and are not visible from the point of view of other pupils in the same group or class.

The environment devised in the present studies addresses these and other issues of media literacy and participation. It gives possibilities for physically sharing and composing media texts, and it provides new possibilities to open media languages to inquiry. Some of these possibilities lie in the different degrees of abstraction in which authoring decisions can be made and in which inquiries can be conducted collectively within the same physical environment.

Also, the practices have potential benefits of providing pupils with the experience that the education they can receive from media texts – and their critical interpretation – does not need to be confined to the discourse they are presented with in the first place. The digressive actions can take them out of the engagement intertwined by the discourse and the plot of the initial presentation. By distancing themselves from it, the practical tasks can encourage them to judge, or at least to question the persuasiveness of the media texts they access.

The tasks that could be devised engaged pupils in exploring effects of the alterations of media texts. Pupils could enrich and reorganise the original material with a variety of additions, or by generating alternative versions. The environment and the tasks permitted inquiries into the surrounding reality, including other events and representations they had access to. A concluding summary of the stages and forms this took in the study is presented below.

A design trajectory

The study has taken some of the many available design paths. It has started with devising an open ended task called ‘building films in space’. It has evolved the design details by following the ways pupils characterised their joint work and jointly made sense of the task. Also some of the specific ways in which pupils’ work became fragmented, disordered, evasive or stalling, have been taken into consideration. The study has moved towards more articulated and closed-ended collaborative tasks. Two different, but not necessarily alternative or complementary, design styles have emerged. The study has focused on the roles of technology by describing some of the manners it featured in pupils work.

Table 5.6 summarises the features and limitations of interactive tangibles when used as tokens, containers, bricks or utensils in relation to the major themes about the practices observed and described in sections 5.5 and 5.10.

Table 5.6: Requirements and limitations of tangibles when used as tokens, containers, bricks or utensils

	<i>Composition work in installations as “building sites”</i>	<i>“Framing” and “packaging” of contents in tangibles</i>	<i>Transposition of TV genres in the environment – the case of TV news</i>	<i>Abstraction and memory in the responsive and physical environment</i>
Tokens	<u>Coordination:</u> In building films in installations, tangibles used as tokens acquired the role of easing coordination and synchronization of	<u>Physical actions:</u> When used as tokens, tangibles had the function of making the actions of selection and negotiation more overt as they had to be made as	<u>Proposition:</u> When used in the transposition of the TV news genre, tangibles were used as tokens when they	<u>A limit to abstraction:</u> When interpreted and used as tokens of information, tangibles tend to be associated with specific media

	composition and screening actions in the group, as they had to be passed around	physical actions. A problem arose with the implementation of functions: it needs to be clear when tokens are part of a 'domain'	were recognised as 'propositions' an argument	texts. This posed a limit to abstraction, which was overcome by articulating the use of other tangibles as utensils (e.g., using 'shorten' or 'bias')
Containers	<u>Only one content:</u> In building films in installations, tangibles tended to be used as containers of one video episode only	<u>Need to see the association:</u> Using tangibles as containers when articulating functions posed the problem of visualizing their content from their physical design	<u>A proposition and its negation:</u> When considered as containers in the TV news genres, tangibles were expected to contain a proposition and its opposite	<u>Containment as abstraction:</u> One way in which tangibles were used as containers, is by representing common qualities of specific media texts (and give access to those)
Bricks	<u>Need physical formats:</u> When building films in installations, physical composition was implemented in different ways in types of building sites (e.g., town, museum and geometrical shape), in which tangibles as bricks had different shapes and assembling methods.	<u>Ability to be composed can clash with ability to function:</u> When framing and packaging meant arranging tangibles in space, then the qualities of tangibles as bricks were relevant. When framing and packaging meant articulating functions and other 'physical-digital' mappings, then those same qualities clashed with their ability to represent the mapping or function (their ability to 'function')	<u>Composing arguments:</u> When composed together in the TV news genre, tangibles were used as bricks to compose arguments with propositions	<u>Composition as abstraction:</u> Installations made of physically composed interactive tangibles represented abstractions of different possible instances of edited films, which share the selection and sequential orders of those tangibles.
Utensils	<u>Utility as physical object:</u> The use of tangibles as utensils in the composition of films in installations was limited to their utility as physical objects to physically support or to join other tangibles	<u>Functional operator:</u> When framing or packaging media texts through the articulation of functions and other 'physical-digital' mappings, tangibles were used as utensils every time they became operators for the function or mapping (e.g., the interactive small table which served to 'shorten' videos)	<u>Argument connectives:</u> Some rare tangibles had the role of argument connectives	<u>Rhetorical figures:</u> The abilities of tangibles to work as functions – and permit the access of groups of media texts which share some properties – depended on their ability to work as rhetorical figures. E.g., the interactive small table to 'shorten'; the interactive window to 'give a specific view'

Applications to media literacy

A result of the studies described above was the creation of practices in which participants negotiated and collaborated towards the construction of media texts and their adaptation. The practices included viewing experiences and simple editing actions. They included ‘sorting’ and ‘selecting’, the formulation of ‘subjects’ or ‘themes’, ‘composition’ and ‘installation’.

The tasks provided examples of different inquiries on paradigmatic and syntagmatic aspects of compositing. This included the effects of changing the order of elements of a sequence: interview, news, commercials, and associations with extraneous visual or verbal material. Some tasks permitted to experience the consequences of having access to the alternative paradigmatic choices. These features of the practices will be discussed further in chapter 7, looking back at the five main terms of media literacy introduced in section 2.3.2. The discussion will be informed also by the design work done with similar interfaces in a museum, as described in the next chapter.

Chapter 6

Performances and development of mixed media in an art museum

Some aspects of media literacy acquire a different character when addressed in public places, with the general public, and when addressed in short, sporadic interactions. This chapter describes a study in a design project in an art museum. It focuses on selected themes pertaining to media production and fruition in responsive physical environments. These themes could not be addressed in the same detail in the previous studies, because of several constraints in the school context.

A major interest in studying the activities with interactive tangibles in public places is in relying on the role played by audience groups, when they adopt images and artefacts and assign to them a significance rooted in needs and uses. This chapter summarises some selected aspects of the study. In particular, the discussion over the design of three interactive installations focuses on themes which are relevant for media literacy, and which contribute to the general discussion in this thesis.

Because of the context of a public workshop and exposition in a public place, and because of the limited amount of time available, the activities in the installations were designed to be very simple. Still, the installations were designed to have a degree of incompleteness. The incomplete character of the designs, combined with directed tasks, was meant to achieve innovation and to attune the design to emerging use scenarios. This was researched with the contribution both of participants in the workshop and of visitors in the museum.

- *Movement continuity.* How people accomplish ordered uses of image assembling, through the action of ‘meeting’ in a place, when the system switches from the monitoring of discrete movements to the monitoring of continuous movements.
- *Regularity and repetition.* In the collective fruition of interactive media in public places, attuning the design work to the production of *rituals* can regulate spectatorship and participation of audience groups. This issue can be related to the role of rituals as devices to reach a focused organisation of media interpretation, as referred to in media studies;
- *Multimodality.* How the multimodality of media fruition with interactive tangibles can be interpreted in participation in creative tasks. What design expedients can attune the environment and the tasks.

Each of the three themes originated from practically studying selected aspects of the design of interactive media and participation in a public place. They were studied by designing interactive installations centred around forms of composition of media texts addressing the following questions:

1. How to configure the environment in order to enable scenarios of meeting between two people which trigger the composition of an image;
2. How the action of composing videos with blocks can be made to evolve into a coordinated event involving different people;
3. How to enable composition through different media in order to support collaborative storytelling with physical objects and characters triggering video projections.

In this chapter, these issues are selected and discussed from some events among the many that happened around the design of three interactive installations during a public workshop. The installations were especially designed to be exhibited in a museum at the end of the workshop. The design work in the museum was organised as a two day public workshop in the Centre for Contemporary Arts in Glasgow, and two separate days of public exposition of the installations. During the workshop, the initial designs were developed further thanks to the contribution of participants. The final installations were then exposed to the public in the museum.

6.1 Context and terminology

6.1.1 The 'Manipulate Media' workshop

The workshop included practical sessions in which participants would perform collaborative tasks in interactive installations for media composition and fruition. Such activities were introduced by theatre improvisation performance demonstrations. These were used to introduce the problem of directing collective inquiries by imposing constraints, which was a main technique used in the practical design work done with participants. The practical sessions were also concluded with more theoretical presentations and discussions in the workshop, which are not described here.

The events studied in this chapter include different phases of the practical design process. This includes: the design concept of the interactive installations; the performance and re-design with participants in the workshop; and the outcome of their exposition to the general public.

The workshop's concept

A focus in the workshop has been the problem of addressing *design* as the act of building social relationships. In the activities, performances and practices needed to be explored through practical attempts, and made use of theatre approaches.

The main concept of the workshop, which transcends media literacy, is summarised in (Jacucci *et al.* 2005a). Among recent research that explicitly integrates work in the arts with the design of interactive technologies, the *Manipulate Media* workshop proposed a specific approach. Firstly, the workshop was organised as an event in a modern art museum, ending with a public exposition. Secondly, it was driven by the practical demonstration and the application of a specific type of practice to devise theatre. Thirdly, it made use of 'interactive installations', both as design *places* for interaction and as design tools.

Author's involvement in the workshop

The author's involvement in the workshop included co-organising the initial designs and the activities, as well as contributing to the following:

- the original concept design for the three interactive installations, and the editing of the audiovisual material;
- a further refinement of the initial design concepts done with the other workshop organisers: Giulio Jacucci, Thomas Psik, Ina Wagner and Mira Wagner;
- the contribution in defining the workshop's vision, with the concepts discussed so far in the thesis, and, in particular:
 - the role of concepts from media studies, such as framing and deconstruction;

- the devising of collective activities as theatre improvisation exercises, in which constraints on action and perception are set to focus the group's practice;
- the organisation of theatre performances demonstrations on the workshop's first day, to clarify the methods in devising the design activities with groups of participants.

Many of the design choices and improvements during the practical sessions originated from the contribution of different parties. It included the contribution of individual participants, groups of participants, visitors, and the other organisers.

6.1.2 Different facets of 'manipulation'

The word manipulation, as the word "handle", has a reference to the use of hands. Accordingly, the "*manipulation*" of media refers to a variety of features of mediating technologies which naturally are – or are intentionally designed to be – accessible to people's hands. Following its pictorial connotation, the word manipulation also bears a vision of the potential of the actions people can exercise on mediating artefacts. The hope is to extend this to *mediatise* resources. That is, to extend it to resources that are influenced by the media, such as media texts, visual compositions, stories, archives, news, pictures. This goal implicitly includes the intention of making media access, and its related operations – such as editing and authoring – accessible to people via tangible and ubiquitous properties of artefacts.

Previous work addressed how tangible interfaces can support different activities and relate to pre-existent modes of experience. For instance, with *The Box Garden*, Ferris and Bannon (2002) researched a sound installation made up of cardboard boxes, varying in shape and size, split into groups with specific sonic tasks. Artefacts and digital objects in their installations were seen as vehicles of sociality as assemblies that allow for juxtaposition, linking, stacking, etc. The role of artefacts, materiality and human activity play in physical interfaces was also the object of study in (Ciolfi and Bannon 2002), who studied them in the setting of a museum

exhibition. There, objects are seen as both material and symbolic devices in their own right, with a history, a context of use, and both mediating and being the object of interaction.

The reference to current trends in tangible interface and ubiquitous media design is overt. But, in the context addressed in this chapter, these important aspects of a design vision acquire more specific and restricted meanings. These aspects include: ‘configuration’, as in (Binder et al. 2004, Jacucci et al. 2005a), ‘framing’ and ‘composition’ as intended from chapter 4.

Additionally, manipulation, in the vision of the workshop, refers to a commonly recognised effect of the ‘media’ on people’s mind, desires, and perceptions. This is commonly referred to as the manipulation exercised *by* the media upon audiences. However, in the context of the workshop, the audience was constituted only by a restricted group of participants, and by the museum’s visitors. Also, the media *agenda* was largely controlled by the designers.

6.1.3 Participative media in art installations and public places

Among the phenomena related to *mediation* of artefacts in public places, and among the many which are described in the literature, only some are pertinent here. However, the term ‘media’ here is still used in its wider connotation. This includes both the *mediation* in the sense of extension and filtering, and cultural constructs, such as the genres and formats developed in the media. The term will be used to refer also to actions that frame media texts, including selection, editing, emphasising, rephrasing for the media.

These design problems in public places have a specific reference to how activities are displayed with relationship to the space and in relation to which the place is identified as a *venue*. Its boundaries usually are publicly displayed, readjusted and agreed upon.

Heath et al. (2002) examined how people in and through interaction with others, explore, examine and experience a mixed-media installation in a museum. They show how “through interaction participants discover and reflexively create the sense and significance of the installation and its various components”. (*Op. cit.*: 28) The scope of design in the activities here

is intended as the configuration of technologies and places (Binder et al. 2004, Jacucci et al. 2005a).

6.1.4 The social construction of technologies and media

The activities described here are devised from open ended tasks in interactive installations. They all have a puzzling, unresolved starting point. Starting from it, groups of visitors eventually create activities that have a degree of organisation. These events are studied with three interactive installations. They are media-specific and:

1. are built by embedding interactive technologies in spatial layouts, and
2. give access to images and videos from the broadcast media.

Three situations are studied, one for each installation. They are: (1) couples of people composing images by the act of physically walking into a place; (2) a group coordinating the composition and screening of video sequences; (3) collaborative storytelling with interactive objects.

A major interest in studying these activities with interactive tangibles in public places is in relying on the role played by audience groups, when they adopt images and artefacts and assign to them significance rooted in needs and uses. A difficult aspect is that the images and the interactive artefacts designed to research and innovate at first need to be incomplete.

As pointed out in various traditions in cultural studies (e.g., Griswold 1994), the “collective production” of meaning can be described as an inquiry which ends with the revelation of some order in the form of practical organisation. People dismiss unresolved aspects by displaying social activities which formulate what they designate as cultural objects. Such activities include interaction, cooperation, organisation, and contestation. Studying these phenomena for the

design of interactive tangibles and media literacy can inform design results in a way that would not be achievable otherwise, as for example by prescribing use scenarios or interaction procedures.

Accordingly, the design work described here, after an initial design phase, consisted of two steps. One step is the observation of how groups reach an order and create a focused activity in a brief amount of time. The second step consists in the identification of key roles of technology and in re-design in order to enhance them. The interest in technology focuses on interactive tangibles *embedded* in the physical environment. The investigations were directed towards embedding sensors in the environment in order to enable fruition and “manipulation” of media texts. A special interest is in furthering the study of media literacy in responsive physical environments.

6.2 The first installation: assembling images by the act of meeting people

6.2.1 Design concepts and questions from the previous studies

The concept of this installation consisted in using visual markers to invite and visualise the meeting of people within a public place. The use scenarios for the exploration of this concept were developed around the everyday life situation of people meeting in a restricted place. The aim was to recreate a stage for the enactment of rituals and behaviours which commonly happen in places such as an elevator, a bus stop, a waiting room, and similar *places*.

In the studies described in chapters 4 and 5, composition with interactive tangibles charged with audiovisual material was organised in somehow defined tasks upon a table or in a classroom. Freer explorations, such as those with continuous body movement in everyday environment spaces were not tried out, mainly because of the need of providing pupils with clear instructions and dedicated tasks. The first installation was designed explicitly to explore

the design concepts in more open-ended environments and tasks. The concepts and questions that are brought from the previous studies are described and discussed further in section 6.2.2. The main advancement that is discussed here is the switching from the monitoring of discrete actions to the monitoring of continuous movement, as described below, in the redesign of this installation.

Design of space, objects and interaction

Each visitor was given a visual marker to wear (figure 6.1). Camera recognition software was used together with a webcam mounted in the installation to recognise the markers within a limited area. The initial version of the installation was designed in order to host the meeting between two people. The space was shaped in order to fit the size of a common elevator. Such an area was marked in colour on the floor, in front of a wall where the projections appeared.

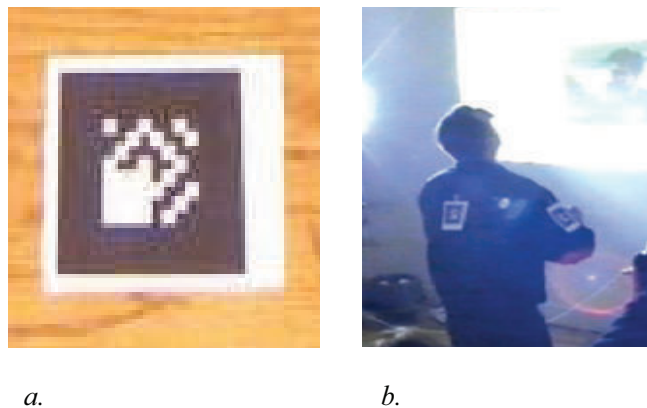


Figure 6.1: A wearable visual marker (a). In the initial configuration, each person wore a single marker. Figure b shows a participant during the redesign sessions, wearing several markers

The camera could only recognise the markers in a limited area within a certain angle of view. Each marker was associated with an image. The meeting of the two people would cause the projection of the images associated with the two people. Hence, each projection was of a half screen.

Figure 6.2 shows the possible actions of two people triggering the projection of two parts of an image through the act of meeting in a determined area marked on the floor. Each half image is associated with one person, via the visual marker. Figure *a* shows the half image triggered by a person entering the left part of the area. Figure *b* shows the half image triggered by a person who enters the right part of the area. A person entering in the installation's space causes a half image, which is attributed to her, being projected. If two people enter, then they can compose the full image, in the case where they happen to be charged with the two halves of the same image, and if they stand in the right order (as in figure *c*). Part of the task consists of finding the person who holds the other half of one's image.

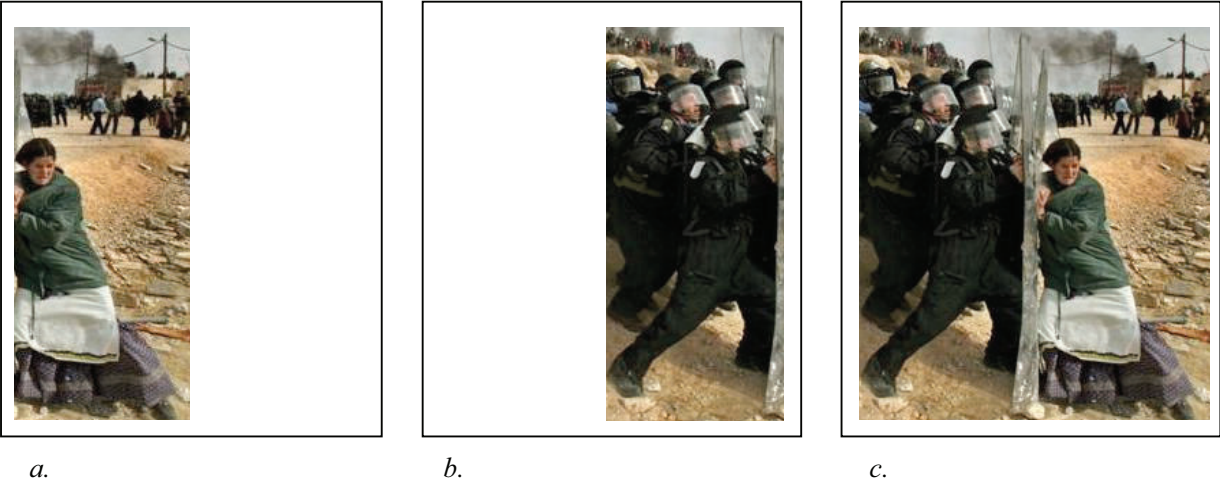


Figure 6.2: The concept of the interactive behaviour of the first installation

Design of the audiovisual material

All images associated with the wearable markers were taken from television. They all featured people. The association of the two parts of an image usually played with the differing effects in seeing a whole image, or only one half or the other. Not all images were interesting when decomposed in this way. However, no specific methods were followed to choose and cut the images. The redesign of the installation is discussed further below.

6.2.2 Initial rules, categories and procedures

The following table summarises the main initial categories, rules and procedures. Reference is made also to design concepts pertaining to the second and third installation. They are compared with those in table 5.3, which refer to the studies in the school. Overall, in the museum, the physical-digital mappings and the design of the audiovisual material resemble more the choices made for the activities which in the school concerned the deconstruction of advertisement and propaganda.

Hence, media texts tended to be disengaged from their original context and their originally intended interpretation. The installations and the corresponding activities researched in the museum needed to foster what has been called “aberrant” interpretations (Eco 1967).

Table 6.1: Initial and explicit design categories, compared with those of table 5.3

Initial design categories and conventions compared with those in the school studies	
Charged object	Unlike in the studies in the schools, objects were “charged” with digital content and could not be discharged, nor charged with different material during the course of the activities. Such objects included: the visual tag to be worn (first installation), leading to people to be “charged” with contents; the block on the interactive surface (second installation); and puppets and other objects (third installation).

Block	<p>Blocks were the objects used to compose video on the glass surface. Unlike in the studies in the schools, in the museum the design of digital-physical links in blocks was simplified. Always three sides were covered with a visual marker, the opposite of which carried a corresponding pictorial representation. So blocks were not used to represent groupings of different media texts, nor to represent abstractions of themes or versions. Such a simpler design was motivated by different research questions.</p>
Episode	<p>As in the school studies, the definition of episode relied on <i>time</i> and made no reference to aspects of <i>relevance</i>, <i>integrity</i> or <i>coherence</i> of content. But, unlike in the school studies, these explicit definitions were never mentioned.</p> <p>As in the practices of deconstructing advertisements and propaganda in the studies in the schools, in the museum the choices made when selecting the start and end points when chunking out episodes aimed to dismiss its original function.</p>
Physical edit	<p>What in the museum can correspond to the category of “physical edits” defined in the school mainly were: (1) the composition of two people meeting in the first installation, and (2), the physical adjacency of blocks on the interactive surface in the second installation. In both cases, they represented a particular editing along a time-line, and the corresponding edited material was made accessible on the same device (a projection). Only in the second case, the physical edit had a visual reference, as the blocks were marked with pictures. In both cases, physical edits were not supposed to constitute a self contained film. They referred back to the original material (films, documentaries and television commercials).</p>
Version	<p>Unlike in the studies in the school, in the museum there was no “handling” of alternative <i>versions</i> of the same media texts. That is, every media text appeared only in one installation and in one version. Like the other simplifications mentioned above, this one was motivated both by the fact that participants’ interaction with the installations and with designers was much shorter, and by the different research questions.</p>

6.2.3 Initial design goals

The interaction syntax was shaped around the conventional unfolding of the act of meeting. An intention in designing this installation was that people in the museum would find ways to make sense of an unresolved situation. In fact, nothing had been prepared nor prescribed for the moments after the two people have met and have triggered the images. The intention was well placed. In fact, it never happened that two people just left without doing anything. The observations led to further discussion and redesign of the installation, according to a new paradigm. The technology in the installation relies on visual markers, with each of which a picture to be projected is associated. Their design rested on the assumption that by carrying the marker (or by coming and picking it up), people find out that they have been associated with an image, and somehow use this fact in their subsequent actions.

In particular, the assumption was that, when meeting in the defined place, two people jointly perform the act of composing a projected image. Hence, special care had been given to the timed behaviour of the installation, which triggered the associated images in conjunction with the act of stepping in the determined place. Would this create a situation leading to further action? Would the co-presence of two persons and the visual content associated with them call for some explanation or for subsequent action?

Different scenarios were tried out in order to research whether people found ways of relating to each other or to the wider context surrounding the installation. The images that were used included some that did not have an obvious or intended interpretation. This was meant to favour a necessary degree of openness to possible scenarios.

6.2.4 Choices about the installation's syntax

The following descriptions of the installation in terms of syntactic rules are used here as a tool to describe how performances were directed and interpreted. They are considered as examples

of intended behaviours, and not as constituting a complete syntax. From the point of view of the actions of handling a visual tag (the card), the installation's syntax can be summarised as:

(R1) *Putting a card* in the space before the web cam (like the act of *showing* the card to the web cam) will probably cause *a projection of its picture* to be displayed within the wall screen, on the right or on the left side according to the area of the space where you are hanging the card.

From the point of view of persons as bodies, that syntax had to be restated as:

(R2) If you *take a card* and *go* stand with it upon the orange area on the right, then *a picture* will be probably displayed on the right side of the wall screen.

From the point of view of peoples' encounters, the description had to be rephrased again:

(R3) If you *go meet* over there, you will probably *compose* an image made of the two parts associated with you.

Implicit in these descriptions are the choices of the terms (or the "alphabet") of the behaviour syntax. These are either actions such as handling and moving objects, or actions such as walking or meeting.

6.2.5 Performances and redesign: switching from discrete to continuous

The first installation aimed at hosting meetings between two people. People's attempts to make sense of its use during the practical sessions led to investigating the influence which the initial design abstractions have on the ways to direct the Performative Development.

The problem of creating meaningful interactions in the space of the installation (*'we need to make sense of this installation'*) was displayed by participants who intervene and suggest what to do: "we could do this and that...", including suggestions about what is it for and how it

should be used. Several interventions ended either with “I don’t understand”, “it doesn’t work”, or with the acknowledgement of a discovery. People’s puzzlement about the meaning of the projections caused by their moving into the interactive area, lasted a few minutes. Afterwards, the focus shifted from the content of the projections to the possible variations of the simple actions of image triggering.

In the practical session, participants started to explore the installation alone. This was possible because initially the markers had been left unattached, and free to be taken and used. At first, it was not clear which of the images were launched by whose marker. In fact, the camera could read markers at several meters’ distance and the images of markers that people wore in the crowd would appear as well as projections on the wall.



Figure 6.3: The first installation during the redesign trials

The images were also unstable. Small body movements could make them appear and disappear. This fact was initially seen as a “problem”, but soon appeared to lead to the most interesting interactions. In fact, as explained in the following, the redesign of this installation was made on the ground of the importance of the continuity of movements of people slowly walking in and out of the area, trying to evoke digital events, instead of discrete actions, such as “stepping in”

or “not stepping in” (figure 6.3). A lesson learnt during the participation with people in the workshop is that this installation favours a much richer participative behaviour of image composition by the act of stepping into a determined area if it tracks and mirrors continuous instead of discrete movements.

Some people were better than others in gaining some control over the creation of images. One participant placed eight markers around his body creating a rhythm of images on the projection by repeating a sequence of motions that would reveal the various markers to the camera. Through observing the users some of the concepts of the installations were changed and adapted to the interests and requirements of the situation. The second model of the installation allows for the visualisation of more complex time and space relationships.



Figure 6.4: Behaviour of the redesigned installation, when entering the space

Figure 6.4 shows the behaviour of the redesigned installation. Each person wearing a marker could progressively uncover the content of her associated image by progressively entering into the interactive area. The images were split into thirds so that three markers were required to recreate one complete image. This resulted in quite different interactions between people compared with the configuration that had been designed in the first place. In the first configuration, two people entering the interactive area would cause two images to appear on the wall. In the second, three people would cause three thirds of an image to appear on the wall.

The triggered projection was made to depend on people's movements in space. That is, the size and format of the image was made to depend on the distance between the camera and the marker (figure 6.4). This increased the awareness of how the users relate to each other in space; as their positions and distances between each other directly influenced the projected collages they created. Since there was a time-lag between the reading of the image and its projection, it was possible to overlay two images in the same place, adding another layer to the process. As the images were very unstable the length of the time-lag was made to increase with the number of markers that were simultaneously read. This system allowed for a very rhythmical use of image making. Also, it was possible to hold onto an image, which increased participants' control over the resulting collages.

6.2.6 The effect of monitoring and mirroring in a continuous (not discrete) way

A discovery made with this installation is the effect of monitoring continuous movements in this type of interaction. By monitoring the relative distance between two markers and their distance from the projection, and by mirroring these measures in the projection, the installation enabled much more interesting interactions and composition work done by participants.

Such a concept was implemented in the re-design of the installation, which was the version that was exposed in the museum exposition on the fourth day. This favoured a more participative use of the installation and enabled a richer set of experiences and actions. Participants could progressively uncover the content of their associated image. Additionally, the installation was modified to work with three people (and the images were cut in three parts).

6.3 The second installation: collaborative composition and screening

The second installation had been designed with the intention of exploring the way people interact and participate in video compositions operating on cubes upon a surface. A critical engagement of people with the contents of the installation was never achieved. Instead, the gatherings and the rituals that were presented around the installation, and which were motivated by the necessity of triggering any projection, became the important event.

In spite of its failure to attract critical inquiries around its rich multimedia contents, the installation provided clues and opportunities to establish rituals and performed actions. The interesting aspect these practices displayed is the achieved ordered way to use it that was achieved by the group. There has been an appropriation of broadcast media conventions and formats. These were made in rituals of screening and spectatorship.

6.3.1 Design concepts and questions from the previous studies

The initial concept was to take a theme and show clips of different genres that would allow for the construction of controversial points of view into a series of images. The installation was intended to be managed by a group of people in an ordered way. No support was given for the creation of such an order, as the interest was focussed on the conditions for the emergence of such an order.

The concepts that are motivated and imported from the previous studies pertain to the composition and deconstruction of audiovisual material through the manipulation of embodied artefacts. In particular, the design of blocks and the interactive character of the glass surface was developed in order to accommodate group interactions that are more open ended. In chapter 5, an emphasis was put on the organisation of the task of film composition or deconstruction, in such a way that pupils could collaborate in a dedicated task. In the case of the present installation, instead the group interacted in a more open ended context. The main

findings around this installation regard the emerging character of practices of composition. The results are articulated further by distinguishing the interactive and the conventional character of the designs in the installation.

Design of space, objects and interaction

Tagged cubes, whose faces are selectively covered with visual markers, are placed onto a glass surface, under which a camera is used to track their position (figure 6.5). The glass surface was relatively small so that only three cubes could be aligned joining each other. The glass surface was divided into two areas (or tracks).



Figure 6.5: Details of the second installation

These choices followed the system used one month earlier in the second field study in the primary school (referred to as “the glass surface” in chapter 5). Also, this installation retained the qualities of a CODIS design (combinatory, dissembled and sealed), which was proposed in chapter 5 as a format to support a specific perspective on media literacy. However, some

differences were introduced in the museum version in order to attune the installation to the different context and to different design questions.

Some differences concern the design of space and the interaction design. No compound associations were implemented, as, for example, that between a block and a theme or an abstraction of a set of clips (as in chapter 5). Instead, each block was always associated with three video clips. That is, one clip for each of the three different opposing sides, as in figure 6.5. The blocks were larger in size and the table was mounted in a high position in an accessible part of the room, so that people could easily access it and join in the explorations.

Overall, the installation was designed in a much simpler way than the “glass surface” used in the school. The aim was to explore its use in a social context, as opposed to being a task-specific, dedicated tool, as in the school. As in the version in the school, the upper track on the surface was dedicated to trigger the video source of the clip, and the lower one for their audio source. A separate marker was used to activate the reading of the composition and the production of the composed video in the projection. An additional constraint was imposed to simplify the use: it was not possible to interrupt the process once an arrangement was activated. That is, the composition would play until the end.

Design of the audiovisual material

The audiovisual material used in this installation consisted of segments of very different videos, taken from a set of documentaries, and some additional music. The aim was to enable the re-contextualisation of clips and images in unpredictable ways.

6.3.2 Performances and redesign: composition and screening

There were several different approaches to labelling the markers on the opposite face of the cube. Stills from the clips were placed on the cubes’ faces to represent the video content. A more associative approach was to take an image from a completely different clip, to make more

room for a different reading of the clip. Some of the cubes used the more abstract medium of drawing to differentiate the clips. All the visual markers connected to video files, were represented with images, so that it would be easier to make sense of the material and to support the redesigning of arrangements. The audio files were covered with white cardboard, because an interest was placed on the annotations that users would create to represent and remember certain sounds. This approach was not successful, because participants found other ways of ordering the cubes without marking them.

The installation was reprogrammed so that the last image played would remain as a projection, until a new arrangement was activated, so that one would gain some time to reflect upon the process. Also the gaps between the cubes were integrated so that one could use time as an element, redefining the meaning of certain combinations. Participants found a routine with which the composition and screening started to become regular and recurrent (figure 6.6). Different people would choose the blocks with which to compose the audio and visual parts, and would give them to a controller. This fitted a “bus-driver” model of interaction. That is, one person would take control of the installation, while the other people are driven collectively in the browsing experience, and tell the driver when they want to stop.

In this configuration, spectatorship became a process coordinated by different parties. It took the form of an architecture which is between a cinema screen, a parliament and a gambling counter. Some of the meanings of the performed action were not explicitly interpreted. The extent to which tasks were divided and how much people shared the roles varied during the trial.



Figure 6.6: Practical sessions with the second installation in which participants explored ways to organise composition and screening

The use of this installation contained an ironical element. It worked at times as a parody of television. As an embodiment of media texts as products, they became mocked compositions. The installation had no ways to retain a memory of past explorations. In fact, once the cubes were disassembled, there was no record of what had happened, apart from the last frame, which was set to remain on the screen until the next screening. What became more important, then, was the coordinated reaction of the group, which lasted after viewing each projection.

6.3.3 The role of repetition and ritual in designing for collaborative fruition

The main features the installation had acquired immediately after the workshop included conventions that made it work as a coordinating device for social viewing. These conventions were partly transposed from broadcast media genres, such as TV programs in which a presenter drives simple rituals or routines. The main issue that has been highlighted in the practical sessions around the re-design of this installation is the role of rituals in collective media fruition. When the group could switch from a chaotic and ineffectual use of the installation to a regular and interpreted one, this happened through the constitution of a ritual. That was the

“bus driver” model described above. That is, an organised and repeated set of actions, in which labour had been divided.

Similar rituals are common in the broadcast media programs, and usually they are marked with rhythm and music. In performances and the re-design studied here foregrounded at least two roles of rituals in media fruition:

1. The interactive character. The details of this aspect had an impact on the *participation* in the fruition of media texts. Not only was each selection step initiated by one of the participants who was asked to contribute to adding a piece of the composition, but at the end of the routine there was space for a response from the audience group. This was elicited by the participant managing the viewing, after each screening;
2. The regular and conventional character. The details of this aspect had an impact on the *perception* of the media text and on the *coordination* of its fruition. The fact that rituals around media fruition are repeated and become habitual, permits the facilitation of a response from the audience. The effect of regularity is a possibility to play with expectations. In fact the audience know what to expect and when, and can focus their attention on selected aspects.

The role of design choices over the space and interaction in order to produce such a ritual of media fruition can be described as follows:

1. Designing for the interactive character. Some designed features enhanced the interactive character. These features concern, in particular, the timed behaviour of the installation. Two examples of design actions which were observed to enhance this feature are: (1) to reduce the delay in the installation’s reaction, and (2) to retain the

last image played as a projection, which served as a short memory display and facilitated feedback.

2. Designing for the regular and conventional character. The screening ritual became stereotyped and the actions and objects were adopted at least once by each participant, before the installation worked as a coordinating device.

- In order to become *stereotyped*, the actions had to be made in simple patterns. For example, the use of sounds to mark each step enhanced this feature. A sound was attached at the end of the block selection, and the end of the screening, in a similar way as done in television programs.
- In order to be *adopted*, the actions and the designed objects needed to be visible enough and shareable enough. In the instance of the installation, the blocks had to be made of a larger size compared to those used in the schools, and the glass surface had to be made more easy to be reached from all sides by a group of people standing.

6.4 The third installation: audiovisual material charged on objects and characters

This installation was designed with the intent of experimenting with the relationships between actor, artefacts and action, using tagged figurative objects (figure 6.7).

6.4.1 Design concepts and questions from the previous studies

This installation furthered the investigation into the nature of interactive tangibles as ‘charged’ objects. The investigation started in chapter 4, which discussed some simple cases of interactive cards. The research continued in chapter 5, where the role of framing and packaging led to more conventionalised designs. One aspect was neglected in these previous studies due to the need for addressing a simple context. That is, the relationship between the design on interactive tangibles and their featuring as both embodied objects and as digital referents in the specific case of video projections. This case is addressed in the third installation, which is described below. The results of the performances and redesign point to principles for the support of multimodality in the responsive physical environment.

Design of space objects and interaction

The design concept of this installation consisted of enabling collaborative storytelling on a stage populated with objects and characters, including puppets, which were “charged” with audiovisual material, which could be triggered on a projection by placing objects in a special place. RFID tags enabled the sensing of the action of placing objects on special locations and trigger the projections accordingly. As in the other installations, the sensing technology, except for cameras and projectors, was hidden.

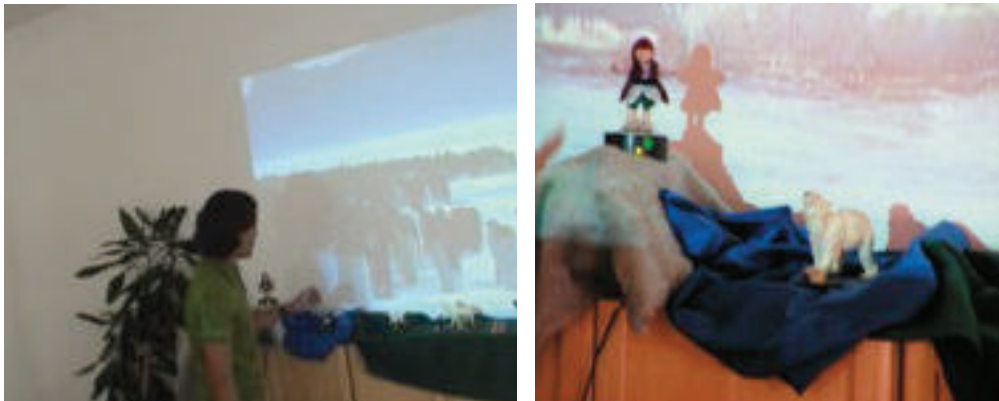


Figure 6.7: A museum visitor at the third installation and a detail

Figure 6.7 shows a participant triggering videos by rearranging characters on the set, and a detail of the set showing two characters, who also appear in the videos: the penguin and the bear. The composing actions available to participants consisted only in sequencing and starting each projection, just by the act of selecting an object and placing it on one of the determined “triggering places”. The working of the installation is discussed further below in its redesign (figure 6.8).

An initial interest was to see how far the same set of images would be reinterpreted by changing the sequence of action and artefacts triggering them, and adding different sounds. However, the performances and the re-design of the installation led the discussion and the discoveries of aspects of multimodality.

After observing how participants made sense of the storytelling tasks, the installation was re-designed in order to favour the use of three different modalities: the digital environment of the video projection, the reality of the person and the object triggering that video, and their shadow in the projection.

Design of the audiovisual material

The audiovisual material chosen and edited for this installation consisted of sequences from documentaries. Each sequence lasted between 10 and 20 seconds. The audio and visual tracks have been left integrated as in the original films. Hence, in this installation, the composing actions available to participants did not include the possibility of trying different associations between sounds and images.

6.4.2 Performances and redesign: acting in different modalities

While trying to create a presentation together, people had to trigger projections by displacing objects. While doing this, some others started making shadows with the objects on the projected videos and pictures (figure 6.8). Objects (e.g., a penguin, a boat and a bear), were employed in the narrative in three separated domains in the same story. The three domain were:

1. the projected video, in which they appeared as filmed characters,
2. the physical domain, in which they had the form of embodied characters, and
3. the shadows which participants projected on the screen. This way of using the installation was discovered in a group of participants and performed as a coherent story.



Figure 6.8: Two participants telling a story in the third installation

As figure 6.8 shows, participants used embodied objects (e.g., penguin, boat. ...) to trigger videos they have been charged with, and move the action across the projected video, the physical domain and shadows on the screen. The co-authoring task in the group became that of creating closure in the performance. In fact, the characters of the story appeared and moved from one domain to the other, according to how this passage functioned in the story. The story emerged through the contribution of different participants.

The act of creating closure was transposed to an embodied performance. This consisted in giving a function or a meaning to all of the elements present in the visual presentation, and cutting or hiding those that were unnecessary. At the end, the task of creating a story extended to the act of performing the story, as also the shadows of the people telling the story became part of the mediated representations.

6.4.3 Enabling actions in three different modalities

A main principle that can be retained from the re-design of the third installation is the effectiveness of the use of the third modality which participants discovered during the practical

tasks. That is, the use of shadows on the screened videos. This modality was added to the other two, which were obvious in the installation: the embodied objects and characters in the set, and the screened videos. Also, the third modality worked as a bridge between the other two. That is, it is through the shadows that physical objects could populate the video in the projection.

The shadows also became the privileged modality for participation and interaction with the media content and between participants. As seen through the re-design trials, this was enhanced by introducing some design expedients. Videos were selected and cut in order to give space and time to shadows to enter in the videos and have some narrative roles. Also, the initial configuration of the installation was modified: objects were placed to project a shadow on the screen in the first place, in order to invite their use. After the first discoveries of this unexpected use of the installation it became apparent that such multimodal use cannot always be prescribed. The conditions for multimodal use need to be favoured.

6.5 Conclusion

The study in the museum permitted researching some questions of media literacy and the use of interactive tangibles that arose in chapters 4 and 5 in the different case of public places. In particular, the simple action of composing an image by meeting in a place needed to be enhanced by the tracking of continuous movements in order to acquire a significance in the public place; media texts' construction devised in the form of collective composition needed to be made into a ritual in order to focus the group's actions. The investigations in the museum feed into the central argument of the thesis:

- The use made in the museum of the glass table permits comparison of the design and the orchestration of actions done with the same technology in the school.

- The designs in the installations provided examples in which they featured as neutral, larval and expressive mediating artefacts. In particular, the role of their incomplete character in the design activities was better understood.
- The very act of organising activities around the design of installations, better articulated the practice of researching the design of interactive tangibles by using ‘installations’ as design *tools*.

In the next chapter, these themes are discussed further alongside the findings of chapters 4 and 5.

6.5.1 Interactive installations as design tools for media literacy in public places

Interactive installations were used as ‘design tools’. The common meaning of ‘installation’ entails exposition or display. In the present case, installations were considered as distinctive material arrangements of objects and tools, which partly retained the common meaning. But they had to be initially designed as incomplete. In particular, their affordances were only partly *aligned* with the stated purposes. Therefore, installations still displayed contents but required the participation of visitors in order to create the conditions for the contents’ fruition.

What differed in the installations in the present study, compared with most common interactive installations for content browsing in museums and public places, is the fact that the fruition of their content was supported and researched as a social event. In the three installations described below, that is: (1) *creating* image composition by the act of “*meeting*”, (2) *launching* video compositions by the act of *coordinating* some simple actions in a group, and (3) collaborative *storytelling* with interactive tangibles.

At the same time, in order to work as design tools, installations had to be designed as ‘places’, in which events were hosted. Hence, they partly worked as sets or stages, whose boundaries depended on the presence of people, and for limited amounts of time.

6.5.2 Evolution of the masks framework

The main contribution of the studies in the museum, as described in this thesis, concerns the role of incompleteness in the designed artefacts. In fact, among the several ways in which the installations were designed as incomplete, some features worked better than others in facilitating interaction and creativity. In particular, one aspect of incompleteness is that the affordances of the installations were only partly aligned with any purposes they could serve. Such lack of alignment can be and was researched in order to foster participation and innovation. A total lack of alignment annihilates interaction, but a complete alignment annihilates innovation. Incompleteness needs to be attuned accordingly to avoid falling in insufficiency or inappropriateness.

When, in groups of participants, ways of working were identified, the technology could be said to work or not to work accordingly. Before then, there was uncertainty about what could be named as a ‘problem with technology’. In working with incomplete features in the three installations, some progress in the design happened when participants named problems, as this fact pointed to an accepted purpose or ordered use of the artefacts or the places.

Installations were partly seen as ‘media’ because of the access they provided to the audiovisual material. As media they enabled acts of composition and fruition. However, one path that can be followed to progressively overcome incompleteness in public places is to transform installations progressively into ‘venues’.

Events were constrained within their limits, and would not have been the same if staged elsewhere. Installations as venues finally served to regulate events, to frame them, anticipate them and evoke them. The three examples discussed here are: the meeting place, the projection screen and the locus of interaction with tagged objects.

6.5.3 Three emerging themes concerning media literacy

Introducing continuity of movement in assembling images

One of the discoveries made with the first installation, that is, the new composition behaviours and interactions which could be enabled by monitoring and mirroring continuity of movement, points to a wider principle for media literacy in physical environments.

Enabling *progressive* actions of images being uncovered or assembled permitted giving wider dimensions to the expressiveness and the explorations of participants. In fact, the large but predictable set of discrete assembling combinations which were designed in the first place was transformed into a continuous space of possibilities. In such a space, the possibilities for exploration and composition are never ending.

Moreover, an enabling factor for such richer participation of visitors in the installation was the enhanced control they gained over the behaviour of the installation. That is, the continuity of their movements was mirrored in the behaviour of the images, which could be uncovered progressively.

Rituals in collective media fruition

The importance of repetition and regularity in collective media fruition is an important theme in media literacy. Audience expectations can be influenced by such aspects. Also, some simple design expedients concerning the interactive tangibles could be seen to influence the possibility of recreating these aspects. This principle seems all the more relevant as it influenced the organisation of the composition and screening tasks, even without the need of an explicit critical reading of the media texts. The social dimension of such mechanism, which could be experienced in the museum, is constantly visible in the broadcast media. The importance of rituals, as carefully constructed acts of communication, in the formats of the mass media, is

broadly recognised in media studies (e.g., McQuail and Windahl 1998). Their recognised role is in how they create a focused organisation of media interpretation.

Multimodality

The importance of favouring a multimodal use of interactive tangibles was recognised in the third installation. Such an importance rested on the possibility it gave to participants to access the behaviour of the installation with intrinsic, even if mediated, features of their movements. It was also recognised that the conditions for such multimodality had to be researched again, after the first discovery made in a particular group. It could be favoured again by attuning the design of the multimedia material to the configuration of the installation's setting.

Chapter 7

Discussion and conclusion

Interactive tangibles and digital augmentation of the physical environment can support constructive and collaborative practices for media literacy education. In order to be able to describe the supportiveness of these media, one needs to devise and understand the practices. The outcomes of this research include principles and qualities of the environment in selected activities, which have been co-developed with participants. In this sense, the thesis mostly contributes to HCI design practice, rather than to HCI theory. The thesis has mainly addressed three themes:

1. *multiple views in the same environment*. multiple views on the aspects of media literacy were supported within the same environment. This has benefits on visibility, collaboration and access of the languages and the technologies which govern media and their literacies. Multiple alternatives to integrating traditional linear audiovisual media and new tangible, interactive, segmented fruition and authoring, when realised in the same environment, can enable people to have multiple perspectives on the working of the media languages.
2. *a design oriented inquiry on media literacy*. Because traditional approaches to media literacy are not design oriented, a contribution of this thesis is directed towards linking aspects of media literacy to design problems. In a broader context of technology design, this permitted a grounded interpretation of common terms with which tangible

interfaces are defined in the literature on HCI and Interaction Design. These are, for instance, terms such as embodiment, manipulation, representation, control, reconfigurability, authoring.

3. *the contextualised development of activities*. Designs and the activities mediated by them have been devised and studied in different environments. The studies have addressed contexts: a pilot study for ad hoc design inquiries, as in chapter 4; media literacy in primary schools, as in chapter 5; the design of interactive installations for media fruition and authoring in public places, as in chapter 6.

7.1 Discussion of five traditional terms of media literacy

The five common terms of traditional approaches to media literacy (see section 2.3) were developed in the following way.

7.1.1 Enabling the '*construction*' of media texts

As reviewed in section 2.3, a major theme in traditional approaches to media literacy is the awareness of media texts' 'construction'. The practical tasks included acts of framing media texts in physical architectures and combinatorial exploration. The approach enabled the provision of alternative views on the construction process. Participants could move in and out of selection or combination tasks, and experience the composition of media texts of different genres.

Some specific qualities of the environment enabled the practices. They have been identified with the help of the various examples in the previous chapters. In particular, concerning the problem of enabling the construction of media texts:

1. the provision of means to make abstractions;
2. a variety of uses of interactive tangibles (i.e., as tokens of information, bricks or building blocks, containers, or utensils) which include both expressive and functional applications;
3. a principled use of incomplete artefacts.

In the studies in the schools (chapter 5), the composition of “interactive installations” provided means for the composition of video sequences. In the same studies, the activities of advertisements deconstruction provided means for the discovery of the ways in which some particular media texts – such as advertisements and propaganda – are constructed in the broadcast media. It has been relevant to provide both types of activities in order for pupils to be able to construct and learn authoring practices, and to appropriate some means of media texts construction from broadcast media. It has been relevant that both activities could merge and be supported in the same physical environment. They were supported at different levels of abstraction. In particular, different levels of abstraction were provided as participants needed to:

- treat as separate the paradigmatic and syntagmatic aspects of media texts composition;
- keep a view on a reasonably large set of possible versions of key media texts;
- hide detail and try out combinations without making full commitments;
- act or refer to digital features by manipulating physical features.

A research focus has been put on aspects of *framing* and *packaging*, the understanding of which has helped articulate more compound activities, such as authoring and deconstruction. Framing

and packaging have been defined as important terms which uncover relationships between several design dimensions of the environment. These are: visual features, physical properties, digital functions and events, and interactive capabilities. In the empirical studies, these attempts have led to increasingly structured design choices. The construction of media texts evolved from the discrete and abstract mode of the first empirical studies described in chapter 4 to the more articulated mode of the studies in the schools described in chapter 5.

In the latter studies, other qualities have been implemented and studied. These are, for instance:

1. Grouped in the CODIS design style:

- The capability to carry out *combinatorial* explorations. That is, to easily research through a space of alternatives to combine segmented media texts together;
- The capability to *dissemble* some specific solutions. Hence these are to be researched through combinatorial explorations;
- A way to constrain participants' search by *sealing* physical digital mappings in such a way that participants can focus on the conceptual work;

2. Grouped in the FINPE design style:

- A *furnished* quality of the environment. That is, the capability of the interactive tangibles to acquire a place in everyday environments;
- The capability of interactive tangibles to be *installed* in the physical environment and be ready for selection and composition work;
- The capability of the environment to evolve by being *permeable* to participants' comments and impressions, by the means of integrating eventual additional recordings.

The types of actions summarised in table 7.1 result from observations in the empirical studies. They have been incrementally defined through the devising and observation of people's practices.

Table 7.1: Articulation of deconstruction and authoring in the practical work in relation to roles of interactive tangibles leading to abstraction

	Main role of interactive tangibles	Themes on designing for abstraction with tangibles
Decomposition	<i>Tokens</i> of information, employed to enable and track segmentation of audiovisual material	How to keep a view on a reasonably large set of possible versions of some key media texts
Composition	Building blocks or <i>bricks</i> , used in conjunction with spatial features to combine sound and images in time-lines	How to enable trials with alternative combinations without having to make a full commitment
Attribution of digital contents	<i>Containers</i> which can be charged (or discharged) with audiovisual material	How to selectively hide and show details, to identify and compose tangibles/contents
Definition of functions between the digital and the physical domain	<i>Utensils</i> to operate on the digital domain, to evoke, shorten, and perform other actions on media texts	How to act or refer to dynamic digital features by manipulating physical features

7.1.2 Identifying '*media languages*'

The creative language in composition practices was governed by rules and conventions (table 5.3). Some of these were directly related to broadcast media codes. In particular, the sequential organisation of some types of video sequences was constrained by the ways in which interactive tangibles could be employed in compositions. This enabled access to the language of some specific genres, such as documentary and TV advertisements. For example:

- The means for the creation of sequences on the interactive installations and the videocards, provided some specific alternatives for the organisation of sequences as: temporal, categorial or associative;
- The ways of constraining the combinatorial exploration of sequences with the interactive surface and the videoblocks provided a means for exploring sequential organisation in advertisements and propaganda has a role which is different from that of editing details.
- They also provided means to reinforce meanings by either showing or hiding contents.

The general problem of addressing media languages was expressed in terms of the principles synthesised in table 7.2.

Table 7.2: Summary of principles for supporting awareness and experience of different languages of media, thanks to specific methods and roles of tangibles

Principle	Method	Role of interactive tangibles
<i>Exemplify different ways of framing the same media texts</i>	Dedicated installations to specific genres or approaches to composition or research. But they should work with the same material	Portability / Flexibility: as tangibles have affordances which can fit different installations
<i>Provide access also to the original, unworked audiovisual material</i>	It is possible for participants to refer back to the original material from the composed media texts, by using tangibles as containers of different versions of the same media texts	Abstraction: to support the dealing with different versions
<i>Provide opportunities to experience with alternative genres</i>	Genre-specific installations, but with the same audiovisual material	Tangibles could support different genres with their affordances
<i>Represent media codes in different modalities</i>	Design digital/physical transpositions	Embody rules of codes, with physical constraints or with rhetorical figures

7.1.3 Supporting ‘*different experiences*’ of the same media texts

As reviewed in section 2.3, one aspect of interest for media literacy is the dealing with the differing interpretations which can be potentially given to the same media. According to traditional approaches, the critical interpretation of media texts can lead to convergence of interpretations. This first perspective tends to fix the *competence* of the readership as *uniform*. It leads to associating a dominant message to each text, and to prescribing correct readings.

An opportunity for media literacy is the provision of means to change the codes and the values for interpretation. Eco (1990) also employed the term “aberrant decoding”. This was used to describe the interpretations that are given of a media text, when the codes and the values that enable its intended interpretation are not shared between the author and the audience. Propaganda usually constitute closed text in that there is a preferred reading. Viewers are expected to receive the message and to register its meaning as intended by the producers. However, the closure of such texts can be undermined and uncovered by segmenting them and finding alternative ways of framing them.

The provision of opportunities to transform media text, and make them switch between closed and open, and vice versa, has been exemplified in each of the empirical studies. This was done with the use of properties of the physical environment. The practice relied on the different features and alternatives to compose and decompose media text in the environment. In the decomposing and composing tasks with tangibles, aberrant readings could become a visible and shareable product. The potential benefits of this practice are the resulting possibilities to practically experience the functioning of media texts, by creating variations and unsettling their mechanisms. Additionally, this embodied nature of the practice and its material enabled collaborative practices, in which different parties could contribute to the inquiry. The practice was supported as practical more than rational. This is a rich resource to feed traditional approaches to media literacy which, instead, are based on conceptual debate and critical analysis.

7.1.4 Uncovering the media ‘agenda’

Another major term in traditional approaches to media literacy concerns the setting of the media agenda (section 2.3). Media influence the subject domain about which the audience is more likely to debate. Research has shown that media can exercise different sorts of influences. Some concern the design and the format of media texts and channels.

As shown in chapter 5, some aspects of media framing and packaging with interactive tangibles are relevant for the agenda setting of the media. Two examples of such aspects are the selection (section 5.2.4), and the transposition of TV genres, such as the news (section 5.5.1).

This aspect is recognised in traditional approaches to media literacy as the mechanisms through which the media establish what should be and can be debated. However, in traditional approaches, the understanding of agenda setting in the media can usually be approached in a conceptual way. In the practical tasks participants could try out different alternatives. In particular, opportunities could be provided of framing the same media texts in ways the set the media agenda in different ways, for example with different levels of agenda assertiveness. The CODIS style leaved less freedom to readers to ignore the order of priorities set by the editor, compared with the FINPE style, in which the salience of the media texts can be decided.

7.1.5 Treating media texts as ‘*commodities*’

In traditional approaches to media literacy, one of the major themes regards the awareness of the ways in which media texts can be made into commodities by the media (section 2.3). An everyday connotation of the word *commodity* suggests the quality of an object when it becomes of *use* or *advantage*. The use of this term is inclined towards methods that are advantageous rather than fair or appropriate.

Commodity has been interpreted according to the *convenience* or *expediency* of applying media texts in the practical tasks. The driving principle is to move away from passive viewer and become active. When one *uses* a media text, then its interpretation can be substantially different. The distinction between the experience of reading media texts ‘in the mind’ (e.g., for the sake of debate) and the experience of employing them in compositions has been made to be relevant in the practices. Similar distinctions can be found in (Eco 1990). Eco distinguishes between *interpreting* a text and *using* it.

In the practices, the relevance of this aspect in media literacy was in how the value or worthiness of media texts changed according to specific tasks in the setting. The tangible and

structured design solutions that have been implemented provide means to experience these differences. This has been exemplified with all the tasks in which participants had to ‘use’ texts in compositions by *embedding* and *quoting*. For example, this happened in the ordering of historical accounts in the pilot study, in the activities of film compositions in the school studies.

Participants needed to accommodate the fact that the recordings, just like speech utterances in general, are essentially incomplete and allusive. By editing them together participants need to adapt their inherent occasional and elliptical character, in order to achieve some unity. Also, most of the information used is second-hand. They report what other people say.

The term commodity has been interpreted to describe how, through *expediency* and *use*, media texts can create new needs to know or to inquiry. In particular, in the empirical studies, two aspects came to the fore:

1. *Sharing and exchanging physically*. The needs and opportunities (expediency) which stem from the act of sharing and exchanging objects physically, for example as described in sections 5.5 and 5.10;
2. *The worthiness of media objects according to emerging practical purposes*. The worthiness (advantage) of such objects, which stems from the needs which emerge when they are employed in compositions.

7.1.6 The same terms reinterpreted in the CODIS and FINPE styles

The ‘combinatorial, dissembled and sealed’ mode has organised the environment in a way that reconciled the need to explore and to express the creation of new meanings through alternative montages. Exploration was devised around the discovery of prepared examples by the search through arrangements of tagged objects. Expression was mainly achieved by the articulation of physical montages.

Table 7.3: Summary of the different ways in which the CODIS and FINPE design styles address the five terms of media literacy discussed above

	CODIS	FINPE
<i>Construction</i>	Focuses on the combinations in the syntagm; Abstraction is mainly a generalisation of possible alternatives to achieve the same syntagmatic structure; Physical/digital couplings are applied to dissembled associations	Media texts are put in relationship to the physical environment; Abstraction is used to generalise types of experiences; Construction is displayed and experienced in an itinerant way
<i>Decoding media 'languages'</i>	The inquiry is driven by the provision of examples at different levels of detail; The environment hides the prepared alternatives, which must be discovered	The formats available guide plans and arrangements which show different styles to create a development, through physical paths
<i>Different experiences of the same media texts</i>	The environment constrains negotiations of details during the construction, by focusing on combinatorial exploration through physical manipulations	Interpretation and experience are displayed by embodied actions
<i>Media agenda</i>	People build a corpus of compositions mainly through selecting and rejecting associations of a small set of elements; novelties in the agenda depend on the discovery of new associations; Hence the focus is on a detailed aspect: association	The media agenda depends heavily on the evolution of designs in everyday environments and on the integration of other sources; The media agenda is set by an organic process of production, though the emphasis is on the 'framing' of elements
<i>Commodification</i>	Packaging is mainly to create needs to inquiry more on the meaning of specific associations; Dissembling contents in physical objects serves to create enigmas	Packaging is mainly to guide and create a format for a 'development' to be explored. creating needs to see more; The practice relies on events

The ‘furnished, installed and permeable’ mode enabled the collaborative construction of media texts compositions installed in the physical environment by relying on a set of conventions and formats. They foregrounded alternatives to genres of composition in space (*encyclopaedic* – focusing on hierarchical and comprehensive arrangements, *geographical* – focusing on evoking texts through spatial exploration, and *geometrical* – focusing on argument structures). In the latter, collaborations are characterised by the presence of multiple originators, different and fragmented audiences.

Table 7.3 above summarises how the two approaches address the terms of traditional approaches to media literacy reviewed in section 2.3 in different ways.

7.2 An approach to devise media literacy practices in a physical environment

In the empirical studies, devising practices of *deconstruction* and *authoring* of media texts has involved enabling decomposition and construction in the physical domain. The design approach aimed at exploiting associations between actions in the physical domain and actions or events in other domains, such as digital and conceptual domains. The problem was not to find just any possible association, but to research those which made sense for participants during their work.

7.2.1 Organisation of an environment to support deconstruction and authoring

In the practices devised in the studies, media texts in digital formats could be composed, decomposed, physically shared and exchanged. A set of interactive tangibles was used in conjunction with a framework of principles, rules and conventions. Important features of the practices were enabled or enhanced.

In particular it has been possible to:

1. have a selective view on processes of media authoring or deconstruction;
2. organise practices of media texts composition or decomposition through the use of interactive tangibles and a set of conventions, which includes rules and procedures;
3. interpret, search and evoke media texts by using visual cues and physical properties or actions in the environment.

In particular, practices of composition and decomposition – mentioned in point (b) – were enabled by coupling physical and digital properties in particular ways. This was done by the use of:

- physical constraints or physical properties (including the role of interactive tangibles as building blocks or *bricks*);
- rhetorical figures using physical properties of objects, spaces and actions (including the articulation of actions which made interactive tangibles into *utensils*);
- the capability to charge and discharge digital content on physical objects (including the role of interactive tangibles as *containers*);
- the discrete (i.e., non continuous) nature of physical objects (including the role of interactive tangibles as *tokens* of information).

The physical environment has served as a ‘repository’ of shared representations, and, according to the activities, also as a ‘place’ for negotiations over composition and decomposition, or as a ‘space’ where to host events of collective media fruition. The study addressed the conditions

and the design principles according to which people interpreted the activities and put in place collective inquiries. Design problems have been addressed according to each one of these three ways of seeing the responsive physical environment, as summarised below.

1. The environment as a repository of shared representations;
2. The environment as a place for negotiations over composition and decomposition;
3. The environment as a space where to host events of collective media fruition.

7.2.2 Dimensions of the design approach and co-development

Associations

In the empirical studies, devising practices of *deconstruction* and *authoring* of media texts has involved enabling decomposition and construction in the physical domain. The design approach aimed at exploiting associations between actions in the physical domain and actions or events in other domains, such as digital and conceptual domains. The problem was not to find just any possible association, but to research those which made sense for participants during their work. A major theme about associations is that of digital/physical *mappings*. In current literature on HCI and Interaction Design, these mappings are prevalently intended to be a designer's choice. In this thesis, instead, they have been regarded as objects of permanent inquiry, in the sense that they have been treated as emergent from participants' practices.

The role of formats and conventions in media framing

The environment has hosted both traditional and non traditional ways of composing and authoring. New conventions, codes and standards have evolved, and have been passed on from

practice to practice in the different studies. One of the main actions researched in the environment is that of framing media texts in physical architectures. To this end, it has been argued how physical architectures need to be endowed with conventions and formats in order to enable composition and interpreting. The field studies described in this thesis have addressed different ways in which participants make sense of framing media texts in time and space.

Relationships with traditional approaches and orthodox media production

Past approaches to media literacy (section 2.3) advocate the need for learners to only to ‘decode’ media texts but also to *produce* them. However, those approaches treat the problem as that of providing learners with environments which are similar – even if simplified – to those of professional producers. They are not the only possible source of inspiration, and any simplification will introduce some bias. Accordingly, two assumptions were set in the introduction in the present thesis:

1. The treatment of a learning environment for media literacy must be studied in relation to that bias;
2. In designing a tangible environment for media authoring or deconstruction basic principles of traditional approaches to media literacy might have to be reviewed.

The motivation for such a distinction is also that an explicit appropriation of traditional media and of orthodox ways of media production is necessary. Furthermore, the design of the environment is open in the practices. This is needed in order to equip participants with instruments that are to be adapted to the emerging purposes. Section 7.3 explicitly addresses this issue by distinguishing different ways of coupling the traditional and the “new” tools and practices.

The role of participants and of action-oriented artefacts in devising practices

As explained in the introduction, the design problem addressed in this study focused on devising new practices. This imposed the need to seek the participation of people, to instruct them with open-ended tasks, and work with incomplete artefacts and tools. The openness of the initial tasks and the openness of the system of technologies and conventions constituted major difficulties in the design work.

The activities were intended to challenge orthodox ways of authoring media texts and to enable new active learning. In the accomplishment of these activities, it was not always obvious for participants to see what could be done or expected. However, in order to devise practices with participants, a structuring of the environment had to be chosen.

To this end, incomplete artefacts were used to define the practices in the first place. They were incrementally characterised according to how participants appropriated them as ‘neutral’ and ‘expressive’ designs, by reinterpreting a paradigm from masked performance.

The approach to coach collaborative inquiries

The collaborative activities were characterised by the presence of multiple originators, different and fragmented audiences. Also, there has been a fragmented reading. The reception of media language was as fragmented as its production.

The design choices have aimed at making the activities of the system visible to users. Such choices depended on foreseeing what those actions could be. And, when users could combine active entities and incorporate them into new ways of authoring in a variety of ways, the role of the “designer” vanished.

This is why details of collaborative inquiries have been defined by instantiating definitions of deconstruction and a form of participatory theatre. This served to better constrain and focus the design problem. It also served to envision a space of possible design choices and their relationships with common terms of media literacy.

The role of action-oriented artefacts as ‘masks’

The design of interactive tangibles has been articulated also according to their neutral, larval and expressive character as ‘action-oriented’ design artefacts, according to the terms discussed in chapter 3. In the specific case of the studies in the schools, neutral, larval and expressive (characterised) features are related to three themes identified in the observations of section 5.5: composition of interactive tangibles; framing and packaging; and abstraction and memory. Such features are summarised in table 7.4.

Table 7.4: Actions on (and with) interactive tangibles as neutral, larval or expressive designs, that have informed design along three themes in the observations (informed by the studies in chapter 5)

	<i>Composition work in installations as “building sites”</i>	<i>“Framing” and “packaging” of contents in tangibles</i>	<i>Abstraction and memory in the responsive and physical environment</i>
Neutral	Interactive tangibles made the construction process more overt because of the acts of physically sharing and exchanging tangibles between participants; and the acts of locating and enacting spectators	Acting on functions and other mappings in which media texts were framed was physically displayed	In the acts of evoking the digital from the physical environment interactive tangibles evolved as neutral designs
Larval	In each physical format for composition there are details to be fixed: tangibles as larval designs favour concurrency and reiteration	Rhetorical figures are ‘suggestive’. This often was their larval character which helped finding functions	Some interactive tangibles became larval designs as <i>incomplete</i> functions had to be implemented to organise abstraction
Expressive	Expressive use of interactive tangibles include the use of composed paths to characterise films, and the ways objects stood out to represent singularities	The expressive use of tangibles included their alteration, modification, modulation in order to frame media texts	The main use of tangibles as expressive designs in relation to abstraction was their role in representing rhetorical figures

As discussed in chapter 3, in the present thesis, these three features are meant to characterise interactive tangibles as action oriented artefacts. They are not purely qualities of

the artefacts, nor purely qualities of the actions with or through them. ‘*Neutral*’ refers to those properties of interactive tangibles and their use, which help informing design relying on universal or uniform features of human action. ‘*Larval*’ refers to those incomplete features of interactive tangibles, which favour embodied inquiries and help evolving designs through more complete and finished artefacts. ‘*Expressive*’ refers to the features of interactive tangibles which represent, articulate and communicate because they are characterised as such, and not because they favour any particular inquiry with tangibles (e.g., through neutrality or incompleteness).

7.2.3 Criticisms

The interdisciplinarity of the study makes the discussions vulnerable to incompleteness and various inconsistencies. Some have been indicated throughout the dissertation. For example:

- The contrasts in methodologies between HCI research and practical work in the performing arts, and the difficulties in transposing theatre practices in design, have been discussed in section 2.2, and in chapter 3;
- The variety of ways to name aspects of the environment upon which design is meant to operate, and the consequent difficulty of talking about design choices, have been anticipated in the discussion in section 2.3;
- Because of its orientation towards design issues, the thesis has accounted for the rare creation of ordered ways of working, which people put in place locally and temporarily. This dangerously shadows the more frequent situations of stalling and disorientation in collective inquiries. However, the relevance of these aspects of the practices – which tend to be regarded as non-results – has been accounted for in the descriptions and discussions in:

- section 5.5: the overly time consuming and disorienting aspects of the first actions of selecting the initial media texts in groups activities;
- section 5.10: scenes of evasion and stalling in pupils' inquiries;
- section 6.4: the way the second installation failed in working as a tool for media composition.

Other problems which undermine the consistency of the thesis, and its ability to generalise have only been mentioned or suggested. In particular, the following criticisms can still be advanced:

1. The definitions of 'formats', 'genres', and other aspects related to conventions have been simplified. In literatures on media literacy these terms are discussed in more critical ways, as they depend on cultural factors. Usually a conceptual framework to discuss spectatorship needs to be established when talking about genres and conventions, depending on ethnographic, functionalist or social action modes of media analysis (e.g., Watson and Hill 2006).
2. The word 'medium' has been employed in relation to so vast a set of contexts and attributes that, in a conclusive stage in the dissertation, it is problematic to employ the term again without having to make punctilious distinctions. This undermines the ability of the discussion to generalise.
3. The distinction between 'traditional' and 'new' media – including interactive tangibles – that is employed in the last part of the dissertation is vague. Hence, it is difficult to discuss matters of integration among media, when considering the body of findings in the thesis.

4. Only a restricted set of the applications devised and described in the thesis can actually be applied in real contexts, without the need of a substantial amount of design work to adapt, complete and install technologies and resources.

The need to leave these four criticisms open can partly be motivated in the following way. The four answers below indicate alternative ways in which the studies could have been conducted. They also indicate ideas for further work.

1. About the definition of conventions in media fruition: As described in the studies ‘commodities’, physical packages and designs, and other dimensions of the ‘outdoor’ inquiries were subject to or part of codes and genres. Hence it has been necessary to include matters of categorisation and conventions in the aspects of design. However, the definition of format and genre had to be simplified in order to be able to address them in the practice in the studies and to still relate to traditional media.
2. About the use of the term media: The need to encompass traditional and unorthodox media, and to integrate them in the activities, has been regarded as an essential aspect of the proposed approach to media literacy. Hence, the broad use of the term media has been necessary in order to talk about new and conventional forms in the same environment.
3. About the distinction between new and traditional: Media have always been evolving. The need to distinguish between new and traditional media has always been present and is likely to be present in the future. Hence, what seems relevant to retain is the fact that, in order to address media literacy, new and traditional media should be integrated within the same environment – as advocated further in section 7.3 – rather than formulate a distinction between them once and for all.

4. About the absence of an implemented system: Rather than an implemented system ready to be applied in real settings, from the present thesis readers are meant to retain a way of creating activities, and a documented set of alternatives, along with design principles.

7.2.4 What could have been done differently

The availability of the same mediated material in different interfaces and activities could have been made to be the norm. In fact, only part of the media texts and other resources employed in the studies crossed modalities, genres, activities and contexts of applications. For example, the TV commercial advertisement about crisps and the propaganda video about healthy eating were used as: material for video screening as through a TV channel; as pictures on blocks in composition activities; embedded in a CODIS setting – with the interactive surface; and used in a FINPE setting – for documentary composition. Such a feature increases the opportunities for comparison and discussion, and could have been extended to all material and across the different stages in the study.

The workable material and the products of the activities could have been made available and used through the web. This aspect was not addressed in the study.

As an alternative way of devising practices, participants could have been given more control in setting the initial designs in the environment. For example, all initial editing of the material was always prepared in advance by the designer. Also, participants never edited the material on traditional editing suites.

There could have been more visual accounts in the studies. Most of the time during the design sessions, only one camera was employed to record the activities. Occasionally two or three cameras have been used. This could have enhanced the possibilities to report and discuss.

All practices have been devised anew. This has been regarded both as a problem and a contribution in the studies. However, along with this chosen way of working, more preexisting games and activities in the contexts of leisure and the industry – made of moves, steps and rules – could have been explicitly transposed. This could have enhanced the search for ways of working with which participants could make sense.

Cultural probes could have been used in order to test how the practices and tools devised in the studies could reach into other contexts of life of the participants.

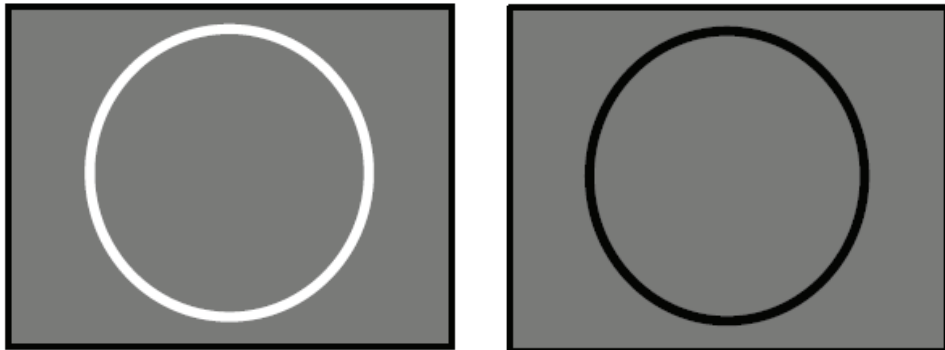
7.2.5 Further work

A promising application, and a natural extension of the present study, would be the devising of an environment which presents all the five types of configurations. This would relevantly augment the possibilities to discuss the findings and the proposals in the present thesis. Also, the idea of an ‘unfolding’ path of configurations, can only be suggested. Its implementation would further the study of several themes presented in the thesis. These include the role of formats and genres, in the principled use of interactive tangibles for media literacy.

7.3 The emerging path of activities and configurations

7.3.1 Configurations as couplings of traditional media and interactive tangibles

Figures 7.1.a and b show the representations of traditional media and interactive tangibles that will be employed in the following discussion on the alternative configurations that have been developed and used, in relation to specific views on media literacy.



a.

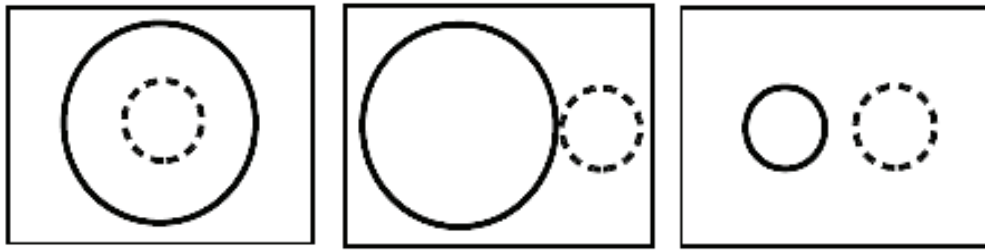
b.

Figure 7.1: The diagrammatic representation of the partial and rough distinction between (a) “traditional media” and (b) “interactive tangibles and new media”, which is considered for the sake of the discussion about design alternatives

7.3.2 Implementing an ‘unfolding’ path of design alternatives

In the following, different alternatives to couple traditional and new media are grouped in major types which can identify different partial perspectives on media literacy. Their relevance stems from the fact that:

1. they can be supported within the same environment;
2. there is a degree of continuity in the unfolding path, so people can leap from one perspective (or activity) to the other



a.

b.

c.

Figure 7.2: Three different types of media configuration and activity in the responsive physical environment that emerged in the studies

They will be represented using the metaphor of an “unfolding path” (figure 7.2). In each configuration, traditional media and interactive tangibles are integrated or coupled in different ways. In describing five alternatives, the three configurations in figure 7.2 will be referred to as ‘inclusion’ (a), ‘adjacency’ (b), and ‘separate coexistence’ (c).

In the diagram in figure 7.2.a, *inclusion* stands for configurations of media and activities in which traditional media hide interactive tangibles (or vice versa). In other words, that configuration, in conjunction with a specific activity, induces people to focus on one of the two media. In figure 7.2.b, *adjacency* stands for cases in one of the two media is employed for practical purposes, but the way different media are integrated is in focus in the activity. In such a way, the media that is employed, is “present at hand”. In figure 7.2.c, *separate coexistence* stands for those practices and configurations in which the different media are both acknowledged but as totally separate entities, not needy of each other for practical purposes.

7.3.3 A definition of media literacy based on five types of configurations and activities that emerged in the field studies

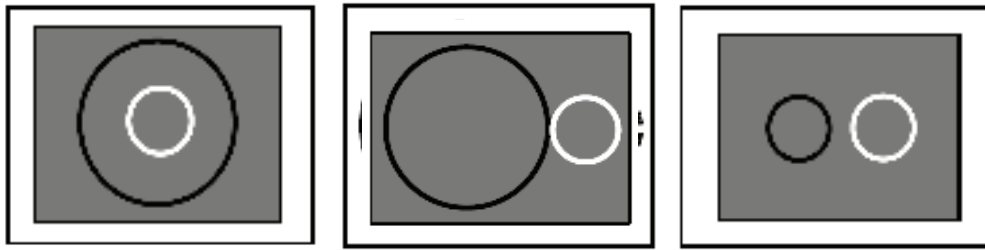
The path of configurations that have been followed in the different studies in this thesis proposes a grid through which different perspectives of media literacy practices can be

addressed. The categories proposed are not intended to be formally distinguishable. They define five different configurations of media and activities, which suggest different perspectives on media literacy. They are meant to inform practices and designs for media literacy in various contexts, as in the schools and in public places.

In each type of configuration, traditional media and interactive tangibles are integrated in different ways. Each one needs to be described in conjunction with an activity. As proposed here, each one of these types can have an important and different role in addressing media literacy. In the following, reference is made to ‘application units’, ‘multiple representations’ and the ‘infrastructure’, as discussed in chapter 2.

Five types of configurations

In a first configuration (figure 7.3.a), interactive tangibles are used as application units (see chapter 2). That is, coupling with traditional media is not in focus. In this case tangibles can be said to be ready to hand. In a second configuration (figure 7.3.b), interactive tangibles are used as part of ‘multiple representations’ (see chapter 2). That is, coupling with traditional media is in focus. In this case tangibles can be said to be present at hand. In a third configuration (figure 7.3.c), interactive tangibles and traditional media coexist uncoupled, but they are both necessary in the activity. By reinterpreting Heidegger’s phrase, in this case tangibles can be said to be ‘present off hand’. In a fourth configuration (figure 7.4.a), there is traditional media fruition, and their coupling with interactive tangibles is in focus. In this case tangibles can be said to be present at hand. In a fifth configuration (figure 7.4.b) there is traditional fruition, and their coupling with interactive tangibles is not in focus. In this case tangibles can be said to be apparently absent.



a.

b.

c.

Figure 7.3: The three of the five types of configurations in which interactive tangibles have a predominant role over the digital media. As explained below, examples of activities include: Use of the installation as an abstraction (a); Exploring how interactive tangibles work (b); Decontextualised presentations and screenings (c).

Examples of five corresponding activities in the studies

In the case of the first configuration (figure 7.3.a), the installation was used as an abstract representation of film making, in the sense that the selection and ordering of tangibles did not signify a commitment to final videos arrangements. Hence, there was a selective view on the process of composition. In these activities, the skills that were favoured included abstract views on paradigm and syntagm; deconstruction; and practice of CODIS and FINPE explorations. A more specific reference to an activity is the composition of documentaries, and CODIS explorations with the interactive surface (section 5.10)

In the case of the second configuration (figure 7.3.b), an activity consisted in the exploration of how interactive tangibles work, by accessing traditional media. The focus was on their design, and there was a relative indifference to the context of traditional media. The corresponding skills that were favoured included packaging and framing media texts. A more specific reference to an activity in the studies is the exercises of packaging, and ordering and framing historical accounts in space (chapter 4).

In the case of the third configuration (figure 7.3.c), an activity consisted in instructions, decontextualised presentations, and activities setting up the environment for use. The focus was on the infrastructure. The corresponding skills that were favoured included managing the infrastructure and its database. In this sense it resembles the practicing with traditional ICT. A more specific reference to an activity in the studies is the activities of introduction of the tangibles in the environment of the schools (in section 5.5).

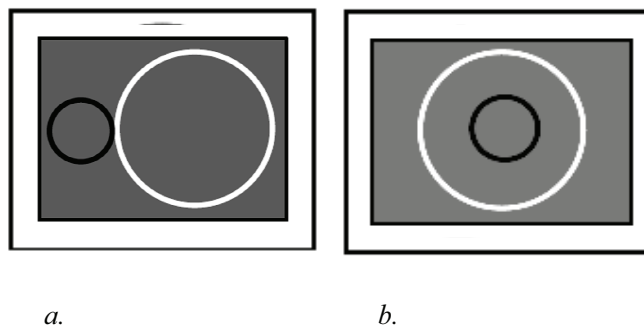


Figure 7.4: The two of the five types of configurations in which interactive tangibles do not have a predominant role over the digital media. As explained below, examples of activities include: Fruition focusing on the digital content, but accessed through the tangibles as screening controls (a); Traditional media fruition and interactive technology is hidden (b).

In the case of the fourth configuration (figure 7.4.a), an activity consisted in watching films, but having to launch them using tangibles, so most of their capabilities (e.g., for composition) were not used. The skills favoured included active spectatorship mastering thematic browsing and other explorations. A reference to an activity in the studies is the combinatorial exploration (section 5.6), or in the museum (section 6.3).

In the case of the fifth configuration (figure 7.4.b), an activity consisted in traditional media fruition, and interactive tangibles were not considered in the activity. The skills favoured included traditional critical spectatorship. A reference to an activity in the studies is the training of pupils to critical interpretation of advertisement (section 5.5).

Five perspectives on media literacy corresponding to the five configurations

The perspective on media literacy in the first configuration is media texts construction, transposed in the physical environment, with selective view on different aspects (figure 7.3.a). In the second configuration, media literacy practices consist mostly of creative work of composition, focusing on framing and packaging of media texts using interactive tangibles (figure 7.3.b). In the third configuration, media literacy can be seen as traditional ICT (figure 7.3.c). In the fourth configuration, media literacy can be favoured as in museums. That is, an itinerant, associative, segmented fruition of media text (figure 7.4.a). In the fifth configuration, media literacy coincides with ‘traditional’ media literacy, as discussed in chapter 2 (figure 7.4.b).

With these categories there is no intention to predict nor to prescribe how the transition between one configuration to the other should happen, nor that the five configurations can be clearly distinguishable. In fact, a shift in activities and people’s focus from one category to the other might happen just because the technology stops working, or because a person involved lacks a specific skill.

Because of this, disorientation was frequent in the activities described in this thesis. The activities risk stalling when people do not know what is supposed to be done, what skills are needed, or recognised as such, and what aspects to regard as ‘problems’. In this sense, an aim of this compound view is to contribute to orienting the practices of media literacy, by indicating how ‘regular’ procedures, ‘skilled’ behaviour, or problems with the tools or instructions can be defined. The table proposes the organisation of a field of possibilities for design, in order to take advantage of interactive tangibles to have a more complete view on media literacy.

Examples of transitions between configurations followed in the studies

From packaging to composition: (figure 7.3.b to figure 7.3.a) As explained in chapter 5, in order to prepare for the combinatorial explorations with the glass surface (section 5.10), the blocks had to be charged with three videos each. This activity of ‘packaging’ the interactive

tangibles by choosing media texts and their association is an activity of the second configuration. This led to learning different sorts of groupings by associating the video material. But it is not until the actual combinatorial explorations of the commercials with the blocks (first configuration) that the effects of decomposing the material could be tried out. The transitions between these two configurations (figure 7.3.b to figure 7.3.a), allowed translation of packaging choices into activities of deconstruction.

From introducing tangibles to arranging interviews: (figure 7.3.c to figure 7.3.b) As described in the first study in the school (section 5.5), the working of tangibles had to be introduced and tutored in the classroom. These activities are supported by the third configuration, because they make use of tangibles and their digital contents in an uncoupled way.

From browsing to presentation: (figure 7.4.a to figure 7.3.c) Also in the case of uncoupling the tangibles and digital media starting from an activity of browsing benefited the addressing of media literacy as it permitted switching from tutoring to exploring, as done in the schools study (methods described in section 5.4). More generally, rapid transitions to activities of browsing or framing and packaging, such as arranging and annotating interviews, permitted exemplifying the working of the setting. In this sense, the activities that make use of the system in the third configuration benefit from transitions to the neighbouring configurations in order to achieve examples and views on packaging on one side and on media browsing on the other.

From content screening to combinatorial explorations: (figure 7.4.b to figure 7.3.a) An extreme case of transition between configurations is that which happens when, in the second school study, the activities switched from screening TV commercials, and their deconstructed versions, to combinatorial explorations. The switch between configurations consists on the fact that first we look the projection of the media material as if accessed in their intended environment, that is TV, and then we practise their rearrangement upon a dedicated interface. The role of this transition in the media literacy practices has benefit in that it gives access to the different modes of working of media texts, such as commercials, when they are contextualised either on an interactive tool for decomposition or on a traditional TV. The ultimate goal of media literacy practice is to have a bearing in daily life. Hence, all dedicated tools for

exploration and rearrangement need being able to make transitions between activities, including bringing fruition back to the daily life context of media fruition.

7.4 Conclusion

This thesis developed a set of media literacy practices with participants in different settings. It contributes mostly to HCI practice, rather than to HCI theory. The thesis jointly addressed research problems of interaction design and media studies by:

- articulating a set of configurations of interactive tangibles and audiovisual media, which give different perspectives on media literacy within the same physical environment;
- developing a set of activities and practices which are attuned to how participants in audience groups work and collaborate in inquiries around media fruition and production;
- developing design methods and principles through the employment of practical knowledge from theatre practices.

Through these contributions, the thesis addressed the integration of findings in interaction design and HCI and research on media studies and media literacy by:

1. applying advances of HCI for supporting new media literacy practices in the physical environment, by coupling “traditional” media, and interactive tangibles, or forms of digital ‘augmentation’ of tangible objects and spaces;

2. applying the perspectives on media literacy, which emerge from these integrations, in order to contribute to current research on HCI and interaction design.

Because traditional approaches to media literacy are not design oriented, a major contribution of this thesis to the general problem of media literacy consists in linking aspects of media literacy to specific design problems in the practice. The research has focused on the categories, the rules and the procedures which can enable collaborative inquiries. In a broader context of technology design, this permitted a grounded interpretation of common terms with which tangible interfaces are defined in the literature on HCI and Interaction Design. For instance, embodiment, manipulation, representation, control, reconfigurability and authoring have acquired a specific meaning in the practical studies and have been linked to design qualities.

In conclusion, responsive physical environments can be designed as constituting privileged settings for the exploration and discovery of the endless forms of integration between the ever existing “new” and “traditional” media. The physical nature of the environment, and the responsiveness arising from forms of digital augmentation can play a role in improving visibility, exploration, collaboration and abstraction when coming to terms with authoring and deconstruction of genres, media codes, media agendas and media fruition.

People can take advantage of overcoming traditional or orthodox habits in media authoring by deconstructing the media texts they usually have access to. However, unorthodox ways of working on media texts still have to be taught and enabled. To this end, genres composition needs to be organised in terms of formats and conventions.

Along these themes, the following specific questions have been addressed. They still constitute fields for further work:

- Are physical packages and designs – and other designed features of the embodied inquiries – also subject to or part of media codes and genres? As argued in this thesis, it is critical to find relationships between the affordances of media objects and the media ‘codes’. Examples have been discussed in chapter 4, concerning the organisation of the

environment as a museum, a picture album or as a market, and concerning the embodiment of forms of framing and packaging. Other examples have been discussed in chapter 5, concerning the embodiment of documentary codes, and TV codes, as the ‘vision of order’ of TV news.

- Why and how should one apply generalisations over the many and tacit ways in which people create, author, or deconstruct? Design interests usually lead to standardisation. As discussed in chapters 5 and 6, the collaborative inquiries with the application of tangible designs needed the creation of local conventions, formats and even rituals. This is in order to attune the groups to collective practices. However, in the face of deconstructionist interests, locally conventionalised and organised ways of inquiring can emerge as being vain. However, the creation of ordered ways of inquiring has been researched as emergent in participants’ tasks, starting from a relaxed set of rules and with incomplete designs, which have been characterised through descriptions of how people worked. This led to devising different forms of inquiries through locally ordered ways of working as in: the practices of ordering historical accounts (chapter 4), the practices of media framing and packaging towards the creation of documentaries (chapter 5), the CODIS and FINPE explorations.
- Supporting media literacy with mixed media poses the question of whether and how crossing or changing the medium supports participants in being critical and in retaining a form. An ‘unfolding’ path of activities and configurations has been proposed in which to place the different activities and designs addressed in the study. The path across the five configurations can be followed using the same design style and format, such as the CODIS and FINPE, which helps participants to retain a form across the different views.

Glossary

Agenda

The term ‘media agenda’ here is used to refer to the many ways in which media impact on what issues are thought or talked about by the audience. This includes the common connotation in media studies, where the term is used to refer to the setting of an order of importance in current *issues*, especially in the reportage of news. In the studies the media agenda has explicit and implicit aspects of the media, including their selectivity, their different degrees of *assertiveness*. Some aspects have been related to how readers have access to alternative views, or to the media texts which are not represented in the media (section 7.1.4).

Closed

In this thesis, the adjectives ‘closed’ and ‘open’ have been used to distinguish between media texts which elicit various degrees of freedom of interpretation in audiences. Closed media texts have a preferred or intended reading. Instances of closed texts are most propaganda or commercial advertisements. When a text can be said to be closed, it doesn’t mean that it is not possible to find interpretations that are different from the preferred ones, but that such non intended interpretations are overtly *aberrant* (Eco 1979). In the practical activities in the thesis, closed texts have been used as resources for activities of deconstruction and search for aberrant interpretations.

The definition of closure here is derived from that of *openness* as found in Eco (1962) – (see ‘open’).

Combinatory

The term has been used here to describe the CODIS design style (section 5.10), which supports *combinatorial* explorations in the montage of media texts. By exploring different arrangements of objects in the physical domain, people can have a practical experience of upending the unstable structures that govern the working of media genres, such as genres of advertisements or news. By disrupting the original order, and by trying out different structures, it is possible to practically experience the mechanisms underlying both the technical and the aesthetic aspects of media compositions.

Deconstruction

The term deconstruction has been used here to refer to some types practices of *practically* reorganizing media texts. Deconstruction has not been considered as being a conceptual work, even if it operates referring to concepts. Rather, it has been considered to be a textual work. Its objects are texts, and it largely consists of rearranging them. The relevance in media literacy which is envisioned here is that such deconstructing practices aim at searching behind the dominant expressions of texts. They regard these as serving to exclude subordinate terms. As explained in section 2.3, these connotations are only inspired by the use of this term in the literature on philosophy.

Dissembled

The term has been employed to defining the CODIS design style (section 5.10.3), in which different recombinations of ‘charged’ objects identify different edited versions just by the order in which they are laid down. ‘Dissembled’ has been intended as the design quality of physical objects, which *contain* or *link to* digital representations, and which mask or disguise such representations. This quality was put into use to create enigmas, or arise expectations, according to a principle of the

design of visual and tangible advertisement: their design should ‘create new *needs*’ (Berger 1977), calling for attention and for reconciliation.

Expressive

This term has been used to distinguish those features of interactive tangibles and mediating artefacts which represent, articulate and communicate because they are characterised as such, and not because they favour any particular inquiry with tangibles (e.g., through neutrality or incompleteness). In particular, ‘expressive’ has been used to contrast with ‘neutral’ and ‘larval’ design qualities, as they have been transposed in chapter 3 from the practices of design and coaching of masked performances, according to the approaches taught by Jacques Lecoq (1997).

Framing

Here media framing is intended as the process by which the media place reality into frames. In particular, framing of real events, phenomena, aspects of reality is realised in spatial and temporal dimensions. In the specific applications of interactive tangibles, framing consisted in deciding on technical and formal elements such as time-length, spatial ordering of elements, but also on how framed contents are introduced and concluded.

Furnished

This term was employed in the definition of the FINPE design style (section 5.10.4), which focuses on the use of physical properties of the environment as a working set in which media texts are embedded, organised, composed and accessed. In particular, their ‘furnished’ character points to the physical properties of environments in the schools and in the museum, in which FINPE designs became

‘equipped’ with the features of the everyday environments.

Installed

This term was employed in the definition of the FINPE design style (section 5.10.4), which focuses on the use of physical properties of the environment as a working set in which media texts are embedded, organised, composed and accessed. Such designs are meant to be ‘installed’. The emphasis is in their location-specific design. Hence, it involves the *placing* in position, *connecting* and *adjusting* for ‘use’. The relevance for media literacy is the actions of framing and packaging that are put in place in the FINPE designs when ‘installing’ the objects.

Larval

This term has been used, along with the terms ‘neutral’ and ‘expressive’, to orient the design of interactive tangibles as ‘action-oriented’ artefacts. The terms have been transposed in chapter 3 from the practices of design and coaching of masked performances, according to the approaches taught by Jacques Lecoq (1997). ‘*Larval*’ refers to those incomplete features of interactive tangibles, which favour embodied inquiries and help evolving designs through more complete and finished artefacts. As ‘larval’ and ‘expressive’ qualities, ‘neutral’ does not indicate purely qualities of the artefacts, nor purely qualities of the actions with or through them. Larval indicates incomplete forms which have the potential to evolve into more complete ones, and which help people stretch their imagination.

Media text

A representation accessed through or produced for the media. Here ‘textual’ is intended in the larger sense, in which ‘text’ is

taken as meaning any signifying structure composed of signs and codes, and which can take a variety of forms: film, speech, writing, painting, records.

Neutral

This term has been used, along with the terms ‘larval’ and ‘expressive’, to orient the design of interactive tangibles as ‘action-oriented’ artefacts. The terms have been transposed in chapter 3 from the practices of design and coaching of masked performances, according to the approaches taught by Jacques Lecoq (1997). ‘*Neutral*’ refers to those properties of interactive tangibles and their use, which help informing design relying on universal or uniform features of human action. As ‘larval’ and ‘expressive’ qualities, ‘neutral’ does not indicate purely qualities of the artefacts, nor purely qualities of the actions with or through them.

Open

The definition of *openness* is derived here from Eco’s *Opera Aperta (The Open Work, 1962)*. Eco poses the problem as to how and to what extent a text should foresee the reactions of its addressee. His definition of ‘*openness*’ of texts is based on the extent to which a text invites readers to participate in interpretation, in such a way that “right interpretations” become less important than the possibility of any active response.

Packaging

In this thesis, packaging is intended as the one of the forms of media framing that were put in place by participants through the use of tangible and interactive artefacts. As discussed in chapter 4, the definition of the term is taken from the practical

accomplishments of similar tasks which include the actions of wrapping, enveloping, and formatting, and are related to the craft of product packaging or advertisement. In these practices, representations are arranged in order to create needs to explore and inquire more. Packaging is discussed more in chapter 4.

Paradigm

The word paradigm has been applied as with *sign systems*, meaning the set of elements from which choices are made to create (media) texts. The word has been used in opposition to ‘syntagm’, which refers to a particular combination of those chosen elements. These terms have been used when the creation of media texts could be seen as involving a *selection* from a paradigm and a *combination* into a syntagm. This was not always the case.

Such connotations for paradigm and syntagm are similar to those in the linguistic and semiotic contexts. The analogy can be taken further. In particular, for the definition of paradigms: units must share characteristics that determine their membership and, at the same time, must be clearly identifiable among each other. Syntagms are governed by rules and conventions about composition (e.g., grammar, syntax, rules of harmony).

A further characterisation of these terms, in the context of media literacy practices in responsive physical environments, was suggested or attempted in some specific cases. The need for unifying features and distinctive features of elements of a paradigm has been discussed in section 5.10, for the case of ‘functions’ and ‘domains’. The need for rules and conventions of composition has been addressed with the creation of specific styles or formats, as the CODIS and FINPE styles.

Permeable

This term was employed in the definition of the FINPE design style (section 5.10.4), which focuses on the use of physical properties of the environment as a working set in which media texts are embedded, organised, composed and accessed. In particular, their ‘permeable’ qualities point to how such designs were made to be receptive to the recordings of voices and events locally occurring.

Sealed

The term has been used here to describe the CODIS design style (section 5.10.3), which supports *combinatorial* explorations in the montage of media texts. The objects designed for such explorations privileged the use of pre-existent texts – i.e., voices and images from the surrounding environment could not be integrated in the environment. In this sense, the designs – including the physical/digital couplings – were *sealed*. The media texts were encoded as properties ‘under the surface’ of the physical objects.

Syntagm

The word syntagm has been applied as with *sign systems*, meaning a particular combination of chosen elements and its structure. The word has been used in opposition to ‘paradigm’, which refers to the set from which elements are selected to compose the syntagm. These terms have been used when the creation of media texts could be seen as involving a *selection* from a paradigm and a *combination* into a syntagm. This was not always the case. These connotations are similar to those in the linguistic and semiotic contexts.

For a further characterisation of these terms in the context of this thesis, see ‘paradigm’.

Bibliography

- Africano, D., Berg, S., Lindbergh, K., Lundholm, P., Nilbrink, F., Persson, A., (2004). Designing tangible interfaces for children's collaboration, April 2004 *CHI '04 Extended Abstracts on Human factors in computing systems*, pp 853-868.
- Alborzi, H., Druin, A., Montemayor, J., Sherman, L., Taxen, G., Best, J., Hammer, J., Kruskal, A., Lal, A., Plaisant Schwenn, T., Sumida, L., Wagner, R. and Hendler, J. (2000). Designing StoryRooms: Interactive storytelling spaces for children, in: *Proceedings of DIS 2000*.
- Annany, M. and Cassell, J. (2001). Telltale: A toy to encourage written literacy skills through oral storytelling. *Winter Conference on Text, Discourse, and Cognition*, Jackson, USA.
- Ascott, R. (2003). Telematic Embrace: Visionary Theories of Art, Technology, and Consciousness, In: E.A. Shanken (ed), Berkeley, US: University of California Press.
- Bannon, L.J. (1991). From Human Factors to Human Actors, In: J. Greenbaum and M. Kyng (eds.), *Design at work: Cooperative Design of Computer Systems*, Hillsdale: Lawrence Erlbaum Associates, pp. 25-44.
- Bannon, L. J. and Bødker, S. (1991). Beyond the Interface: Encountering Artifacts in Use. In: Carroll, J.M. (ed), *Designing Interaction*, Cambridge: Cambridge University Press: 227-253.
- Bell, A. (1991). *The Language of News Media*, Oxford: Basil Blackwell.

- Binder, T. (1999). Setting the Stage for Improvised Video Scenarios. *Proceedings of CHI'99*, Pittsburgh, 1999.
- Binder, T., De Michelis, G., Gervautz, M., Iacucci, G., Matkovic, K., Psik, T. and Wagner, I. (2004). Supporting Configurability in a Tangibly Augmented Environment for Design Students, *Personal and Ubiquitous Computing*, Vol. 8, Num. 5, Special Issue on Tangible Interfaces in Perspective, Springer 2004.
- Boal, A. (1979). *The Theatre of the Oppressed*, New York: Urizen Books.
- Boal, A. (1992). *Games for Actors and Non-Actors*, New York: Routledge.
- Boal, A. (1995). *The Rainbow of Desire*, New York: Routledge.
- Boal, A. (1998). *Legislative Theatre*, New York: Routledge.
- Bodker, S and Buur, J (2002) The Design Collaboratorium – a Place for Usability Design. *Transactions on Computer-Human Interaction*, Vol.9, No 2, June 2002, pp 152-169
- Boles, D. (2002). The Language of Media Literacy: A Glossary of Terms, URL: http://www.medialit.org/reading_room/article565.html (last accessed on 31 August 2007).
- Bolter, J.D. and Grusin, R. (1999). *Remediation: Understanding new media*, MIT Press.
- Brandt, E. and Grunnet, C. (2000). Evoking the future: drama and props in user centered design. In T. Cherkasky, J. Greenbaum and P. Mambrey (Eds.), *Proceedings of the 6th biennial Participatory Design Conference (PDC 2000)*, pp. 11-20.

- Brandt, E and Messeter J. (2004) Facilitating Collaboration through Design Games in Proceedings Participatory Design Conference 2004
- Brandt, E. (2006). Designing exploratory design games: a framework for participation, In: *Participatory Design PDC 2006*, ACM Press, pp. 57-66.
- Bruner, J. (1990). *Acts of Meaning* Cambridge, MA: Harvard University Press.
- Buckingham, D. (1993). *Children Talking Television: The Making of Television Literacy*, London: Falmer.
- Buckingham, D. (2005). The Media Literacy of Children and Young People - A Review of the Research Literature, London: Office of Communications (Ofcom). URL: www.ofcom.org.uk/advice/media_literacy/medlitpub/medlitpubrssi/ml_children.pdf (last accessed on 31 August 2007).
- Burr, J, Binder, T and Brandt, E (2000) Taking Video beyond 'Hard Data' in User Centered Design in Designing Digital Environments: Bringing in More Voices Proceedings 2000 Participatory Design Conference pp 121 – 131.
- Cassell, J. (2004). Towards a model of technology and literacy development: Story listening systems. *Applied Developmental Psychology*, 25, 75-105.
- Cassell, J. and Ryokai, K. (2001). Making space for a voice: Technologies to support children's fantasy and storytelling. *Personal Technologies*, 5(3), 203-224.
- Chalmers, M. (2001). Book review: P. Dourish, "Where the action is: the foundations of embodied interaction". *Computer Supported Cooperative Work*.

- Chandler, D. (1992): 'The Phenomenology of Writing by Hand', *Intelligent Tutoring Media*, 3(2/3), May/August 1992: pp. 65-74.
- Chandler, D. (1996). Shaping and Being Shaped: Engaging with Media, *Computer-Mediated Communication Magazine*, February), URL: <http://www.december.com/cmc/mag/1996/feb/chandler.html> (last accessed on 31 August 2007).
- Chandler, D. (1997). Context and Expectations; Selectivity. In *Visual Perception*, URL: <http://www.aber.ac.uk/media/Modules/MC10220/visper06.html> (last accessed on 31 August 2007).
- Ciolfi, L. and Bannon, L. (2002). Designing Interactive Museum Exhibits: Enhancing visitor curiosity through augmented artefacts, in S. Bagnara, S. Pozzi, A. Rizzo and P. Wright (eds), *Proceedings of ECCE11*, European Conference on Cognitive Ergonomics, Catania (Italy) September 2002.
- D'Agostini, F. (1997). *Analitici e continentali. Guida alla filosofia degli ultimi trent'anni*, Milan: Raffaello Cortina Editore.
- Dearing, J.W. and Rogers, E.M. (1996). *Agenda-setting*, UK: Sage.
- De Michelis, G. (2003). The Swiss pattada: designing the ultimate tool (with original drawings by Marco Susani), *Interactions*, 10(3): 44-53.
- Derrida, J. (1976). *Writing and Difference*, UK: Routledge and Kegan Paul.
- Dewey, J. (1916/1966). *Democracy and Education*, New York: Free Press.

Dewey, J. (1938/1963). *Experience and Education*. New York: Collier.

Dietz, P. and Leigh, D. (2001). DiamondTouch: a multi-user touch technology, in: *Proceedings of the 14th annual ACM symposium on User interface software and technology*, November 11-14, 2001, Orlando, Florida.

Dolonen, J., Mørch, A. and Åsand, H-R. (2003). Learning and Knowledge Building at Work, Poster at *The Computer Supported Collaborative Learning Conference*, Bergen, Norway, June 2003.

Dourish, P. (2001). *Where the action is: the foundations of embodied interaction*, MIT Press.

Dworaczyk, B., Creel, J., Azeez, B., Kerne, A. and Beane, B. (2005). A Gesture-based Hyperrealistic News Space. URL: <http://ecologylab.cs.tamu.edu/courses/recombinant/gallery/assets/GestureNewsLong.pdf> (last accessed on 31 August 2007).

Eco, U. (1962). *L'Opera Aperta: Forma e indeterminazione nelle poetiche contemporanee*, Bompiani (Translated in English as: *The Open Work*, Cambridge University Press, Harvard, 1989.)

Eco, U. (1972/1980). Towards a semiotics inquiry into the television message, in J. Corner and J. Hawthorn (eds), *Communication Studies*, Kress, UK: Edward Arnold.

Eco, U. (1990). *The Limits of Interpretation*, Indiana University Press.

Ehn, P. (1989). *Work-oriented design of computer artefacts*, Erlbaum, New Jersey.

- Ehn, P. and Kyng, M. (1991). Cardboard Computers: Mocking-it-up or Hands-on the Future, in: J. Greenbaum and M. Kyng (eds), *Design at Work: Cooperative design of computer systems*, Hillsdale, N.J.: Erlbaum, pp 169-195.
- Ehn, P. (1992). Scandinavian Design: On participation and skill, in: P. S. Adler and T. A. Winograd (eds), *Usability: Turning technologies into tools*, New York: Oxford University Press, pp 96-132.
- Ehn, P. and Kyng, M. (1991). Cardboard Computers: Mocking-it-up or Hands-on the Future, in: J. Greenbaum and M. Kyng (eds), *Design at Work: Cooperative design of computer systems*, Hillsdale, N.J.: Erlbaum, 169-195.
- Engeström, Y. and Kallinen, T. (1988). Theatre as a Model System for Learning to Create. *The Quarterly Newsletter of the Laboratory of Comparative Human Cognition*, April 1988, 10(2): 54-67.
- Ennis, R. (1962). A Concept of Critical Thinking, *Harvard Educational Review*, Winter 1962, 32(1): 81-111.
- Ferris, K. and Bannon, L.J. (2002). ...a load of ould boxology, in: *Proceedings of the Conference on Designing Interactive Systems: Processes, practices, methods, and techniques*, London, pp 41-49.
- Ferris, K., Bannon, L., Ciolfi, L., Gallagher, P., Hall, T. and Lennon, M. (2004). Shaping Experiences in the Hunt Museum: A Design Case Study, in: *Proceedings of DIS, Designing Interactive Systems 2004*, pp 205-214.
- Fischer, G. and Giaccardi, E. (2004). Meta-Design: A Framework for the Future of End-User Development, In: H. Lieberman, F. Paternò and V. Wulf, (eds), *End User Development –*

Empowering People to Flexibly Employ Advanced Information and Communication Technology, Dordrecht, The Netherlands: Kluwer Academic Publishers.

Fishkin, K. P. (2004). A taxonomy for and analysis of tangible interfaces, *Personal Ubiquitous Computing*, 8, 347-358.

Fiske, J. (1982). *Introduction to Communication Studies*, UK: Methuen.

Fitzmaurice, G., Ishii, H. and Buxton, W. (1995). Bricks: Laying the Foundations for Graspable User Interfaces, in: *Proceedings of Conference on Human Factors in Computing Systems (CHI'95)*, ACM Press, pp. 442–449.

Fjuk, A. and Sorensen, E.K. (1997). Drama as a metaphor for design of situated, collaborative distributed learning, *European Journal of Open and Distance Learning (EURODL)*, Vol. 1997/I, URL: <http://www.eurodl.org/materials/contrib/1997/fjuk/fjuk.html> (last accessed on 31 August 2007).

Freire, P. (1970). *Pedagogy of the oppressed*, New York: Seabury.

Freire, P. and Macedo, D. (1987). *Literacy: reading the word and the world*. South Hadley, MA.: Bergin and Garvey.

Freire, P., and Faundez, A. (1989). *Learning to Question*, New York: Continuum.

Fukuzaki, Y. (1993). Electronic pen according to the BTRON guideline and its background, *Tronware*, vol. 4, Japan: Personal Media publishers, pp 49-62.

Greenbaum, J. and Kyng, M. (eds) (1991). *Design at Work: Coorporative design of computer systems*. Hillsdale, NJ: Erlbaum.

- Griswold, W. (1994). *Cultures and Societies in a Changing World*, Pine Forge Press.
- Guha, M., Druin, A., Montemayor, J., Chipman, G. and Farber, A. (2007). A Theoretical Model of Children's Storytelling using Physically-Oriented Technologies (SPOT). *Journal of Educational Multimedia and Hypermedia*, 16 (4), pp. 389-410. Chesapeake, VA: AACE.
- Hall, S. (1986). Media power and class power, in: J., Curran, J. Ecclestone, G. Oakley and A. Richardson (eds), *Bending Reality: The State of the Media*, Pluto Press.
- Hartley, J. (1992). *The Politics of Pictures: The Creation of the Public in the Age of Popular Media*, UK: Routledge.
- Heath, C., Luff, P., Von Lehn, D., Hindmarsh, J. and Cleverly, J. (2002). Crafting Participation: Designing Ecologies, Configuring Experience, *Visual Communication*, 1(1): 9-33.
- Heidegger, M. (1996). *Being and time*, State University of New York Press, Albany, 1996.
- Holmquist, L.E., Redström, J. and Ljungstrand, P. (1999). Token-Based Access to Digital Information, in: *Proceedings of the 1st International Symposium on Handheld and Ubiquitous Computing*, Springer-Verlag, pp 234-245.
- Hutchins, E., Hollan, J.D. and Norman, D.A. (1986). Direct manipulation interfaces, in: D.A. Norman and S.W. Draper (eds), *User Centered System Design*, Hillsdale, NJ: Lawrence Erlbaum Associates, pp 87-124.
- Iacucci, G., Iacucci, C. and Kuutti, K. (2002). Imagining and experiencing in design, the role of performances. *Proceedings of the Second Nordic Conference on Human-Computer Interaction*, ACM Press, pp 167-176.

- Iacucci, G. and Kuutti, K. (2002). Everyday life as a stage in creating and performing scenarios for wireless devices, in: *Personal and Ubiquitous Computing Journal*, London: Springer-Verlag, 6(4): 299-306.
- Iacucci, C., Pain, H. and Lee., J. (2003). Collaborative Authoring Practices with Video Episodes: Designing for accountability of learners' methods in re-using video material, in: B. Wasson, S. Ludvigsen and U. Hoppe (eds), *Designing for Change*, Kluwer Academic Publishers.
- Jacucci, C., Jacucci, G., Wagner, I. and Psik, T. (2005a). A Manifesto for the Performative Development of Ubiquitous Media, in: *Proceedings of the 4th decennial conference on Critical computing*, ACM Press, pp 19-28.
- Jacucci, C., Pain, H. and Lee, J. (2005b). Media Co-Authoring Practices in Responsive Physical Environments. In T. McEwan, D. Benyon and J. Gulliksen (Eds.), *People and Computers XIX – The Bigger Picture*, Springer-Verlag.
- Jacucci, G. and Wagner, I. (2005). Performative Uses of Space in Mixed Media Environments. In E. Davenport and P. Turner (eds), *Spaces, Spatiality and Technologies*, London: Springer.
- Jacucci, C. (2006). Guiding Design with Approaches to Masked Performance, *Interacting with Computers, Special Issue on the emerging roles of performance within HCI and Interaction Design*, Elsevier, 6: 1032-1054.
- Johnstone, K. (1981). *Impro: Improvisation and the Theatre*, New York: Routledge.

- Ihde, D. (1979). The Experience of Technology: Human-Machine Relations, in: D. Ihde, *Technics and Praxis*, Boston Studies in the Philosophy of Science, Volume 24, Dordrecht: D. Reidel, pp. 3-15.
- Ishii, H., Kobayashi, M. and Arita, K. (1994). Iterative Design of Seamless Collaboration Media, *Communications of the ACM*, 37(8): 83-97.
- Ishii, H. and Ullmer, B. (1997), Tangible Bits: Towards Seamless Interfaces Between People, Bits, and Atoms, in: *Proceedings of CHI'97*, pp 234-241.
- Johnson, F. (2002). Integrating Critical Approaches to Media Literacy into Production Training, Media Working Group, located at *Digital Literacy: Rethinking Education and Training in a Digital World*, URL: <http://digitalliteracy.mwg.org/curriculum/integrating.html> (last accessed on 31 August 2007).
- Kankainen, T., Rantola, V., Mehto, K. and Tiitta, S. (2000). Interactive Drama and User Centered Product Concept Design. URL: <http://www.hiit.fi/uerg/publications/> (last accessed on 31 August 2007).
- Kindberg, T., Barton, J., Morgan, J., Becker, G., Caswell, D., Debaty, P., Gopal, G., Frid, M., Krishnan, V., Morris, H., Schettino, J., Serra, B. and Spasojevic, M. (2002). People, places, things: Web presence for the real world, *Mobile Network Applications*, 7(5): 365–376.
- Kitamura, Y., Itoh, Y. and Kishino, F. (2001). Real-time 3D interaction with ActiveCube, *CHI '01 extended abstracts on Human factors in computing systems*, ACM Press, pp. 355-356.
- Koschmann, T. (2001). Dewey's Contribution to a Standard of Problem-Based Learning Practice. in: *Proceedings of the European Conference on CSCL 2001*.

- Kress, G. (2003). *Literacy in the New Media Age*, London: Routledge.
- Kuutti, K., Iacucci, G. and Iacucci, C. (2002). Acting to Know: Improving creativity in the design of mobile services by using performances, In: *Creativity and Cognition, Proceedings of the 4th Conference on Creativity and Cognition*, Loughborough, UK, ACM Press: 95-102.
- Laurel, B. (1993). *Computers as Theatre*, Addison-Wesley. Lecoq, J. (1997). *Le corps poétique*. Paris: Actes Sud-Papiers. (Published in English as *The Moving Body*, London: Methuen, 2000.)
- Lievrouw, L.A. (2006). Oppositional and activist new media: remediation, reconfiguration, participation. In: *Proceedings of The Participatory Design Conference*, ACM Press, pp. 115-124.
- Livingstone, S. (2003). *The Changing Nature and Uses of Media Literacy*, Published by Media@lse, London School of Economics and Political Science (LSE). (Available from URL: <http://www.lse.ac.uk/collections/media@lse/>)
- Livingstone, S. and Bovill, M. (1999). *Young people, New Media*, Final Report of the Project 'Children Young People and the Changing Media Environment', An LSE Report. London: London School of Economics. (URL: <http://www.lse.ac.uk/collections/media@lse/> last accessed on 31 August 2007).
- McLuhan, M. (1995). *Understanding Media : The Extensions of Man*, Cambridge: The MIT Press.

- Mackay, W. and Pagani, D. (1994). Video Mosaic: Laying out time in a physical space, in: *Proceedings of the second ACM international conference on Multimedia*, pp 165-172.
- MacKenzie, C.L. and Iberall, T. (1994). *The Grasping Hand*, Amsterdam: North-Holland, Elsevier Science.
- Marshall, P., Price, S. and Rogers, Y. (2003). Conceptualising tangibles to support learning. In: *Proceedings of the Interaction Design and Children IDC'03*, ACM Press.
- McQuail, D., and Windahl, S. (eds) (1998). *Communication Models for the Study of Mass Communication*, UK: Longman.
- Mazalek, A., Davenport, G., Ishii, H., (2002). Tangible viewpoints: A physical approach to multimedia stories, in: *Proceedings of the 10th ACM international conference on Multimedia*, ACM Press: 153-160.
- Matheson, D. (2005) *Media Discourses: Analysing media texts*. Open University Press.
- Mellar, H. and Bliss, J. (1994). Introduction: modelling and education, in: H. Mellar, J. Bliss, R. Boohan, J. Ogborn, and C. Tompsett (eds), *Learning with artificial worlds: Computer-based modelling in the curriculum*, London: The Falmer Press, pp 1-7.
- Messaris, P. (1986). Parents, children and television, in: G. Gumpert and R. Cathcart (eds), *Inter Media: Interpersonal Communication in a Media World*, New York: Oxford University Press.
- Moran, T.P., Saund, E., van Melle, W., Gujar, A.U., Fishkin, K.P., Harrison, B. L. (1999). Design and technology for Collaborage: Collaborative collages of information on physical

- walls, in: *Proceedings of the UIST'99 Conference on User Interface Software and Technology*.
- Mørch, A.I. (1998). Tailoring Tools for System Development, in: *Journal of End User Computing*, 10 (2): 22-30.
- Mørch, A.I. and Mehandjev, N.D. (2000). Tailoring as Collaboration: The Mediating Role of Multiple Representations and Application Units, in: *Computer Supported Cooperative Work*, 9 (1), pp 75-100.
- Mørch, A., Engen, B. and Åsand, H-R, H. (2004). The Workplace as a Learning Laboratory: the winding road to e-learning in a Norwegian service company, in: *Proceedings of the Participatory Design Conference (PDC) 2004*, pp 142-151.
- Newman, M.W., Sedivy, J.Z., Neuwirth, C., Edwards, K., Hong, J., Izadi, S., Marcelo, K., Smith, T., Sedivy, J. and Newman, M. (2002). Designing for serendipity: Supporting end-user configuration of ubiquitous computing environments, In: *Proceedings of the Conference on Designing Interactive Systems: Processes, practices, methods, and techniques (DIS 2002)*, London, England, June 2002, ACM Press, pp 147-156.
- Norman, D.A. (1988). *The Design of Everyday Things*, New York: Doubleday.
- Oliver, M. (2000). Scenarios for Convergence and the Internet: Implications for content and content providers?, *Communications White Paper Seminar*, June 2000. (Available from URL: <http://www.bipa.co.uk/getArticle.php?ID=106>, last accessed on 31 August 2007).
- O'Malley, C. and Stanton, D. (2002). Tangible technologies for collaborative storytelling, in: *Proceedings of the 1st European Conference on Mobile and Contextual Learning MLearn 2002*, pp 3-7.

- Raffle, H. Parkes, A. Ishii, H. Topobo (2004). A Constructive Assembly System with Kinetic Memory. *Proceedings of CHI 04*. ACM Press, 869-877.
- Read, G. (2005). Theatre of Public Space: Architectural Experimentation in the Théâtre de l'Espace, Paris, 1937, *Journal of Architectural Education*, (58)4: 53-62.
- Reimann, D., Herczeg, M. and Winkler, T. (2003). Gaining Computational Literacy by Creating Hybrid Aesthetic Learning Spaces, In: *Proceedings of the 3rd IEEE International Conference on Advance Learning Technologies*, pp 384- 385.
- Rittel, H., and Webber, M. (1973). Dilemmas in a General Theory of Planning, *Policy Sciences*, Vol. 4, Elsevier Scientific Publishing Company, Inc., Amsterdam, pp 155-169.
- Rizzo, A., Marti, P., Decortis, F., Rutgers, J., and Thursfield, P. (2003). Building Narrative experiences for children through real time media manipulation: POGO world, in: M. Blythe, K. Overbeeke, A. Monk and P. Wright (eds), *Funology: From Usability to Enjoyment*, Kluwer Academic Publishers.
- Rogers, Y., Scaife, M. Gabrielli, S., Harris, E. and Smith, H. (2002). A Conceptual Framework for Mixed Reality Environments: Designing Novel Learning Activities for Young Children, *Presence*, Dec 2002.
- Rogers, Y. and Muller, H. (2005). A framework for designing sensor-based interactions to promote exploration and reflection, *International Journal of Human-Computer Studies*, 64 (1), pp 1-15.
- Rushkoff, D. (1996). *Playing the Future: How Kids Culture Can Teach Us to Thrive in an Age of Chaos*, New York: Harper Collins.

- Ryokai, K., Vaucelle, C., and Cassell, J. (2003). Virtual peers as partners in storytelling and literacy learning. *Journal of Computer Assisted Learning*, 19, pp. 195-208.
- Salber, D., Dey, A.K. and Abowd, G. (1999). The Context Toolkit: Aiding the development of context-enabled applications, In: *Proceedings of the Conference on Human Factors in Computing Systems (CHI'99)*, Pittsburgh, Pennsylvania, May 1999, ACM Press: 434-441.
- Salvador, T. and Howells, K. (1998). Focus Troupe: Using Drama to Create Common Context for New Product Concept End-User Evaluation, *Summary of CHI 98*, ACM Press, pp 251-252.
- Schmidt, K. and Bannon, L. (1992). Taking CSCW Seriously: Supporting articulation work, *Computer Supported Cooperative Work (CSCW): An International Journal*, 1(1-2), pp7-40.
- Shneiderman, B. (1983). Direct manipulation: a step beyond programming languages, *IEEE Computer*, 16(8), pp 57-69.
- Sokoler, T. and Edeholt H. (2002). Physically Embodied Video Snippets Supporting Collaborative Exploration of Video Material During Design Sessions, in: *Proceedings of NordiChi02, the 2nd Nordic conference on Human-Computer Interaction*, ACM Press, pp 139-148.
- Srivastava, M., Mutz, R. and Potkonjak, M. (2001). *Proceedings of SIGMOBILE*, Rome, January 2001, ACM Press.
- Stanton, D., Bayon, V., Neale, H., Benford, S., Cobb, S., Ingram, R., O'Malley, C., Ghali, A., Wilson, J. and Pridmore, T. (2001). Classroom Collaboration in the Design of Tangible

Interfaces for Storytelling, in: *Proceedings of CHI 2001, ACM Conference on Human Factors in Computing Systems, CHI Letters*, 3(1), pp 482-489.

Star, S.L. and Bowker, G.C. (1995). Work and infrastructure, *Communications of the ACM*, 38(9), pp 41.

Star, S.L. (1999). The Ethnography of Infrastructure, *American Behavioral Scientist*, 43, pp 377-391.

Streitz N., Geibler J., Holmer T., Konomi S., Müller-Tomfelde C., Reischl W., Rexroth P., Seitz P., Steinmetz R. (1999). i-LAND: An interactive Landscape for Creativity and Innovation, in: *Proceedings of the Conference on Human Factors in Computer Human Interaction CHI99*, ACM, pp 120-127.

Streitz N., Tandler P. , Müller-Tomfelde C. , Konomi S. (2001). Roomware: Towards the Next Generation of Human-Computer Interaction based on an Integrated Design of Real and Virtual Worlds, in: *Human-Computer Interaction in the New Millenium*, J. Carroll (ed), Addison-Wesley, pp 553-578.

Strömberg, H., Pirttilä, V. and Ikonen, V. (2004). Interactive Scenarios – Building ubiquitous computing concepts in the spirit of participatory design, *Personal Ubiquitous Computing*, 8, pp 200–207, London: Springer-Verlag.

Thoman, E. (2003). Screen-Agers... and the Decline of the “Wasteland”, *Federal Communications Law Journal*, Vol. 55, pp 601-610.

Tiitta, S., Mehto, K., Kankainen, T. and Kantola, V. (2005). Drama and user-centred methods in design, *Include 2005, International conference on inclusive design*, London.

- Turley, S., Rogers, T. and Jagodzinski, A.P. (1999). Paradigms for the design of interactive drama, *Personal Technologies*, 3(3), pp 141-152.
- Ullmer, B., Ishii, H. and Glas, D. (1998). mediaBlocks: Physical Containers, Transports, and Controls for Online Media, in: *Proceedings of the 25th Annual Conference on Computer Graphics and Interactive Techniques SIGGRAPH 98*, pp 379-386.
- Ullmer, B. and Ishii, H. (2000). Emerging frameworks for tangible user interfaces. *IBM Systems Journal*, 39(3&4), pp 915-931.
- Ullmer, B. and Ishii, H. (2001). Emerging frameworks for tangible user interfaces, in: J. Carroll (ed), *Human Computer Interaction in the New Millenium*, Allison-Wesley, pp 579-601.
- Watson, J. and Hill, A. (2006). *Dictionary of Media and Communication*, 7th edition, Oxford University Press.
- Wellner, P., Mackay, W. and Gold, R. (1993). Computer Augmented Environments: Back to the Real World, *Communications of the ACM*, Vol. 36, No. 7, July 1993.
- Winner, L. (1977). *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought*, Cambridge, MA: MIT Press.
- Wright, J. (2006). *Why Is That So Funny?: A Practical Exploration of Physical Comedy*, Nick Hern Books.
- Yildiz, M.N. (2004). Power of Digital Video Production in Developing Media Literacy Skills among K-12 Educators, Unpublished manuscript. William Paterson University, Wayne, NJ, URL:

http://center.uoregon.edu/ISTE/NECC2004/handout_files_live/KEY_61469/MNYildizpaper.pdf (last accessed on 31 August 2007).

Zancanaro, M., Cappelletti, A. and Stock, O. (2003). StoryTable: Computer Supported Collaborative Storytelling, in: *Proceedings of UIST*.

Zuckerman, O., Arida, S. and Resnick, M. (2005). Extending tangible interfaces for education: digital montessori-inspired manipulatives. In: *Proceedings of ACM CHI 2005 Conference on Human Factors in Computing Systems 2005*. pp. 859-868.

Zuckerman, O. and Resnick, M. (2004). Hands-on modeling and simulation of systems, *Proceeding of the 2004 conference on Interaction design and children: building a community*, ACM Press, pp. 157-158.

Appendix

A.1 Transcripts and pictures

Table A.1: Transcript from 90 seconds of A. and D.'s composition activity

Person	Line	Transcript <i>[time]</i>	Notes on actions	General notes
A.	1 2 3	See, you know... I think this ... maybe should go towards the end because it's talking about... September the eleventh...	<i>Picks up a card.</i>	Order in the sequence is established even before the discursive form is mentioned.
D.	4	Yes.		
	5	Then you've got sort of the...		
A.	6 7 8	Then here is the monetary one, I think, because, you know, it's talking about the EU...		'Locates' a theme in a place ("here"). 'Monetary' will be a dimension in their historical treatment.
D.	9	Yes.		
A.	10	So, maybe that can go there.	<i>Indicates a point on the table where other cards are.</i>	Proposes a grouping, given the place given to a theme.
D.	11 12 13 14	So, you've got sort of... You have got... The first thing is putting in relationship France and Germany, and then the re-unification, and the European Union.		A problem has been identified: the problem has become to relate F with G. She creates the need to find relations. Whereas, until now, cards were referred to

A.	15 16	Ehm... no 'cos we are putting them in a lot of different... like...	<i>With her hands she represents an architecture in layers.</i>	as themes. Layering is now preferred to sequencing. Cards are charged with new properties (levels). Those cards are used to refer to layers.
D.	17	We'll put them on these cards...		
A.	18 19 20	Yeah yeah. ... So, what did I say? We'll do... We can go backwards! Radio A... then was...	<i>Puts down three cards in a sequence, from right to left.</i>	A physical path has been created.
D.	21	Oh, I see! Ok.		
A.	22	Yeah, well, I mean, apparently...		
D.	23	So, right ok, then we can join things on the same...		Establishes a link between compositions: joining here means establishing contiguity.
A.	24 25	Yeah, well I mean, apparently it could also be th! th! th!...	<i>Mimes following the sequence of cards from left to right.</i>	Instead of contiguity, here the joining into a single sequence is proposed.
D.	26 27	Right, ok what... the things...		
A.	28 29 30 31 32 33 34 35 36	For example this Is not focused on co-operation bablabla... European union nanana... This one I think seems to lead to... should go with... with this about what he's saying about September 11, so we should put it in the middle	<i>Picks up a card.</i>	Cards are associated to keywords and distinguished by these.
	37	Which was number 3. 'Cos then he goes the relations... that got pushed out, and there they said... and Germany and Russia that got changed...	<i>Indicating card A.</i> <i>Points to between cards H and A.</i> <i>Puts it in the middle.</i>	In this area in space "lead to" rhetorically is associated to leading to spatially.
D.	38	Do we put them on little stands so that you can show...		
A.	39	Yeah...		

	40	I don't know... What do you think?		
D.	41	I think that...		
A.	42	I think this one	<i>Picks up a card.</i>	
	43	is a good introduction because he says they created Europe because after a switch of balance,... because basically...	<i>Keeps showing the card throughout her speech.</i>	
D.	44	Yes, ok.		
A.	45	... Because for me it seems like that they created the European Union to make a super power against America's super power...	<i>Indicates each one of the cards in sequence from left to right.</i>	Now, places and physical relationships between cards are used to refer to political relationships between states.
	46	This seems like a good way to start off...		
	47	And then afterwards we show that those are the problems... ..that they had...		
D.	49	Are you taking your general knowledge into account?		
A.	50	No, this is just what I understood.		
D.	51	Ok.		
A.	52	But I don't know like,...		
	53	where do you think we should start? ...	<i>(Unintelligible, they just start speak at once.)</i>	
D.	54	I don't know...	<i>Indicating a path through the composition</i>	A chronological and narrative order is indicated in the composition.
	55	You are trying to make sense of sort of what happened, how things came by. ...		

Table A.2: Transcripts from S. and L.'s composition activity

Person	Line	Transcript ⁸ [time]	Annotation on actions	Note
S.	1	[0"] The states, the big states.	Marks three areas using bluetack on the surface.	S. and L. have been exploring the digital videos attached to the composition created by A. and L. (see previous example). From this point S. and L. start altering the physical composition. Interprets the idea of 'the big states' from A. and L.'s composition. S. refers to this idea verbally and marking it visually with areas on the surface
L.	2 3	Here we have those about the states. [5"] Why don't we take... and put Russia, Germany... and America...	Using the same features of the ground that S. has prepared, she puts the cards concerning those themes standing in opposition, one facing the other.	
S.	4 5 6	[16"] But I would like to go beyond this thing... Because I think it is not only ... I mean it is not only a political question.	Pointing to two cards about issues concerning two states, that are standing, facing each other.	What might seem as an arbitrary choice made by S., gets appropriated by L.. She uses the physical ground prepared by S. to display the themes.
L.			She agrees. (5 minutes later)	
S.	7		[5'43"] Places two cards on top of the created box, making a flat surface.	
L.	8 9	Maybe we will put them together like this. 'Equilibrium', 'separation' ... 'avoided the problem'... [6'13"]	She is arranging some cards in groups.	Here the size of groups of cards matters in representing equilibrium and separation.
S.	10	Then yours seem all about ...	Taking the video cards from L.'s hands.	
L.	11 12	[6'21"] Then mine seem all about union, and yours seem all about separation.		

⁸ The original speech is in Italian. This transcript is a translation of the original.

Table A.3: Transcripts from a composition task: co-operation

Person	Line	Transcript [time]	Notes on actions	General notes
A.	1		<i>A. is triggering the clips corresponding to cards sequence on the table.</i>	A., F. and J. further the first cards sequence.
F.	2	[1"] Where should we put this J.	<i>Holding and showing a video card (referred to as 'X' in this transcript).</i>	
			<i>Places the card on the table</i>	
A.	3		<i>A. tries to grab card X as soon as J. leaves it.</i>	
A.	4	Well... yeah... ehm... .		
J.	5	[5"] I thought we already had a number for that.	<i>Putting his finger on card X.</i>	J. is concerned with having all cards numbered...
A.	6	[08"] This is the guy.	<i>Also puts his finger upon the card.</i>	... whereas A. is fine with referring to cards according to a conventionalised expression for their content ("the guy").
F.	7		<i>Grabs card X, also holding J.'s and A.'s hand, as they are all holding the card now.</i>	
F.	8	Should we try it... after '3'?	<i>Placing card X beside card number 3.</i>	Composition is evaluated. In fact, when F. says "Should we try it..." he indicates that act of placing a card in a composition involves trying out whether it works, which is done in the following.
J.	9	[12"] Yeah.		
F.	10	What's number 3 again?	<i>Grabs card X again.</i>	
J.	11	Hey, that's where we put it!		
A.	12	Oh don't put it first.	<i>Triggers the video corresponding to card 3.</i>	A. contributes to the decision by triggering the video, making it possible to discuss by relying on the video screening.
J.	13	No but I think we should put that first.	<i>Indicating card X.</i>	However, the discussion goes on without even waiting for the video to start.
F.	14		<i>Disagrees.</i>	
Video	15	[21"] "Scotland and England were protestant... whereas..."		The video starts when J. and F. are already disagreeing on the decision.

Table A.4: A transcript from a composition task: stall

Person or voice	Line	Transcript [time]	Notes on actions	General notes
A.	1 2	Right, eh... J., could we see ... eh... number five, please, J.? [00'10"]	<i>Gives the card to J., who triggers it</i>	Cards were given numbers with the purpose of easing the design of the infrastructure. But these cards, as all tangibles, were given shapes and pictures to provide ways of handling them. While here A. refers only to the number
J. Clip 5	3 4 5	No problem. [00'20"] "And... why was it protestant and was there any fear about any other religion?"	<i>During the showing of the clip they all have a look at it, even if not for the whole length</i>	
A.	6 7	I don't quite... is that just a question? [00'30"]		A. poses the problem in terms of judging the card according to its qualities as question
O. J.	8 9	Yeah, that's just a question. Want to see anything else?	<i>A. annotates the card: "question"</i>	Division of labour requires coordination. J. has nothing to do
O.	10	That's just one word	<i>Pointing to the annotation just made. Tutor arrives</i>	
Tutor A.	11 12 13	[00'40"] If you find a question... Ehm... number five it was eh... it's just Clare asking a question.		There is no reference to the 'content' of the card, e.g., what is the question, nor its type
Tutor A. Tutor	14 15 16	[00'50"] Ok, If you think that you can find an answer to that question/ All right! [01'00"] ...then you can use the question and the answer.	<i>A. takes all the cards still to be explored</i>	
O.	17	[01'10"] One, two, three, four, five, six, seven, eight, nine, ten...	<i>Counting the video-cards which are already part of the sequence.</i>	

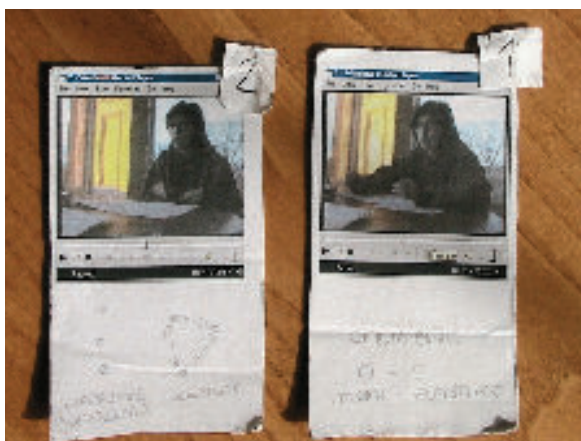


Figure A.1: A first version of cards: including a space for annotations

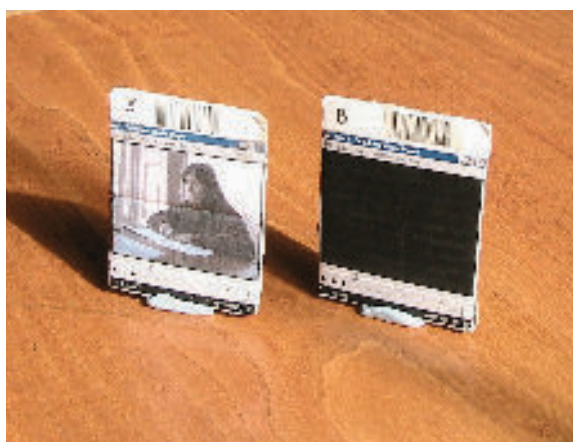


Figure A.2: Examples of cards as referred to in the study

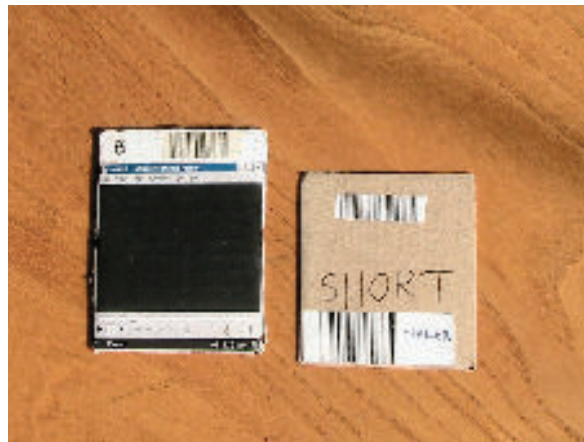


Figure A.3 : Example of a separate card for the function 'shorten'



Figure A.4: A physical arrangement of blocks which corresponds to a video editing of two parts of the propaganda animation for healthy eating and one part of the TV commercial about crisps, and with the sound track from the TV commercial (which is to be placed in the area below, as in the figure)



Figure A.5: Similar example of figure A.4, but starting with a video episode from the TV commercial



Figure A.6 : Example of coupling of blocks (i.e., a coupling between two sides one of each block). This combination triggered a mixed editing from the animation and the TV commercial. The visual reference was symbolic. That is, fruit and crisps stood for the main subject theme of the two original videos.



Figure A.7: Similar example to that of figure A.6, but with a direct reference to an action, as opposed to a symbolic reference. The action is 'eating'.

A.2 Published papers

Iacucci, C., Pain, H. and Lee., J. (2003). Collaborative Authoring Practices with Video Episodes: Designing for accountability of learners' methods in re-using video material, in: B. Wasson, S. Ludvigsen and U. Hoppe (eds), *Designing for Change*, Kluwer Academic Publishers.

In this paper, the author of this thesis contributed by writing the literature review, designing and carrying out the empirical studies, and describing and discussing them in the paper.

Jacucci, C., Jacucci, G., Wagner, I. and Psik, T. (2005a). A Manifesto for the Performative Development of Ubiquitous Media, in: *Proceedings of the 4th decennial conference on Critical computing*, ACM Press, pp 19-28.

In this paper, the author of this thesis contributed by: formulating the design agenda on ubiquitous media, advocated in the paper, especially for the points concerning the role of media studies, and the application of approaches from the performing arts; providing the first of the three provocative examples; providing two sections of the foundations of the paper, that is the one on 'theatre, performances and design', and the one on 'conceptualising media: form and participation'; and contributing to formulating the four points of the manifesto in the paper.

Jacucci, C., Pain, H. and Lee, J. (2005b). Media Co-Authoring Practices in Responsive Physical Environments. In T. McEwan, D. Benyon and J. Gulliksen (Eds.), *People and Computers XIX – The Bigger Picture*, Springer-Verlag.

In this paper, the author of this thesis contributed by writing the literature review, designing and participating in carrying out the empirical studies, and describing and discussing them in the paper.

Jacucci, C. (2006). Guiding Design with Approaches to Masked Performance, *Interacting with Computers, Special Issue on the emerging roles of performance within HCI and Interaction Design*, Elsevier, 6: 1032-1054.

The author of this thesis wrote the literature review, and chose the principles from approaches to masked performance from the theories and from practical activities in the theatre, and transposed them to the context of interaction design.

CARLO JACUCCI, HELEN PAIN, JOHN LEE

PRACTICES OF COLLABORATIVE AUTHORIZING WITH VIDEO EPISODES

Designing for accountability of learners' methods in re-using video material

Abstract. In this paper we explore collaborative re-use of educational video. The focus is on how to design supporting media in relation to how users jointly constructed a shared understanding of the tasks at hand. We explore the collaborative tasks of constructing collages using episodes of recorded speech, including tutorial dialogues and broadcast talk. The practices were devised, recorded and analysed both in digital environments such as Powerpoint, and in physical settings in which hard-paper snapshots embodied the video-clips. We report problems that emerge from such practices that relate to the *open* interpretation of the representations, and the need to rely on this to achieve active spectatorship. Our discussion relies on how users collaboratively conduct the tasks and appropriate the tools. This suggests some principles that address issues of designing support for collaborative learning in which digital video is used as a resource.

1. INTRODUCTION

Tools for producing, accessing and modifying digital video are enabling new educational practices. Attempts to engage learners in exploring tasks with such resources can inform the design of constructive and collaborative learning practices. However, if the aims are to realise the potentials of digital video and authoring tools by fostering learners' 'active spectatorship', critical thinking and participation, and by engaging learners as information designers, problems related to the production and interpretation of visual arts may be encountered. The access of these resources in contexts of use prompts their interpretation depending on background and interests that they evoke but that are not directly represented by them. To understand their effectiveness it is often not sufficient to rely on empirical studies of personal or collective acts of reading (as studied by sociology of reception). The aim of this paper is to contribute to an understanding of such problems and to propose directions for learner-centred design for these distinctive media through constructive activities. We are concerned with collaborative practices in which video episodes are treated with a degree of 'openness' for interpretation. This will allow us to formulate the design problem around a conception of 'collaborative learning' that is centred on the issue of learners' building of a 'shared knowledge' (Koschmann 2002, Arnseth and Solheim 2002). The example in section 2 will permit to define the questions more in detail in section 3. The empirical study in section 4 will address them presenting a new setting, and lead to the discussion in section 5. In the discussion we will draw some consequences of addressing the problem in our context and propose more general conclusions about designing supporting media for collaborative authoring with diverse multimedia objects.

Recent research has addressed the effectiveness of tutorial dialogue videos as educational resources (Cox et al. 1998) and the possibility of fostering active participation of 'overhearers' in such videos (Lee et al. 1998). Numerous systems have been designed that provide ways of supporting collaboration through media that combine video and other media-texts, including annotations, hyperlinks, and multimedia compositions (Liestøl 1994, Plowman et al. 1999, Cadiz et al. 2000). Several problems affecting learners' experiences have been documented in these studies. Some of them are still poorly understood: learners being 'overwhelmed' by distracting functions of the technology, being distracted by the 'syntax' of the task or being 'disoriented' or 'overloaded' with information in their 'exploratory' activities (e.g., Pang and Edmonds 1994, Liestøl and Morrison 1998). In general, the following goals are still relevant to these contexts: how to make knowledge-construction overt; how to maintain attention to learning goals; how to provide process-relevant feedback; how to give to learners the responsibility for contributing to each others' learning (Joyce 1999).

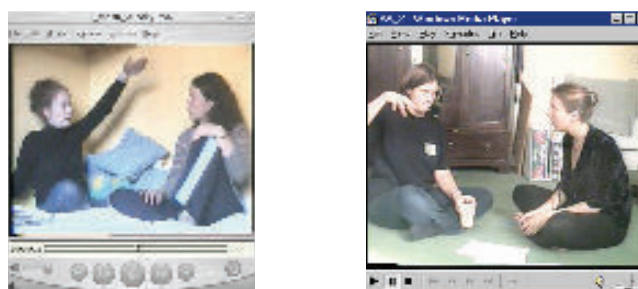


Figure 1. Two snapshots from the clips used in the first study.

2. FIRST STUDY

Two learners are engaged in collaboratively constructing and presenting a hyper-media composition, using physics lecture notes and pre-existing short video clips of students dialoguing about physics issues (figure 1). The instructions are that the clips should be incorporated in a Powerpoint presentation in order to represent a 'point of view'.

Observations. Learners reiterate sequences of actions selecting multimedia objects and combining them together. The task is open-ended and at some point each pair of learners starts redefining the task. Learners' "understanding" of the content of the video episodes influences and is influenced by the use they make by placing them in the presentation. By looking at the discursive structures they put in place in their compositions, or at how they present them to others, we can get insights about how they critically interpret the videos. Learners' interpretations are not only *critical*, but

can also be driven by the *use* they make with the representations. They serve various expository functions or syntagmatic forms. They can constitute *arguments*, by putting forward a thesis and supporting it; *narratives*, when the driving motive is not truth but action; *collages*, when associations between multimedia objects create new meanings. These alternative uses can suggest alternative epistemologies that learners followed in conducting some inquiries. Their practices are mediated by the representations they share in the authoring process.

In spite of the poor visibility of learners' collaboration around these issues through the interface we have used (Powerpoint), we can make the following general observations. (1) *Seeking unity*: the main activities in which learners are engaged aim to create unity and coherence among a given set of multimedia items; (2) *Inaccessibility of the 'a priori' conditions*: learners are prompted to choose an interpretation and display a point of view. But the original objects are chosen, not produced, by them 'a priori'; (3) *'Openness' and 'closure' of texts*: by framing them in the presentations, sometimes texts' (videos) interpretations get closed to various degrees. This can suggest *preferred* readings, or open a field of possibilities for interpretation. This is similar to the property of texts' *openness*, defined by Eco (1967). In this sense, readers' active engagement in interpreting framed texts can become more important than "right" answers; (4) *Interpretation as production*: if we can regard learners' compositions as being 'authored' it is because they are the end of an interpretation. Such interpretation is also a production because it has realised itself through selection and composition. By framing the videos in hypertexts the dialogue utterances get 'relocated' (Linell 1998), learners de-contextualise and re-contextualise them.

In conclusion, framing multimedia objects engage readers in reconstructing the original context and 'intended' interpretations (even if there aren't any). But relating such activities to learning is problematic. In the example, the layout of the shared interface probably suggests solutions, and resolves steps in negotiations about what perspective the collaborative project should take. By looking at this example alone we cannot conclude whether features of the mediating tools do implicitly suggest to learners an epistemology for conducting inquiries, or whether learners would come up with different practices in sensibly different interfaces.

3. QUESTIONS

Learners found ways of accommodating features of the video episodes such as their *incomplete* and *allusive* characters, and their openness to diverse interpretations. Some problems arise.

A problem: 'alternative epistemologies'. Like pedagogical designers, participants use media material, tools, language to redefine or recontextualise references to multimedia objects, and such usages have a relevance to how learners jointly conduct inquiries in the first place. Our interest is beyond providing means to accommodate such features of video and multimedia authoring tools for collaboration. We also question in what sort of inquiries learners can be supported.

A problem: arguing and negotiating. The video episodes are semantically rich and the task open-ended, and the boundary between misunderstanding and disagreement is narrow, as it is a general problem in collaborative learning settings (Dillenbourg 1999). In our case learners can easily create a presentation without really engaging with its content. Since learners' roles are not well defined—compared to similar practices in professional contexts, like news media language production—motivation or space for negotiation may be lacking. These problems call for a redefinition of the research questions in our context.

A question about interpretation and use: how do learners transform multimedia objects into 'artefacts'? A critical issue of the collaborations we consider is that they may aim for objectivity or propaganda, and at the same time be highly subjective. Learners' participation as observers and readers changes as soon as they treat the representations as *artefacts*, as opposed to *mimesis* of reality. This is characterised by the awareness of the presence of authors and interpretations. When learners create an order in the setting through their inquiries, they rely on a variety of methods to transform and locally design representations. Are such methods instructed, or do they arise as constituent practices? How can we investigate and facilitate such methods in different disciplinary settings?

A question about design and use: how to support the accountability of learners' practices'? Returning to the general question we raised earlier, supporting the 'practices of meaning-making in the context of joint activity' (Koschmann 2002) means, in our case, designing for accountability (Eriksen 2002) of learners' methods in conducting their task collaboratively. By describing a perspective for using video material we need to rely on the empirical analysis of learners' practices in becoming aware of competence systems which are autochthonous to the distinctive media and material surfaces they used, such as videos, edited sequences, collages, and to provide learners with an environment that permits their methods to be inspectable.

4. SECOND STUDY: A PHYSICAL SETTING

This section addresses the problem of making learners' collaboration more accountable and the issue of the design of authoring practices in which the original representations are interpreted and 'framed' into physical compositions. We will look at the case of facilitating learning about the history of European politics. An instructor provided some diverse video episodes displaying speech interactions between both experts or novices, aimed at giving learners access to a variety of languages and ways of talking about a restricted set of issues. The instructor didn't test in advance the effectiveness of the video episodes as a way to deliver to *those* learners and in *that* context some intended meanings. Instead of pointing learners to his own interpretations, he gave the set of clips to use in an open ended authoring task. Although he had selected and chunked each clip, to some extent framing them, they were not introduced, concluded, commented on, nor titled, but simply numbered and made available. Five pairs of learners were instructed to make use of a set of

physical items to produce a physical collage on a table, in which eleven short video episodes were embodied in coloured snapshots. Learners were engaged in looking at and annotating them, and then in jointly building a shared representation. They presented selected clips in a compound composition, to synthetically represent the controversies according to an emerging point of view. The composition was a collage in which they could integrate various information items and artefacts. Subsequently, they presented the installation they made to others with the aid of a laptop for showing the videos indicated at any point in the presentation.

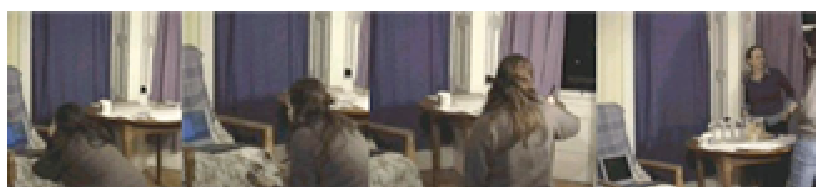


Figure 2. Accessing the clips through a laptop and composing an installation

Three episodes were taken from a radio interview with a Professor of Politics, four were comments on this interview by an European foreign politics expert, and four were segments of tutorial dialogues between students (two were naturally occurring conversations, two displayed students in devised improvisations—figure 3).



Figure 3. Two examples of clips used in the second study

The objects learners used to construct the composition included coloured card mounted snapshot for each video clip, white hard-paper cards, blue-tack, pens, and coloured tape to define areas on a white table surface. The compositions produced are quite diverse (figure 4 shows examples a, b, c and d). Example (a) in figure 4 is a composition in which video-cards are annotated and displaced in layers. The construction has four faces, each one giving a different perspective of a problem. The inner layer inside the construction represents a driving question, and the outer

layers can suggest higher degrees of abstraction. A similar idea of using sides of the same construction to display different perspectives of a problem is implemented in example (b). Here there also is an argumentative path of standing signs with annotated video cards suggesting a starting point for exploring the construction.

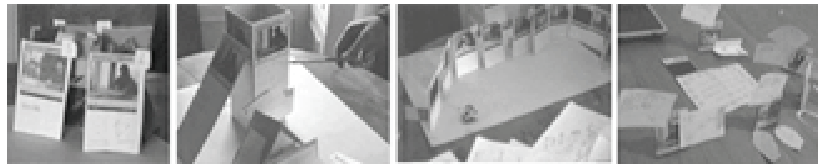


Figure 4. Examples (a, b, c, and d) of installations produced by different pairs.

Example (c) displays a simpler idea of physical path as a sequence of standing cards. Here video-cards are associated to the next in the sequence by thematic cues. The physical display of the sequence makes a curve to represent an *impasse*. Also example (d) displays standing cards on the surface, but the paths radiate from a central annotated video card.

Table 1. A synthesis of features of our approach to devising and exploring the tasks

<i>Producing the initial material</i>	Performing and capturing	Capturing spontaneous interactions, scripting and devising improvisations.
	Multiple originators	Mass media, documentary, teachers' and learners' talk and interactions.
	Multiple genres	Broadcast material; naturalism and realism in representing natural conversations, interviews.
	Episode-based	An instructor has selected and chunked episodes.
<i>Instructing and enabling the tasks</i>	Open task	The instruction is to create an order by representing a point of view.
	Itemised access	Each card corresponds to a video episode.
	Spectatorship	Access and readership both in pairs and alone. Pairs also perform a presentation of their installation.
	The physical setting	The physical objects have references to the digital environment; they enable activities of <i>bricolage</i> .

5. DISCUSSION

Essential features of learners' collaborative work concern how they create artefacts through interpretation and use, and how they achieve a common understanding. By observing learners' work with physical collages we get evidence of the diversity of ways to appropriate the objects and representations, and to build a local language to deal with compositions. In the light of research on the pragmatic aspect of reading, we consider the relationship between interpretation and use of the representations. Methods for timely re-use artefacts produced, in order to account for joint work, can ground the problem of designing supporting media.

5.1. Learners interpreting and using representations as artefacts

In "Opera Aperta", Eco (1967) addressed the problem as to how and to what extent a text should foresee the reactions of its addressee. Eco (1981) tried to find the roots of artistic "openness" in the very nature of any communicative process as well as in the very nature of any system of signification. This led to enquiring how "an artistic text contains, amongst its major analyzable properties, certain structural devices that encourage and elicit interpretive choices" (Eco 1990: 52). Participants in our studies do make use of such *devices*. They transform representations by framing and embedding the multimedia objects. Interpretation and use are aspects of the same achievement.

Affecting texts' 'closure' by framing. By *framing* them, learners arrange multimedia objects and create juxtapositions, making discoveries about new meanings that get *created*. This happens according to quite different principles, for example, continuity (aiming at smooth transitions, and at the devices of compositions), or contrast (producing new meanings by the clash, comparison or contrast of two or more objects, in images, films, texts). When learners author the multimedia objects, they select and give salience to elements of the representations. The activities of 'framing' concern what is explicitly displayed and what is left out. These actions 'close' the range of possible interpretations that readers can give. The term 'framing', from media studies, essentially refers to selection and salience. In the practices we have observed this is a driving motive, practical methods being collected around the making of salience. This doesn't exclude the relevance of their act of *critically* interpreting the representations, but it emphasises the course of actions in which texts' interpretation is realised by their *use*.

Embedding and quoting. Learners need to accommodate that the recordings, just as speech utterances in general, are essentially incomplete and allusive. By editing them together participants need to adapt their inherent occasional and elliptical character, in order to achieve some unity. Also, most of the information used is second-hand—they report what other people say—and the production as well as the reception of such mediated discourses are fragmented, because there are multiple originators and a fragmented audience. The concept of embedding, as referred to by Bell (1991) in analysing the production of 'news media discourse', reveals important

features of such practices. By ‘embedding’ participants quote and juxtapose original texts. This motivates negotiations when the problem becomes “how do we use it” instead of “what does it mean”. Quotations can focus the readers’ attention on textual functioning rather than on text critical interpretation, as they generate a tension between the original integrity of the video episode and the possibility of reintegration. This opens a whole range of means to elicit responses in readers.

Both framing and interpretation are generally governed by conventions and rituals (Bell 1991). In the current setting, a challenge is to create environments for collaboration without trivializing the task: learners should be able to culturally determine their conventions and rituals and apply them in the authoring and interpreting processes. In other words, we can favour learners’ treating of multimedia objects as ‘cultural artefacts’ (Suchman *et al.* 1999).

5.2. Accountability

The problem of understanding the ‘practices of meaning-making in the context of joint activity’ is a core issue if we are to improve and support the learning practices. The problem of designing for a system for using digital video in collaborative practices ultimately becomes the problem of discovering new practices. Like Suchman *et al.* (1999), by the ‘developing of the system’ we intend

... not the creation of discrete, intrinsically meaningful objects, but the cultural production of new forms of practice. (*Op. cit.*: 404)

Koschmann (2001) points to the need for documenting how learners *do* learning, and to regard this as being quite different from researching learning outcomes isolated from situation of use. Referring to Problem Based Learning (PBL) sessions, he argued for *practice-based* descriptions, as opposed to theory-based and procedural descriptions:

“Participants within a PBL meeting, for example, must construct their own interpretations of what it means to “formulate a problem” or to apply their knowledge.” To create such interpretations they don’t begin by asking themselves how shall we proceed to undertake some prescribed action? Instead, their interpretations of the prescribed actions are negotiated interactionally on a moment-by-moment basis. What needs to be explicated, therefore, are not the abstract instructions that tutors and students follow (or fail to follow), but rather what they do when they say they are doing PBL.” (*Op. cit.* 2001)

Our research agenda is centred on the problem of relying on locally, practically accountable methods that learners use. Earlier studies on ethnomethodology to describe laboratory work (e.g., Lynch *et al.* 1982) have focussed on a similar question. The locally produced events with which students turned laboratory instructions into actual inquiries are described as *embodied* practices, for how they were *circumstantially contingent* and ‘found only in and as a course of locally situated work’. They are described ‘in the spatiality of the arrangement of the lab-table’s display’, and for how they are done *unwittingly*. Collaborative activities, in our setting, can be analytically collected around the theme of building shared knowledge through: (1) *Framing in spatial arrangements*. The participants’

embodied work with the material surfaces constituted spatial arrangements in which the reified multimedia objects were framed and made accessible, leading to extensive interchanges between the two participants in the course of the task. The quality of such interchanges relies on how they appropriated the resources for representing the problem. Through these activities they redefined the task at hand, and made their actions coherent in inspectable details; (2) *Accounts of procedures*. Comments and problems in negotiating the meaning of what was said were fitted to features of the emerging representation. They were exploited by the participants to give an account of their representation; (3) *Assembling and re-using methods on the basis of results in hand*. These features become apparent when we take into account their ties to the sequential organisation of the task.

5.3. Conclusion

If we want to discover effective ways of using video material as a learning resource, we can engage learners themselves in such practices as interpreting, editing, framing and presenting them, which usually pertain to pedagogical designers. Under certain circumstances and with the aid of some media these can be effective collaborative learning practices. In order to be able to make judgements about this, we must account for collaborative practices that emerge and study how media tools get appropriated in the course of joint activities. If we aim at the quality of the collaborative learning, we need the learners to be able to *account* for each others' learning practices, as in our second study. This goal follows from conceiving 'collaborative learning' as the 'practices of meaning making in joint activities'. In identifying a major interest for research on Computer Support for Collaborative Learning, Koschman (2002) proposed that

CSCL is a field of study centrally concerned with meaning and the practices of meaning-making in the context of joint activity and the ways in which these practices are mediated through designed artifacts. (*Op. cit.*: 20)

In our context we focus on the practices of construction—or deconstruction—of texts performed by interpreters and authors, insofar as such practices are implemented, encouraged, prescribed or enabled by textual compositions. Learners' methods to accomplish such practices seem to operate independently of any professional or pedagogical interest, and do not rely upon approved methods of inquiry. They provide a rich context to inform the design of media and artefacts to support collaborative learning.

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REFERENCES

- Arnseth, H.C. & Solheim, I. (2002). Making Sense of Shared Knowledge, In *Proceedings of CSCL 2002*, 102-110.
- Bell, A. (1991). *The Language of News Media*, Oxford: Blackwell.
- Cadiz, J.J., Balachandran, A., Sanocki, E., Gupta, A. & Grudin, J. (2000). Distance Learning Through Distributed Collaborative Video Viewing, In *Proceedings of CSCW 2000*, 135-144.
- Cox, R., McKendree, J., Tobin, R., Lee, J. & Mayes, T. (1998). Vicarious Learning from Dialogue and Discourse: A controlled comparison, *Instructional Science*, 27, 431-458.
- Dillenbourg, P. (1999). What do you mean by 'collaborative learning'? In P. Dillenbourg (Ed.) *Collaborative-Learning: Cognitive and Computational Approaches*, Oxford: Elsevier, 1-19.
- Eco, U. (1967). *L'Opera Aperta: Forma e indeterminazione nelle poetiche contemporanee*, Milano: Bompiani. English translation: *The Open Work*. Cambridge, Mass.: Harvard University Press, (1989).
- Eco, U. (1981). *The Role of the Reader: Explorations in the semiotics of texts*, Hutchinson.
- Eco, U. (1990). *The Limits of Interpretation*, Bloomington and Indianapolis: Indiana University Press.
- Eriksén, S. (2002). Designing for Accountability, In *Proceedings of NordiCHI 2002*, 177-186.
- Joyce, M. (1999). Siren Shapes: Exploratory and Constructive Hypertexts, *Academic Computing*, 3, no. 4, 10-14, 37-42.
- Koschmann, T. (2001). Dewey's Contribution to a Standard of Problem-Based Learning Practice. In *Proceedings of the European Conference on CSCL 2001*, 356-363.
- Koschmann, T. (2002). Dewey's Contribution to the Foundations of CSCL Research, (keynote contribution). In *Proceedings of CSCL 2002*, 17-22.
- Lee, J., McKendree, J., Dineen, F. & Cox, R. (1998). Vicarious Learning: dialogue and multimodality, In *Proceedings of the Second International Conference in Computer Multimodal Communication*, 177-180.
- Liestøl, G. (1994). Aesthetic and Rhetorical Aspects of Linking Video in Hypermedia, In *Proceedings of ECHT'94*, 217 - 223.
- Liestøl, G. & Morrison, A. (1998). Making Sense of Multimedia Training, In *Proceedings of ICCE'98*.
- Linell, P. (1998). *Approaching Dialogue: Talk, Interaction and Contexts in Dialogical Perspectives*, Amsterdam: John Benjamins.
- Lynch, M. (1982). Technical Work and Critical Inquiry. Investigations in a Scientific Laboratory. *Social Studies of Science*, 12 (4) 499-534.
- Pang, K.W. & Edmonds, E.A. (1999). Modelling the Learner in a World Wide Web Guided Discovery Hypertext Learning Environment, In *Proceedings of INTERACT'99*, 251-265.
- Plowman, L., Luckin, R., Laurillard, D., Stratfold, M. & Taylor, J. (1999). Designing Multimedia for Learning: Narrative Guidance and Narrative Construction. *Proceedings of CHI'99*, 310-317.
- Suchman, L., Blomberg, J., Orr, J. & Trigg, R. (1999). Reconstructing Technologies as Social Practice, *American Behavioral Scientist* 43(3): 392-408.

A Manifesto for the Performative Development of Ubiquitous Media

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ABSTRACT

This paper addresses design agendas in Human-Computer Interaction and neighbouring fields motivated by the *mixing* of areas that were mostly kept separate until recently, such as media studies, performing arts, computing, and ubiquitous or tangible interfaces. Referring to new developments in this interdisciplinary research area, and moving from three specific design cases, this paper proposes a critical design agenda that pragmatically joins: concepts from media studies, tangible or ubiquitous media design concerns, anthropological perspectives to performance and practices of theatre performance.

ON DESIGN AGENDAS AND UBIQUITOUS MEDIA

A discussion on design agendas in Human-Computer Interaction and neighbouring fields is made particularly timely by the *mixing* of areas that were mostly kept separate until recently, for example, media production, computing, and ubiquitous or tangible interfaces. We refer to this mixed area with the concept of ubiquitous media, for which we propose a critical design agenda. For HCI in general, different design agendas and approaches can set different priorities privileging a certain aspect of the design, for example, the social, the cognitive, usability, or efficiency; they can point to a vision as pervasive computing or ambient environments, addressing predominantly some settings or scenarios; they can make use of different design methodologies and conceptual frameworks.

Several new design agendas and approaches have surfaced recently. Dourish [11], drawing from ethnomethodology and phenomenology, proposes a new model of human-

computer interaction based on the notion of embodied interaction that he defines as “the creation, manipulation, and sharing of meaning through engaged interaction with artefacts” (p. 126). While providing a set of principles around embodied interaction, Dourish recognizes that questions of “how it should be developed, explored, and instantiated remain open research problems”. Other approaches have critiqued the ‘disappearance’ of computers in the environment and the strive for embodied interaction, suggesting that these design ideals may be unachievable or incomplete and proposing seamless design and design in heterogeneity as alternative or complementary agendas [10]. A design philosophy and agenda for everyday computational things has been proposed [17], where meaningful presence is contrasted to previous imperatives from usability as, for example, efficient use. In this design approach, time is the central parameter as exemplified by “Slow Technology” and aesthetics is the basis to design presence. Designing for the user experience and its social dimension co-experience [13] are also related attempts to define design agendas for HCI and related fields. Lately, designing pleasurable products and design for emotions are growing areas of research into designing interactive systems [6,22].

Unlike the above approaches, our contribution joins pragmatically the following elements into a critical design agenda: 1) concepts from media studies, 2) tangible or ubiquitous computing programs, 3) anthropological perspectives to performance and practices of theatre performance.

Based on experiences from three design projects we outline a programmatic manifesto that contains the following themes:

- applying concepts from media studies as generative principles to realise potentials of ubiquitous media
- investigating novel practices and forms of participation in multimedia production and use

- applying concepts from anthropology of performance to situate interaction within events, expression and experiencing
- approaches to devising collective action from the practice in the performing arts that translate into interaction design to ‘make sense’ of the role of space, artefacts, constraints, senses etc.

PROVOCATIVE EXAMPLES

Media literacy in physical environments

The case studies described in the following (one of which is more extensively reported in [20]) are a series of collaborative authoring practices devised with groups of primary school pupils. They were engaged in working at specific media analysis and production tasks in a physical environment endowed with responsive features through barcodes/barcode-readers or camera recognition tools. The studies aimed at devising practices to rearrange, produce and modify audiovisual recordings in order to create different genres, including documentaries, advertisement and news. Pupils could select, edit and produce multimedia material through a series of collaborative tasks of reading, scripting, interpreting, annotating, editing, video-shooting, and composing visual and temporal recordings. The environment enabled them to do so partly by acting and manipulating digitally ‘augmented’ physical objects.

In these studies we aimed to devise practices in which media texts are not just ‘vehicles’ but are employed as workable material and rearranged in physical environments. Such a context demands practical approaches to design. The design case addressed media literacy, and we had to make practical choices to explore and define forms of media access and deconstruction. Matters of aesthetics: form, content, and in particular the creation and disruption of *unity* need to be addressed through practical attempts.

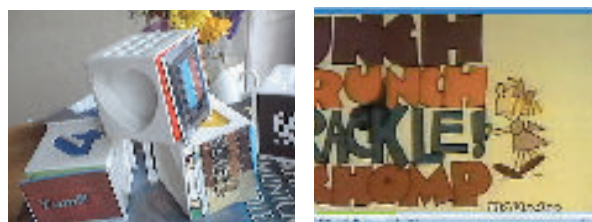


Figure 1. Media co-authoring in space: collaborative ‘composition’ of media texts in responsive environments

The tangible interface, as well as all the aspects of the ‘infrastructure’ had only in part been designed in advance. They were developed further in collaboration with pupils and teachers. The description given in [20], focuses on how they enabled creative practices in which media ‘access’,

‘deconstruction’ and ‘authoring’ acquired specific forms. In order to provide a basis for the discussion, here we will highlight the ways in which the designed features were integrated by the participants in their work and enabled specific kinds of cooperative work in the setting.

Physical and digital features of the artefacts can be integrated according to instructions, rules, conventions and procedures, either imposed or made to emerge. Our study addressed the ways in which this can be achieved through practical attempts to engage participants in making sense of new activities. The goal of the practices in the schools was to provide pupils with the necessary skills and resources in order to ‘access’, ‘deconstruct’ and ‘author’ some genres of media compositions through which the subjects taught can be represented. An underlying assumption of the approach is that abilities to critically *read* media texts cannot be addressed fully without favouring also the acquisition of *expressive* abilities of *authoring* with the same sort of media texts. In this sense, we aimed to turn the knowledge of media languages that pupils acquire in their daily life into a resource. ‘Tangibles’ provided new opportunities to apply such a resource to critical reading and composition of documentaries, trailers, interviews, adverts, reviews and other broadcast or narrowcast media genres.



(1) (2)

Figure 2. Tangibles and interactive features (1): physical, visual, interactive features, and symbols, icons and indexes to digital audiovisual recordings. In this picture the media texts segmented, rearranged and packaged into physical formats are to deconstruct a commercial of crisps (2).

A set of practical tasks addressed the deconstruction of the language of documentaries and other common media ‘languages’[4]. In order to train pupils on reading and modifying instances of genres of media texts, we addressed different types of TV news, documentaries and interviews. Inevitably, and relevantly for the discussion in this paper, we aimed at devising open ended tasks and we had to trade off freedom of expression and the imposition of rules and conventions. In contrast with most traditional video editing suites, the setting devised in the study enabled some simple forms of physical manipulation and rearrangement of temporal recordings. Video episodes were mostly represented on physical objects and displayed on screens or projections by physically acting on them, thanks to the interactive features.

Emerging Themes

A major question in devising collaborations around the environment addressed in this case, is what are the ways in which pupils make sense and participate in the definition of their own tasks. An important aspect of their contributions is the emergence of genres of representation. Such genres consisted in conventions and rules of structure and form in putting together elements from different media, and using tangible and spatial aspect of the environment to give unity to compositions. For example, some interactive features, as barcodes, were attached to windows, by scanning which in conjunction to a video card, one could have a particular ‘perspective’ (view) of the corresponding content. The very mediating nature of feature in the responsive environment were adapted to the necessities in local composition tasks. For example, a small table was assigned the local feature of giving a short version of media texts: a barcode was attached to it, by scanning which in conjunction to video cards short versions were screened. Hence, some ways of integrating media composing features in the physical environment caused pupils to perform activities, and opened new perspectives to the composition task. Directing participants in continually reinterpreting the very nature of the tasks suggested new ways of conceiving the mediating role of the responsive features attached to the environment. The focus of our design effort shifted from looking for the ‘meaning’ of physical actions (as actions on the digital media) to fostering media composing functions that created opportunities for more or expressive embodied actions. This became evident when rhetorical figures – such as a window meaning a ‘view’ (perspective) and small places or features in the space being used to shrink media objects – became commonly used for their driving force to give meaning to physical actions. A major theme emerging from this case is the directed exploration of alternative activities with a given set of technologies and conventions. In this paper we address the ways in which participants creatively contribute as ‘authors’ by the appropriation of media texts through tangible activities of transformation. How these transformations are made into genres, and valorised, attributed, appropriated, circulated, depends on how we engage participants in exploring the alternative possibilities they have at their disposal to relating to each other. This showed an example of how the design approach can be developed through performing activities, in such a way that performance is attuned to the underlying forms of interpretation and participation through the media.

Mobile Multimedia in Co-Experiencing the Rally

The experience of a large scale event (e.g. sport events as Rally or Olympics) depends to a large extent on the crowds of spectators, which are generally thought of passively enduring the event and thought as consumers of an increasing amount of accessories, gadgets and services. Most of the current computing applications (including research work) play an important role merely in expositions offering simulators and computer games, which are set

apart from the competition. Moreover, while current services and research target exclusively individual spectators, statistics show that spectators visit events in groups. Our research points to how the experience of the event is socially constructed and any application or service could take this into consideration. Current computer applications in large scale events propose a very traditional and social-cultural uninteresting role for computing which is socially alienating as individual visitors dedicate their resources (time, cognitive resources, etc.) away from social relations; it is distractive alienating the visitor away from the competition as the computer games and simulators create a reality set apart from the event.

In the following we report of a field study on two groups of spectators at a FIA World Rally Championship in Finland. Both groups were equipped with camera phones. The analysis of the organization of experience-related activities in the mass event showed a central role of mobile multimedia as a powerful expression tool that contributed in constructing the “rally experience”. From this fieldwork we have an initial understanding of the spectator’s experience in distributed sport events. Spectators are actively engaged in staging their experiences: navigating and selecting places, settling, creating multimedia records, expressing group image (some wear “uniforms”), interacting within their groups and with strangers. Spectators are organised in groups that display a characteristic image and exchange joke, tips, and information also between strangers.

We observed a rich articulation of situations in which the members of each group created and shared mobile media which contributed to enhance the spectator’s co-experience of the rally in several ways.



Figure 4.



Figure 5.

Hunting or Documenting. The recording of pictures or video clips became part of a “hunting” or “documenting” collaborative activity. For example, the groups ‘ambushed’ the leader of the Rally between two stages and recorded the passing of the car in a video clip (Figure 4). The other

group of spectator engaged in a hunt and documentation for rally car trucks and all the members photographed several trucks including a toy trucks in a gas station (Figure 5).

Competing. After the recording of a picture or a video the spectators often immediately showed it to other members of the group (Figure 5). Pictures and videos were compared and members discussed about shooting techniques.

Joking. The recording of a picture may also be a part of a joke or a game, in the way that it is purposefully created to be part of a playful exchange or interaction: amusing themselves taking a picture of a strange insect on a shoe of one of the member (Figure 5), or making jokes in replying to Multimedia Messages.

Staging and portraying. Pictures were also the outcome of staged situations or portraits that involved the participation of several members.

Emerging Themes

The central point that emerged from the observations is that the mobile multimedia records emerged collaboratively and that the relevance of the media collections of a member resided in the way they were combined with the ones of the other members. Examples are the jokes that emerged from replying to Multimedia Messages in which one message of one member alone is not relevant but the chain of replies in co-authorship conveys the joke. In the same way hunting, documenting, and competing picture records were meaningful when compared and shared among the group and were important to create and experience collaborative situations (the competition, hunting, documenting etc.). Moreover, this example stresses how the production and fruition of mobile multimedia can be intertwined as these media records were mostly relevant during the event while they were collaboratively produced, with the role of heightening the co-experience of the event.

These observations problematise media production models that identify an author and separate the production from the fruition through the media. This example introduces the theme of participative media (and co-authorship). By indicating relations between expression and experience it points to the relevance of a performance perspective in understanding interaction and the role of ubiquitous media.

An Environment for Learning Architecture Design

This case is about the creation of a mixed media environment for the project-based learning of architecture students [5]. As objects of the trials, the environment had a variety of components: physical inputs – sensors, RFID tags and barcode scanners – to animate physical models and diagrams; media players, multiple projectors, and a physical infrastructure including furniture, to create and configure mixed spaces; an application to paint physical models projecting digital texture with a real brush; computational support to record and visualise multimedia paths while visiting remote sites; tools to manage configurations of digital media in the environment and associations of

physical inputs and digital outputs. The trials resulted in a variety of performative uses of ubiquitous media.

One student prepared an elaborate presentation of her design ideas for an ‘extreme stadium’ in the area between Vienna’s two large museums. She had prepared a soccer field and two slide shows, with one screen displaying cultural aspects of soccer (images, sound, video) and the second screen displaying her design ideas in the making. The slide show was operated through a sensor that had been fixed underneath a miniature soccer field (Figure 6). In the words of the performer “it was the idea to have soccer-games or soccer tools like the ball, yellow card as sensor tools. Also the architectural project used soccer terminology instead of common architecture words”. When the ball touched the goal, a sensor triggered off a reporter’s voice shouting ‘goal, goal’ and the cheering of the visitors. The yellow card was also given to members of the teaching staff to interrupt the presentation with questions and comments. Spectators were invited into an arrangement like in a stadium: “In the presentation them sitting around me, like in a stadium, the whole atmosphere was like in a noisy stadium.” (Figure 6).

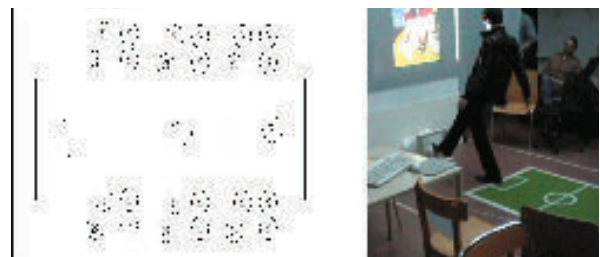


Figure 6. A miniature soccer field as an interface to guide a multi screen presentation where spectators are arranged like in a stadium.



Figure 7. Left a walking path is visualized on a scan of a plan of the building, the red nodes indicate the presence of multimedia recording.

Another performative use of ubiquitous media, can be found in the trials with computational support for visits [19]. Here, tracking technologies using GPS (Global Position System) can be used to record bodily movements outdoors, linking it to multimedia recordings created during the visit. The physical interface consists in being able to “draw lines” with the body, for example walking as in Di Castro’s Drawing with Global Technologies an international project in which artists “draw” by their

physical movements ([31], p. 290). This art project provides further indications of how tracking technology, as opposed to pervasive or context aware scenarios, can be used in an expressive way. In our trials, participants were aware that a system was recording their actions to create a representation. In these cases, the walking is not done “unthinkingly”. The performative use includes consciously drawing a line, which is performed with the whole body moving around the physical space and that is combined with multimedia recordings of a visit.

Emerging Themes

The theme emerging from this example is to do with looking at interaction as performance to recognizing how expressions are embodied in performances of and in spaces. Performance stresses how meaning is embodied in the careful and expressive arranging of elements in the space how space is performed by bodily presence and movements. Participants create expressions embodied in space, artefacts, bodily movements and media choreographies with a spectator in mind and requiring energy for active participation and consciousness of the acts. Expressions are emergent in events, and are contingent processes, rather than being de-contextualised products. Their contingency resides in particular and personal configurations, as events are the outcome of configurations of space, artefacts and digital media. Events are characterised by a coexistence of doing and undergoing, bodily presence and representation, of experience and action.

FOUNDATIONS

A Performance Perspective

In this section we argue that a performance perspective can be useful in outlining a critical design agenda for interaction. The concept of performance is the object of a variety of studies and contrasting approaches across the social sciences, in anthropology, social psychology, linguistics, etc. The term performance can be taken to address everyday life, and can interest a variety of situations beyond theatrical performances and rituals. Here we choose to follow specific views originating from anthropology and performance art. In the late 70s and 80s, a movement in anthropology focused on understanding the experience and performance of culture. The rise of this movement became known through the book “The Anthropology of Performance” edited by Victor Turner [30]. To formulate a performance perspective for interaction we will gather traits from Turner’s work, from the philosophy of Dewey on which Turner based his work. Moreover other anthropological works as those of Eugenio Barba (theatre anthropology), Schieffelin (performance ethnography) will contribute with additional traits. We have also found useful to integrate these traits with views coming from performance art, mostly from the writings and works of a pioneer in this area, Vito Acconci. Here is a summary of these traits to formulate a performance perspective that can lead to a view to interaction privileging novel aspects.

Accomplishment and Intervention. The etymology of the term performance shows how it “does not have the structuralist implication of manifesting form, but rather the processual sense of bringing to completion or accomplishing [29]. A performance is always something accomplished: it is an achievement or an intervention in the world ([25] Schieffelin 1997).

Event and processual character. According to Turner performances are not generally “amorphous or open-ended, they have diachronic structure, a beginning, a sequence of overlapping but isolable phases, and an end.” ([30], p. 80)

Expression and Experience. Turner and others proposed the anthropology of experience as an alternative approach to anthropology, where the experience of a culture is studied analysing its expression. Clifford Geertz comments in the epilogue of the book *Anthropology of Experience* [15]: expressions are “representations, objectifications, discourses, performances” like rituals and other performances, but also artefacts. Turner bases his approach on previous thinkers that addressed “experience”: John Dewey, who saw an intrinsic connection between experience and aesthetic qualities, and Wilhelm Dilthey who affirmed that experience urges toward expression and communication with others [28]. Following Turner’s anthropological perspective, experience structures expression and expression structures experience in a coherent system of interaction and interpretation of cognition (thought), affect (feeling), and will (volition). Expressions can be considered to communicate experiences (cf. Dilthey). Finally, expressions can contribute to perception and therefore to new insights, either in their act of creation for the “creator” or as embodied artefacts in their material and immaterial qualities for an “experiencer” (cf. Dewey).

Space, artefacts, interactions. Expressions can be configured in space and artefacts in the way they “afford-invite-oblige” interactions. Performance may be considered in the creation of artefacts or architectures, especially in the ways these carry a performative potential that is unleashed through participant’s interactions (cf. Vito Acconci explains his Performative Architecture with this words [1]: “The viewer activates (operates) an instrument (what the viewer has at hand) that in turn activates (builds) an architecture (what the viewer is in) that in turn activates (carries) a sign (what the viewer shows off): the viewer becomes the victim of a cultural sign which, however, stays in existence only as long as the viewer works to keep the instrument going.” Performance can be, therefore, linked in many ways to expression, e.g., through bodily movements, artefacts or architectures.

Perception, simultaneousness of doing and undergoing. The perspective of Dewey on experience explains the “standing out” of an experience with the particular relationship between doing and undergoing of the experiencer, and with the concept of perception. There is a simultaneousness of presence and representation; in

Dewey's terms a structural relationship between "doing and undergoing" which leads to perception and to new insights. This is contrasted with recognition: merely recognising something already known.

Energy and consciousness. Dissimilarly to behaviour performance, includes more efforts in terms of energy, skill and consciousness (thinking) of the acts. For example, Barba and Savarese [3] distinguishes between daily and extra daily "techniques" (p. 9): "...the way we use our bodies in daily life is substantially different from the way we use them in performance. We are not conscious of our daily techniques: we move, we sit, we carry things, we kiss, we agree and disagree with gestures which we believe to be natural but which are in fact culturally determined...".

In daily techniques, we follow the principle of less-effort, that is obtaining the maximum result with the minimum expenditure of energy, "extra daily techniques are based, on-the-contrary, on wasting of energy" ([2], p. 16).

Provocations of a performance perspective to interaction. While traditional human-computer interaction identifies a repetitive task with general validity to be targeted by the design, performance points to the organisation of events that maintain a specificity given by the contingency of meaning and material. While, in general, human-computer interaction relies on recognition, accountability and 'affordances' at the interface, performance focuses on perception and experience. Following Dewey, recognition is something we already know, while perception occurs when we experience a thing that imposes surprising qualities, creating new insights. While dominant tenets in HCI are usability, making an operation easy and efficient, or exploiting affordances so that they can be carried out unthinkingly and making the tool disappear. A performance perspective orients towards experiences where participants are more aware, think feelingly about the artefacts around them and engage in the situation in reflection or perception in action. Dominant approaches, as personalisation, tend to have a view from the computer artefact; here configuration is defined by the properties of the artefact. Performance stresses the centrality of the actor that configures expressions and experience in environments; in this case, configuration is defined by the actor and his situation. Finally, pervasive and context-aware scenarios propose sensing systems that measure and simulate space or recognise and sense situations. In contrast, a performance perspective proposes "sensing humans" with the idea that tangible interfaces should make use of spatiality and materiality to enrich interaction using all senses.

Theatre, performance and design

Previous work

Theatre concepts, theories and performances have been recently employed in several areas of the design of interactive technology. Laurel [23] drew from concepts of Aristotle's poetics and other theatre concepts to address the design of computer interfaces, in an approach based on an

Aristotelian theatrical format for the 'orchestration of human response'. Other approaches have gone beyond the application of drama as a metaphor for design, and have applied drama in the practice, either as a fantasy tool, a way to enact and develop scenarios, to test ideas or to stage design events (e.g., [24, 9]). All these approaches have been limited to either developing concepts from theatre writings, or to empirically reproducing the procedures from existing theatre formats, or to relying on *ad hoc* performances, some of which reproduced existing forms of participatory theatre (e.g., Boal's Forum Theatre, as in [24]).

Practice and wisdom from the performing arts

Theatre and the practices from the performing arts can play a different role in design. Instead of *formalising* and directing the design of interfaces with the concepts from theatre theories, or reproducing the *procedures* or the *formats* of some theatre forms, different practical approaches to directing the creative work of people can contribute to shape collective work and creativity. In particular, in the applied arts, as in designing space and interactivity with mixed media, this doesn't need to happen through activities of *staging, acting* or *performing*. The vast practical wisdom in the performing arts can be applied by devising activities with interactive technology. Movement, space, temporality, action and play are all often relevant aspects when researching use situations through engaging people in embodied activities. In various practices involving training, directing, performances and critique in theatres, companies of artists, journalists and audiences these aspects have acquired various forms and relevancies, according to quite different traditions, or schools.

Practical approaches to working with constraints

In the traditions of such theatre directors as, for example, Jacques Lecoq, Philippe Gaulier, Keith Johnstone, Peter Brook, Augusto Boal, John Wright, the main concern of a director is to avoid telling to performers 'what to do', but at the same time to drive the creative process in order to make them work creatively and 'make things happen'. The problem of avoiding dictating outcomes is common also in many design endeavours. The problem is well known in most approaches to directing in the performing arts, where the major goal is to devise a performance by making it emerge with minimum control, and being ready to take advantage from *the unexpected*. As the theatre director John Wright says, "this is a shifting and mercurial world where anything is possible and everything has yet to be found. This means that as a director or facilitator you've got to find strategies that are likely to make something happen rather than strategies for getting people to analyse what they think they might do." A particularly relevant aspect to design activities is how the role of constraints can be developed within collective activities.

As already remarked by Laurel [23] the "value of limitations in focusing creativity is recognized in the theory and practice of theatrical improvisation." In fact, her model

of human-computer activity appreciates the role of improvisation within a matrix of constraints. But there are fundamental differences between our case and the way Laurel applies (implicit, explicit, extrinsic or intrinsic) constraints. Her design of software and computer interfaces addresses how to involve users in the theatre of the electronic space and the action of its applications. Moreover, in Laurel's case, constraints can either depend on technical capabilities and the limitations of the system, or (preferably) be established through character and action in the interface. In our case, instead, constraints are not primarily researched as design features, be they desirable qualities or limitations to human's engagement with interactive technology. We focus on the role of constraints as a resource that can be used when directing collective creative action during design, in the same way in which they can become resources in improvised performances following specific approaches, as for example, the practice of Keith Johnstone [21]. Such constraints may also happen to become designed features in a later stage of design. Or, conversely, design features of artefacts and practices they support, may be used as effective constraints in some design trials, as long as they are made to work, as constraints, against a collective drive towards a form of action. But we research their quality during the *exploration* of different human relationships and activities with a given set of artefacts, infrastructures and practices.

Examples of approaches in applying constraints

In order to clarify a way of applying 'constraints', we can exemplify existing practices in the performing arts that apply constraints from different angles. For instance, let's consider specific ways of conceiving work with: *space and contiguity*, *sensitivity*, *masks*, and *narrative*.

Space and contiguity. One way to work towards framing interpretation of space and movement in theatre is the building of contiguities. Elements can be set to share a space even if they don't necessarily have foreseeable relationships between each other. It is a common attitude to put in place contiguities and constraints to the perception of space, in order to determine the way in which people will have to look or participate in a scene. As a clarification, theatrical framing is what cinema often doesn't need to achieve, as framing in cinema can be researched through camera work, editing and screen projection. Similarly, in everyday life situations, as for example in the streets, people (spectators/participants) cannot perceive everything, and have habits and means of perception to make their own 'editing' and associations. Accordingly, theatre has developed specific devices to achieve "theatrical framing". This theme becomes relevant to technology design in physical contexts and through performance development.

Sensitivity. Some theatre practices (e.g., Boal's [7] work) specifically work on altering participants' senses to train group work. They research the conditions for collective action by modifying senses when leading performing

exercises. In design tasks with media senses are limited, constrained, impeded, or transformed by interactive technology.

Masks. Mediating technology can achieve enable action just from the effects of *masking* human action. We can learn from ways of perform through a mask and working with characters. In theatre methods in mask work follow specific principles and traditions. But in general, a director working with masked actors is a designer, designing for conditions of use of mediating artefacts. She specifically researches the *human* characters by covering up people with different sorts of artefacts or devices. In these cases the director is looking for ways of making the mediating artefacts in order for the performance to become more *transparent* to actors' inner traits and personality. In theatre this is usually researched to create fictional character relying upon the 'humanity' of a performer. In our case it becomes a key issue for designing mediating technology, if the 'human' nature of action is what we address when we design technology.

Narrative. Selected theatre practices, improvised drama in particular, provides a key to make narrative relevant in technology design, both as a way of constructing meaning through performances and as ways to describe and make sense of the use of technology. Fostering the creation of narratives follows precise methods and traditions. Approaches to improvised drama aim to develop narratives by the incremental and concurrent contribution of several performers. Directors practicing these methods lead improvisations with actors in such a way to highlight the mysteries and promises of narratives. Creating promises and mysteries of narratives by collective action can be directed by introducing media as constraints.

Conceptualising 'Media': Form and Participation

Design endeavours addressing ubiquitous media cannot overcome most basic concerns of aesthetics, concerning the working of forms in the experience of audiences. With many approaches to studying mediated or unmediated representation, such endeavours share the common concern of identifying what counts as the 'forms' of representations and the nature of 'participation' of both creators and readers of those forms. We move away from structural analyses relying on a definition of *form* as in opposition to *content*. We consider form "in relation to a perceiver" [8, p. 48], and we focus on how it "*cues* us to perform a specific activity." [*op. cit.*, p. 49]. However, we are still bound to the basic problem of understanding *unity* in accessing media and representations in general. At the basis of every task of interpretation or assessment we need to look for *unity*, a system within which elements, relationships, variations, transformations can be identified.

The main concepts we adopt, concerning the 'working' of media, are motivated by broad issues which are commonly addressed in media studies: (a) all media representations are "constructed"; (b) media texts are constructed using a creative language with its own rules; (c) different people

experience the same media message differently; (d) media have embedded values and points of view; (e) media texts can be constructed to gain profit or power. Although our approach is still bound to these concerns, in the context of this paper, we have more specific concerns. When addressing the 'working' of emerging ubiquitous media, we need to rely on a terminology which abstracts away from specific contexts of production and consumption of the common media, from cinema to radio, or the internet. We shall take two main assumptions in setting to address the problem: (1) There is no true, essential meaning, and there can be no exhaustive reading or criticism, which can settle the interpretation of a media text once and for all; (2) We can persist in learning to read media texts differently, and we can help others to do the same by showing the mechanisms that make this possible.

Such concepts as 'authorship', 'access', 'deconstruction', 'genre', 'code' or 'frame' should be reinterpreted from both structuralist and post-structuralist accounts and applied as generative principles in the design of ubiquitous media. The latter questions posed by Foucault suggest a fruitful way to address 'authorship': "...a study that goes beyond the expressive value and formal transformations of discourse, and considers its mode of existence: the modifications and variations, within any culture, of modes of circulation, valorisation, attribution and appropriation." [12]. According to this vision, the traditional questions of structuralist approaches to authorship: 'Who is the real author?' 'Have we proof of his authenticity and originality?' are substituted by questions such as: 'What are the modes of existence of this discourse?' 'Where does it come from; who is it circulated by; who controls it?' 'What placements are determined for possible subjects?' 'Who can fulfil these diverse functions of the subject?'

Common definitions of 'access' and 'deconstruction' can be applied as conceptual tools to describe participation and engagement of readers as interpreters. In the examples, we have seen how, in particular, ubiquitous media permit the appropriation of media texts as tangible activities of 'textual' transformation. In those contexts, the emergence of 'genres' is a central concern for the development of ubiquitous media, because a way participants contributed creatively in design was by the creation or appropriation of genres. As Frow postulates, referring to the general practice of creating intertextual links in several forms in the literary and visual arts: "What is relevant to intertextual interpretation is not, in itself, the identification of a particular intertextual source but the more general discursive structure (genre, discursive formation, ideology) to which it belongs." [14, p. 46] These forms are defined by such features as *repetition* and *motif* and far as they provide some unity, because unity in the composition is what frames peoples' reading. In [20] we observed that the creation of such genres can be motivated by the constraints in cooperation. A similar problem relating to the nature of

'genres' has already been considered in film studies. In fact, if we take common definitions of *genre*, they bind artistic aspects to production and marketing issues, as in Gledhill's [16] definition of genre as a 'conceptual space' in which "issues of texts and aesthetics ... intersect with those of industry and institution, history and society, culture and audience." [*op. cit.*, p. 221] Other definitions also describe different genres in terms of their collective significance. Some critics suggested abandoning the term 'genre' itself in favour of such terms as repetition, seriality, cycle, trend and mode. In our studies defining and recognising genres has implications on the working of people collaborations in production, spectatorship and criticism. To those who participate as authors it gives stylistic guidelines. It also provides those who review the work of others with tactical means of evaluating a composition's achievements in terms of the ways it affords particular effects by extending, challenging or reinterpreting particular features of a genre [8]. The question remains of whether the concept of genre can be effectively applied to explain how authorship relates to fruition. In media studies, concepts concerning genres have been applied as means to link the working of media texts as ends of creation and as ends of consumption.

A PROGRAMMATIC MANIFESTO

Ubiquitous media are introducing in a variety of aspects of our life niche or fringe applications. Inspiring examples of ubiquitous media are increasingly emerging in art installations. Recent research focuses on producing dynamic, interactive, non-linear narratives (e.g. interactive storytelling), or explores technologically innovative, immersive environments that diverge from conventional screen formats. There is the need to devise and study such applications looking for methodological and pedagogical implications for the development of ubiquitous media in general. Creative practices in the arts can fruitfully drive practical and conceptual attempts to address the Performative Development of such applications.

Performative...

We focus on traditions and methods in the performing arts that: (a) are loosely structured, (b) tend to put meaning at the end of the process, (c) avoid planning and control, and (d) aim to achieve 'acting as play'. This provide a key to address interaction as performance. Interaction can be devised and studied as part of events aimed at generating new insights for participants (interchangeable performers and spectators) privileging sense experience. Events are the outcome of configurations of space, artefacts and digital media, in which doing and undergoing, representation and bodily presence are simultaneous. These can be alternatives to established human-computer interaction tenets: the notion of event is an alternative to the notion of task; perception in Dewey's terms replaces recognition proposing expression as an alternative to accountability and usability. Implications include configuring and staging space instead of measuring and simulating. Situations can first be devised

and staged instead of just sensed and recognised. We need to privilege the sensing and sensible human ‘*interpreter*’ over the sensing and ‘*once-and-for-all-interpreted*’ system. This means approaching the development of artefacts, together with the cultural practices they can enable and support, through practical attempts which are not immediately directed towards functionalities or interpretation of technology.

...Development...

The object of our design interventions is to engage people in creative activities in which a major contribution in their imaginative work is to create new human relationships while they tackle with the urge of socially determine their presence in a newly created space. These attempts have a strong explorative component and focus on the social aspects of the creative achievement. We have observed the following consequences in the practical accomplishment of our design goals, which call for specific methods in the ‘performative development’. (1) First, our design work in researching new collaborative activities – those arising through and around artefacts and practices – extends to the point that alternative ‘relationships between people’ are in themselves an objective of the design interventions. In other words, given the same tools and tasks, we look at alternative ways in which people can relate to each other. Such design endeavours address the continued *exploration* and nourishing of human relationships. (2) Secondly, even though such new relationships and emotional spaces can acquire a relevance in the experience of participants, and therefore in design, they are not necessarily functional, nor can they always be semantically interpreted relating to the practices or the artefacts to which the design interventions are addressed. But the contribution in our design effort is not in their functional or semantic relevance, but in the new forms of engagement that arise, either immediately or in subsequent trials inspired by them. (3) Finally, such a design process can unfold with the guide and inspiration from practical approaches in the visual and performing arts even without necessarily engaging people in any *acting* or *performing* activities, nor by embedding concepts from the arts in designed features. Performance and theatre practices, for instance, can contribute to analysing and carrying out practical attempts to achieve collective creativity.

Practical wisdom and guidance from theatre practice Methodologically, performance implies the uniqueness and contingencies of “happenings”. This contrasts with positivistic movements that strive towards repeatable methods and techniques in design. Performance contributes with a situated (place and time), participative, and experiential epistemology. In previous work, we have shown how performances, by supporting the creation of expression and their experience, can have three goals in Interaction Design: exploring, communicating, testing. These are achieved with at least three important resources: a performance space that enables the formation of

expressions, props to encourage expressions, and interactional creativity [18]. Beyond naïve literal applications of theatre techniques or procedures to design contexts, in this manifesto we are able to say more about what aspects of the practical wisdom from theatre practices are promising to foster the emergence of practices in ubiquitous media. Moreover, we indicated promising concepts that can be translated from theatre practice to design and applied as metaphors, relating to the use of *constraints* in devising collective action, introducing *contiguities* or altering peoples perception of space, working on the *masking* properties of media, altering or limiting *senses*.

...Ubiquitous...

According to a perspective on anthropological notion of performance, and relying on creative practices in the performing arts, the very meaning of ubiquitous, acquires a new meaning. By ‘ubiquitous’ we end up meaning ‘every where’, but in relation to how ‘mediating’ features ubiquitously affect the dimensions of performance reviewed above: in relation to how media work as virtuous constraints in fostering creativity, frame our perception of space by building contiguities, alter our senses, or make people’s traits more transparent through masking behaviours. Here we move away from the distinction of form and content, of interface and data. Current approaches mostly distinguish between media content (movie, song, presentation, video game) and interface or medium (TV, computer screen, keyboard and mouse), with one medium or interface being used for all content objects.

...Media

The definitions we have indicated above in order to address the *mediating* aspect of technologies have referred to a broad problem of identifying form, not in opposition to content but through inspecting performed actions. We related to audiences’ common seek for unity within interpretable representations, and pointed to the critical role of emerging genres in enabling participation. The ultimate advantage of reviewing the terms cited above is a gain in clarity in addressing problems of *access* as deconstruction, and elucidating the various forms of authorship that ubiquitous media can enable. Our agenda heavily relies on the generative roles of such principles from media studies. The perspective in which we frame and apply them is that of authorship and participation as a form of skilled appropriation. Foreseeable applications for this design agenda considers ubiquitous media as promising tools for an intuitive and embodied understanding of complex and subtle mechanisms in learning to read, transform and manipulate media.

REFERENCES

1. Acconci, V. Some Grounds for art as a political model. (1981) In: Sobel, D., Andera, M., Kwinter, S. & Acconci, V., *Vito Acconci: Acts of Architectures*, Milwaukee Art Museum, 19-25, 2001.

2. Barba, E. *The Paper Canoe: a Guide to Theatre Anthropology*, Routledge, London (1995, 2002).
3. Barba, E. & Savarese, N. *The Secret Art of the Performer, a dictionary of theatre anthropology*, Routledge, England, 1999.
4. Bell, A. *The Language of News Media*, Oxford: Basil Blackwell, 1991.
5. Binder, T., De Michelis, G., Gervautz, M., Jacucci, G., Matkovic, K., Psik, T. & Wagner, I. Supporting Configurability in a Tangibly Augmented Environment for Design Students, In: Special Issue on Tangible Interfaces in Perspective, *Personal and Ubiquitous Computing*, 8(5): 310-325, 2004.
6. Blythe, M., Overbeeke, K., Monk, A. & Wright, P. (eds) *Funology: From Usability to Enjoyment*. Kluwer Academic Publishers, 2003.
7. Boal, A. *Theatre of the Oppressed*, Pluto Press, 2000.
8. Bordwell, D. and Thompson, K. *Film Art: An introduction*, Mc Graw Hill, 2004.
9. Brandt, E. and Messeter, J. Facilitating Collaboration through Design Games. *Proceedings PDC 2004*, 2004.
10. Chalmers, M., Galani, A., Seamful Interleaving: Heterogeneity in the Design and Theory of Interactive Systems. In *Proc. of ACM DIS 2004*. ACM Press, New York, NY, 2004, 243–252.
11. Dourish, P. *Where the action is: the foundations of embodied interaction*. MIT Press, 2001.
12. Foucault, M. *Language, Counter-Memory, Practice*, Basil Blackwell, Oxford, 1977. (First published: Paris, 1969).
13. Forlizzi, J., Battarbee, K., Understanding Experience in Interactive Systems. In: Proceedings of the 2004 conference on *Designing interactive systems*. ACM Press. Pp 261-268.
14. Frow, J. Intertextuality and Ontology, in: J. Still and M. Worton (eds), *Intertextuality. Theories and Practices*, Manchester University Press, 1990, 45-55.
15. Geertz, C. Making Experiences Authoring Selves. In: [29].
16. Gledhill, C. Rethinking Genre, in C. Gledhill and L. Williams (eds), *Reinventing Film Studies*, London: Arnold, 2000.
17. Hallnäs, L., Redström, J. From Use to Presence; On the Expressions and Aesthetics of Everyday Computational Things. In *ACM Transactions on Computer-Human Interaction* (ToCHI), Vol. 9, No. 2, June 2002, ACM Press, 106-124.
18. Iacucci, G., Iacucci, C., & Kuutti, K. Imagining and experiencing in design, the role of performances. In *Second Nordic Conference on Human-Computer Interaction*, (Aarhus, Denmark, 2002), ACM Press, 2002, 167-176.
19. Iacucci G., Kela, J. & Pehkonen, P. Computational Support to Record and Re-experience Visits, *Personal and Ubiquitous Computing*, 8(2): 100-109, 2004.
20. Jacucci, C., Pain, H. & Lee, J. Practices of Media Co-Authoring in a Responsive Physical Environment. In: T. McEwan, D. Benyon and J. Gulliksen (eds), *People and Computers XIX – The Bigger Picture, Proceedings of the 19th British HCI Conference*, Springer-Verlag, 2005.
21. Johnstone, K. *Impro : Improvisation and the Theatre*. Theatre Arts Books, 1989.
22. Jordan, P. W. *Designing Pleasurable Products*. Taylor & Francis. London, 2000.
23. Laurel, B. *Computers as Theatre*. Addison-Wesley, 1993.
24. Morch, A., Engen, B., Asand, H-R, H. The Workplace as a Learning Laboratory: the winding road to e-learning in a Norwegian service company. *Proceedings PDC 2004*: 142-151, 2004.
25. Schieffelin, E. Problematizing Performance. In: Hughes-Freeland, F. (ed). *Ritual, Performance, Media*. Routledge, London, 194-207, 1997.
26. Shaw, J. & Weibel, P. *Future Cinema: The Cinematic Imaginary after Film*. Cambridge, Massachusetts. The MIT Press, 2003.
27. Turner, V. *From Ritual to Theatre, the human Seriousness of Play*, PAJ Publications, 1982.
28. Turner, V. Dewey, Dilthey and Drama: An essay in the anthropology of experience. In Turner, V. & Bruner, E.M. (eds). *The Anthropology of Experience*, Urbana and Chicago. University of Illinois Press, 33-42, 1986.
29. Turner, V. & Bruner, E.M. (eds). *The Anthropology of Experience*, Urbana and Chicago. University of Illinois Press, 33-42, 1986.
30. Turner, V. *The Anthropology of Performance*. Performing Arts Journal Publications, New York, 1987.
31. Wilson, S. *Information Arts, Intersection of Art, Science, and Technology*. The MIT Press, Cambridge, Massachusetts, 2002.

Media Co-Authoring Practices in Responsive Physical Environments

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Abstract

This paper describes an approach to devising co-authoring practices of digital media in physical environments. The discussion draws from a design case addressing media literacy, and focuses on the problem of devising new forms of authoring practices enabled by interactive features in the environment. The design is approached as a collaborative effort to create new practices and address both formal aspects and the nature of participation. The issues discussed include the design of physical objects, the interactive features, as well as the rules, conventions and procedures imposed or favoured in the design sessions. The aim of this paper is to contribute to an understanding of the design problem in the large, by reviewing and adopting concepts from recent literature.

1 Introduction

Current developments of tangible interfaces can lead to new ways of experiencing and exploring digital media in spatial arrangements. A research goal relating to the HCI tradition is to account for how the architecture of these responsive environments can shape and be shaped to the life of people. This paper will rely on descriptions of how pupils in a primary school have creatively coped with designers' instructions in participatory design sessions in order to make sense of the use of augmented objects to co-author media genres. If we consider a broader picture, the different production traditions that exist within Education, Interaction Design, Film and Broadcast Media can nourish the innovation of novel ways to produce and access the media with a wide variety of 'languages', authoring styles or genres. These forms of expression are increasingly being combined together.

However, each one of them calls for specific interpretive skills, media, audiences, social purposes. At the same time, the growing body of research addressing the ‘augmentation’ of physical environments with sensing and interactive technology introduces a number of concepts to drive design through an understanding of human experience [e.g., Stanton *et al.* 2001, Ciolfi and Bannon 2002, Marshall *et al.* 2003, Binder *et al.* 2004].

The analytic attention in recent studies on technology design towards the practical accomplishment of organised practices, and the ways in which formalisms, both social and technical feature in day-to-day conduct [Heath and Luff 2000: 11], in our case motivates a careful attention to pupils’ embodied practices to inform design. As Heath and Luff note in a study concerning collaborative media authoring in professional settings, if research separates systems, both technical and human, from social action, “we are unable to recover just how tools and artefacts and the ‘rest of the furniture’ of modern organisation is constituted in and through the activities of the participants themselves.” [Heath and Luff 2000: 7] In our case, the intent to study social action is driven by a constructivist pedagogical interest, shared with most studies on the design of augmented environments in educational settings. As in some of these studies, we aim to devise learning experiences in which learners build their own understanding of the task (Fig 1). Participants must be supported in order to rely upon what they already know, and expand their current skills and understanding by constructing new knowledge in ways which make sense to them. This task needs to be approached by favouring perpetual exchanges of thought and different kinds of experimental interaction [Vygotsky, 1978, Marshall *et al.* 2003].

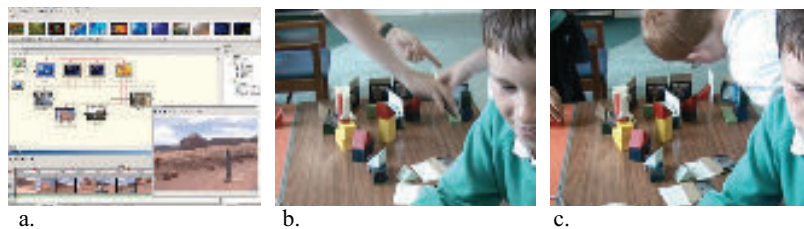


Fig. 1. Contrasting with the example of conventional graphical interfaces to video editing (a), Figures (b) and (c) show parts of the environment we describe below. It enables participants to handle objects in the physical environment in order to collaboratively define compositions of visual and time-based representations. Accordingly, ‘authoring’ practices acquire quite a different nature than with graphical interfaces, with respect to *collaboration*, emergence of media *genres*, and media *consumption*. Nevertheless, we can organize the physical environment in order to favour people’s *access* to the same type of media languages, such as the language of news media, commercial trailers or documentaries.

2 Background and Related Research

Recent accounts of designing digitally augmented environments in educational settings or public spaces, such as museums, as in [Ciolfi and Bannon 2002, Ferris *et al.* 2004], point to relevant conditions for ‘shaping’ experiences and applying tangible interfaces. Concerning our understanding of how these media and tools can invite people to interact and explore, technologically augmented environments should provide clues, triggers or adequate affordances to make visible which actions the visitors are allowed to perform [Ciolfi and Bannon *op. cit.*]. Moreover, they should support “different layers of activity in a way that successive surprises and discoveries are encouraged” [*op. cit.*]. Such designing goals are then intimately related to understanding the nature of these sorts of human activities.

As an instance of designed artefacts, Sokoler and Edeholt [2002] have addressed the use of tangible ‘videocards’ augmented with interactive features via RFID tags, to enable new participatory design practices. The videocards approach that they describe redefines aspects of video remote control for how their augmented objects (in that case, videocards) embed means for control of video playback in novel ways. As argued in [Iacucci *et al.* 2003] if similar kinds of video cards are used to enable authoring practices in spatial arrangements, then describing peoples’ joint work for expressing and interpreting leads to new ways of defining the simple terms of media authoring. In particular we need to address the specific ways in which users articulate their work in ‘media authoring’ in ‘spatial arrangements’.

2.1 Media Authoring in Spatial Arrangements

Mackay and Pagani [1994] proposed solutions to combine the power of paper video storyboards with the full capabilities of video editing software. The system they describe, Video Mosaic, uses an augmented reality approach to extend the static information that appears on paper and provide it with active temporal dimension. One point of interest lies in transposing some of the editing in the physical space, while keeping doing some of the activities in a digital interface. A point of interest is in discussing how such a hybrid system enables users to commit more flexibly to partial results. Relevantly to this point, Mackay and Pagani note that “Current tools tend to concentrate on the production of a final version, rather than on supporting the user in the development and exploration of ideas” [*op. cit.*: 168]. In order to apply such terms as ‘sketch’, ‘version’, ‘editing’, ‘partial result’, ‘production’, or ‘exploration’ in a way that is sensitive to human practices, we need to examine what kind of ‘authoring’ practices are performed by users in a setting.

2.2 Conceptualising Tangibles and Sensible Interfaces

As recent literature has shown, tangibles can work as ‘ready-to-hand’ or as ‘present-at-hand’ thereby favouring different ways of exploring, rationalising, objectifying and abstracting [Chalmers 2001]. Marshall *et al.* [2003] furthered the discussion pointing to differences in the way users can attend to the tangibles in a

present-to-hand manner, and use two classes of tangible systems: expressive and exploratory. *Expressive* features of the system embody aspects of the user's actions with the system or embody some of the learner's behaviour either digital or physical. And when users attend to the tangible as present-to-hand they can focus on an external representation of their own activity. *Exploratory* features do not embody the user's activity. When attending to this type of tangible as present-at-hand, the user will be more likely to focus on the way the system works, thereby exploring a model decided by someone else. Rogers and Muller [2004] argue for a distinction between activities that can be modelled as dialogues with machines and more open ended exploratory activities. Given these differences, augmenting physical objects can serve to enable, to complement or support [*op. cit.*].

3 A Case Study

The case study described in the following is a series of collaborative authoring practices that we devised with groups of pupils in a primary school. Pupils collaborated through a tangible interface to rearrange, produce and modify temporal media in order to create different genres of video presentations, from documentaries to news and advertisement. By manipulating digitally augmented physical objects they selected, edited and produced multimedia material through a series of collaborative tasks of reading, scripting, interpreting, annotating, editing, video-shooting, and composing visual and temporal recordings. The audiovisual material, broadly concerned history, and included pictures, video, texts and music from a variety of sources: educational documentaries from schools' and TV archives, interviews with historians, a storyteller, teachers and other pupils. At the end of the activities, pupils displayed and presented to the school the final products of the practices, and aimed at being integrated with traditional learning resources.

The media and tools had only in part been designed in advance. They were developed further in collaboration with pupils and teachers. The description we give below aims to explain how they enabled creative practices in which media 'access', 'deconstruction' and 'authoring' acquired specific forms.

3.0.1 Goals of the Activities with the Pupils

The goal of these practices was to provide pupils with the necessary skills and resources in order to 'access', 'deconstruct' and 'author' some genres of media compositions through which the subjects taught can be represented. An underlying assumption of our approach is that abilities to critically *read* media texts cannot be addressed fully without favouring also the acquisition of *expressive* abilities of *authoring* with the same sort of media texts. In this sense, we aimed to turn the knowledge of media languages that pupils acquire in their daily life into a resource. Responsive physical environments provide new opportunities to apply such a resource to critical reading and composition of documentaries, trailers, interviews, adverts, reviews and other broadcast or narrowcast media genres.

3.0.2 Overview of the Activities

Three groups of four pupils were engaged in selecting, editing, composing and producing video material in order to create a set of crafted products such as: interactive installations displaying a three dimensional visual representation of the content of the documentaries, a set of short documentaries in digital video, and a series of trailers of the documentaries. Hence, at the end of the participatory design sessions, interactive installations constituted at the same time final products and shared representations of ongoing collaborations. They could be explored by accessing visual and temporal recordings in digital format through the interactive facilities embedded in the physical objects. All final edited products, such as documentaries and their trailers were produced in different alternative versions, suggesting different points of view and highlighting different themes. The whole set of practical tasks addressed the deconstruction of the language of documentaries and other common media ‘languages’ [Bell 1991]. All activities were preceded by introductory examples and tutorial sessions in order to train pupils on how to read and modify some instances of genres of media texts. In these training sessions we addressed different types of TV news, documentaries and interviews. Pupils were provided with instructions and resources through which they could operate simple editing and compositions with the physical objects.

3.1 Setting the Field

The setting devised in our study enables some simple forms of physical manipulation and rearrangement of temporal recordings. Video episodes are mostly represented as cards and are displayed on screens or projections by scanning barcodes attached to them. Through the activities, each card is set to represent an ‘abstraction’ of different possible versions of a given video episode. A variety of objects, including paper, are augmented with digital links, via barcodes and can be set to represent digital editing features. We articulated the setting into a *construction kit* provided with conventions, procedures, conceptual and notational constructs, in such a way to suggest operations of composition and interpretation, as outlined in the following.



Fig. 2. Triggering the projection of an episode by scanning an object in conjunction with a location or with other objects.

3.1.1 Material and Initial Design

The videos are in part taken from several broadcast media sources. The videos were chunked in segments and elaborated in alternative versions with annotations, sounds, voice-overs, titles and sometimes partially arranged in montage sequences. Other physical objects employed and augmented in the environment to make compositions were mouldable plastic, Lego bricks and hard-paper signs. Digital representations were displayed both by screens and projections. In a preliminary phase, prior the start of the design sessions with pupils, pupils were trained in basic skills on critically reading and re-editing interviews. Also video interviews were shot among pupils, teachers, and a storyteller, in such a way that the overall multimedia material had “absorbed” representation from the cultural context of the school in which the project was taking place.

3.1.2 Instructing Open-Ended Tasks

As part of the participatory design approach of this study, the instructions given to pupils aimed at describing open-ended tasks. However, participants to the project need not to be disorientated and must focus to some extent on the same kind of resources and activities. When working in a primary school this issue becomes critical. The instructions and the rules we defined aimed at the same time at constraining and inspiring pupils’ tasks. The overall task was instructed as a film-making exercise, in which “*each group of pupils will build an interactive installation. This will be done by selecting, annotating and putting together the objects provided.*”.

3.1.3 Initial Organisation: Categories, Rules and Procedures

Conducting participatory design of such environments poses a trade off between letting free or constrain the activities. Participants need some freedom to be creative and explore new applications, but at the same time we need to constrain their tasks in order to both support and inspire them. A priority in our study is to encourage cooperation, in order for participants to reach a shared understanding of the tasks. We incrementally defined types of activities to which each group could orient their attention to. We also had to organise time and resources in order to enable different groups to work at the same time.

The environment inevitably favours some ways of transforming instructions into procedures, a major question is how the creation of interactive installations is defined and enabled in the first place. Installations were set to address a theme. They were defined as spaces that visitors could explore by following paths with a barcode scanner, thereby triggering the projection of sequences of digital representations. Installations were defined as displaying paths that not only visitors could follow, but that had actually to be made into finished documentaries.

Such rules and such an organization entail the following ‘design abstractions’ and categorisations. (a) A finished interactive installation has a form provided with some *unity*, it contains one or more start points, and displays paths that can be explored by a visitor; (b) Such paths are sequential organisations of the elements

(also referred to as the ‘syntagmatic structure’), and can be of different forms (e.g. rhetoric, associational, categorical). The only requirement is that the exploration of paths suggests editings that *develop* the theme; (c) The *elements* that get organised in sequences (also referred to as the ‘paradigmatic structure’) are varied and can be modified with some freedom, provided that they bear a relation with the digital representation to which they link; (d) There are no constraints on the type of *relation* between the physically accessible features of an object and the digital representation it triggers. Such a relation can be a resemblance (iconic), a matter of convention (symbolic), or an index set even unintentionally or by common sense; (e) Such *relations* and the other terms mentioned in the previous points are the scope of instructions and questioning in addressing *spectators’ expectations, closure, openness, and critical reading* of the media texts produced in the tasks.

3.2 Methodology

The goal of the design effort was to devise new forms of cultural practices. The methods we applied draw from practical approaches of visual and performing arts, and practices of media production, such as advertisement and news.

3.2.1 Imposing constraints

In order to foster creativity and participation in the design process we relied on some of the possible virtuous effects of imposing constraints to action [Iacucci *et al.* 2002]. The limits posed by the media and tools employed in the setting need to be identified and formulated into directions that make constraints more effective as resources for creativity. The goal of such an approach is to direct the design sessions as a series of creative activities in which participants are helped in their imaginative effort. In this case, pupils participated to design primarily by creatively interpreting and making sense of our instructions and displaying a shared understanding of what they were doing. It is by inspecting how they put together the different elements in the work setting (representations, tools, rules, procedures, conventions) that we can describe what practices emerged, in terms of their skilled behaviour and its outcomes. Before getting to the stage where pupils operated with the tools, and either made sense of our instructions or discarded them, we had introduced and trained parts of the tasks. We had presented the tools, and trained the pupils with examples. We applied an approach to devising media which focuses on the benefit they provide to creativity and expression not only as enablers but also for their constraining functions. Here are few examples of simple constraints.

Examples of constraints to the compositions' paradigm			
<i>Media constraint</i>	<i>Reformulation</i>	<i>Limited outcome</i>	<i>Creative solutions observed</i>
Cards display a picture (chosen by the designer) from their video episode	Compose a collage using the static pictures	The features manipulated by pupils are static. They contrast with the time-based content	Branching structures suggest video sequences. Rhetorical figures link spatial to temporal aspects: small place to scan trailers (timely short)
Changes to the editing of video can be indicated only by verbal annotations	Instruct the editor by annotating objects	Suggestions about changes to dynamic aspects become encrypted and not easily shareable	The composition format (or genre), embodies editing aspects: e.g., using spatial predominance (tower) to suggest features redundancy in the edited sequence

Examples of constraints to the compositions' syntagm			
<i>Media constraint</i>	<i>Reformulation</i>	<i>Limited outcome</i>	<i>Creative solutions observed</i>
Barcodes need to be pointed at to be scanned; scanning is easier if the barcode is near the picture	Display pictures openly	Sequences of static pictures in compositions become predominant structures	The one-sided nature of the cards is exploited to create architecture types that invite to explore physically, turning around and move: as in town, or museum formats
Scanning different objects with the same barcode reader triggers projections on the same screen	Identify possible paths to explore the installation with beginning and an end	Exploring an installation by acting with a scanner became the screening of an improvised film	New conventions for shaping some genres as graphs in the space: multiple points of entry and multiple points of exit, but linked by paths inducing sequences

3.2.2 Supporting the Evolution of Smaller and Digressive Tasks

Important design interventions were aimed at facilitating and identifying subtasks. This influenced the ways participants could be trained and supported. In most tasks a central problem is to find a shared definition of the content of temporal representations. Participants are motivated to make choices concerning relevance and points of view. Subtasks that could be identified include: indicating alternative ways of segmenting a set of video episodes made accessible through a set of objects; operations of video alteration and modulation, such as titling, shortening, adding voiceovers; sub-tasks of composition, e.g., establish rhetorical functions or relationships between episodes; subtasks creating procedures for comparison, such as identifying salient verbal features in the episodes and visualising spoken words, finding different episodes to introduce a videoed statement; shortening a given sequence of video episode by a half; creating alternative trailers.

3.2.3 Rhetorical Figures for the Responsive Environment

The digital augmentation of physical objects can enable intuitive ways of accessing digital media through physical actions. These can be researched by finding rhetorical figures to link physical actions to events in the digital environment. For

example, scanning a smaller card triggers a shorter version; scanning a card and the barcode on the window triggers an edited version giving a specific interpretation (view) associated to that window.

3.3 Observations from Instances of Work of Composing

3.3.1 The 'Composed' 'Installations'

At the end of the sessions installations had become the places containing links to finished films. But, at the same time, represented incomplete alternatives and the discarded versions of those films. As a result, the whole practice became geared around the 'composition' of interactive 'installations', which became shared representations to both access and construct media texts. They became repositories of partly conventionalised information to which all composing practices were oriented. In this sense, they became privileged places where exploration of the texts and the negotiations about its 'meaning' or 'purpose' could take place. As we explain below, the use of installations developed, beyond limited spaces, towards integrating them into broader environments, such as the room or the building.

The resulting environment aims to be more than an informational tool. It became an artistic medium allowing for constructive practices. It doesn't have the objective and the capacity to create the same empathy and emotion as films or theatre productions, and is less perfect in its achievement. There are no detailed scripts, no rehearsals, and no retakes, but only the construction of a *workable* multimedia structure. The following sections will address what 'workable' can mean in the scope of providing people with media 'access'.

3.3.2 Attributing Meaning to Physical Patterns

One aspect of pupils' compositions concerns the ways they put physical objects together in order to create architectural patterns. We favoured the evolution and negotiation of the architectural features within each group. By doing so we became involved in the discovery and definition of a language to make sense of such collaborations. After our engagement in tutoring such practices we can describe the 'architecture' of the compositions in terms of the following features. In reviewing these terms we chose to adopt a language from the architecture of 'packaging' [Fawcett-Tang and Mason 2004], in order to stress the role these compositions have in packaging representations. The various dimension of packaging media texts created different 'formats'. They realised a method for both organising and exploring either physical or digital elements and representations. Three examples are: (a) the 'museum' format, in which the video-cards and objects divided the space into different thematic areas, and had an entrance and an exit, applying common metaphors from the architecture of museums (Fig. 3); (b) the 'town' format, in which the space was organised into streets and avenues, and included the use of architectures enabling interactions such as towers, doors, and backyards; (c) the 'geometric or abstract' format, applying abstract geometrical shapes as circle, radial, or the square, which displays and exploits the architecture of 'opposite

sides'. Different formats favoured different forms of organising and exploring the digital representation through the physical environment. The museum format favoured an encyclopaedic style; the town format favoured a geographical style, in which exploring can be associated with travelling and arriving; the geometric/abstract favoured an argumentative style, in which the lack of rhetorical figures calls for connectives of argumentation: 'therefore', 'but', 'for example', 'and'.

As argued below, we see the creation of such formats as one aspect of the creation of 'genres' for authoring and participation. More practically, these formats facilitated a next step: the integration of installations in wider environments. In fact, the rhetorical figures and architectural experimentations could, in a later stage, leave the table and be adapted to the wider environment. Dimensions of exploration through spatial montage were discovered by pupils who created *parallelisms* with the environment of everyday life. These were of two types: (1) framing multimedia features *into* the daily environment, or (2) embedding features in the dedicated installation *from* the daily environment. As examples of (1), rooms acquired *themes*, and opposed windows, being associated with different episodes, alternative *views*. As examples of (2), exploring town shapes generated branching film architectures or sub-narratives, thematic areas, or architectural spaces built as towers and 'gardens'.



Fig. 3. Elements get composed together in such a way to invite, by their spatial arrangements and verbal and visual inscriptions, the evocation of multimedia objects. The initial environment is characterised by a certain *openness* of interpretation for what constitutes the relationship between spatial and temporal features. For example, spatial adjacency or contiguity can potentially suggest possible temporal editings. We address the ways in which participants overcame such an openness and created local conventions.

3.3.3 Framing: Reconciling Time and Space

A possible drawback in this dimension of pupils' explorations is that the act of *framing* temporal recordings in the physical installation was at times subordinated to the structural constraints of the architectural compositions. For example, two walls can be made out of video cards and built facing each other. They will display two sequences of cards (linking to as many video episodes). Other than simply suggesting two different sequences, they will suggest binary oppositions between cards that end up being physically facing each other. In this case, the spatial

framing of the video episodes becomes subordinated to the oppositions in the architecture which is put in place. And such structural features are not related *a priori* with the media content. We can call this feature of spatial compositions its *geometrical closure*: every time that an architectural shape is started, geometrical constraints appear. Such constraints often have pragmatic consequences on the interpretation of the installation. For example, building a curve limits an inner space, building in height causes predominance, using apposite sides imposes movement from side to side for visual exploration. In order to achieve coherence and unity in the framing of the multimedia content, these constraints need to be explicitly interpreted and conventionalised.

3.3.4 History of Emerged 'Genres' in the Setting

Some design solutions resulted from carrying out the tasks with pupils and included the following features. These solutions developed as conventions. They had initially been adopted by a small group and at a later stage had become universally accepted and implemented. (a) Different ways for physical objects to represent abstraction of digital videos or images: there are zones of the space that represent the modulation of videos according to a principle attached to each zone (e.g., the zone of the shortened versions, the zone of the titled versions, the zone of the perspective according to the Jacobites). Hence, the same video-card, which always *evokes* the same video episode, in different zones evokes different versions of that same episode. (b) Changeable properties of the digital representations were made consistent with changeable physical properties of the objects triggering their access: with double sided video-cards the video episodes on opposite sides of the object represent opposite thematic or rhetoric aspects; object's weight is increased in accordance to the difficulty perceived in reading the digital representation contents. (c) Associations of objects and their digital content: scanning a couple of video-cards synthesises their rhetorical relationship in the context of the composition in which they are scanned. For example, two objects representing two video episodes of contrasting historical accounts will be synthesised as a very short editing displaying the inconsistency between the two accounts.

3.3.5 Handling Versions

While the tasks were carried out, certain aspects of compositions' form, and in particular, variations, motifs, and parallelisms became increasingly encoded 'under the physical surface' of the physical compositions. For example, as soon as the convention of abstracting video episode versions was introduced – thereby permitting to use the same physical object to represent different versions of the same video episode – the physical compositions started to become more and more abstract representations of the same digital compositions. In other words, physical compositions became representations of the different possible ways of editing the documentary that uses those multimedia objects in the sequences displayed physically.

3.3.6 Reconciling the Digital and the Physical Worlds

We are interested in binding a formal analysis of the environment to an understanding of the forms of participation that are enabled in it. To this end, we look at the ways pupils accommodated differently mediated ways of authoring. For example, we can see how the ways discursive structures get articulated in collages depended on what the physical tools and objects suggest one can ‘do’ with them.

In the case of a short film created from the installation in Fig 4, the sequence was taken from an easily explorable area of the collage: a linear sequence. The projection of a similar short film can be triggered by scanning those elements in sequence. But in the digital version some of the contextualising features of the collage are lost. Hence, in the final product pupils were encouraged to introduce some rhetorical features that accommodate for this loss. Formal features of the environment which are present in the digital and in the physical domain call for participation of pupils in negotiating how representations should cross the boundaries between digital and physical media. When *instantiating* a film from a collage, pupils move the representation of a sequence of episodes from the physical installation into another medium: the linear sequence in a digitally edited video. Physical-digital couplings in this case of film authoring create dissonances between the intended structure in the physical collage, and the actual digital film that is produced as an end of the practice.



Fig. 4. Sequences from an area of a physical composition of multimedia objects, which represents different possible alternatives of editing a same documentary.

4 Discussion

From the case presented above we draw considerations on ways to direct design sessions in this setting and on the outcomes. We will approach the discussion by applying some terms which we gather by describing the practices. We intend to apply descriptions of the forms of exploration and expression we observed in order to inquiry on what such terms as ‘authoring’ or ‘genre’ can mean in our context. This will in turn provide us with guidelines to understand how aspects of form link to the nature of ‘participation’. A treatment of the two themes – directing the practices and studying their outcomes – should reflect their mutual dependency. In fact, as we described in the case study, the sorts of practices we observed are

somehow specific to the way design sessions were *directed*. Such form of directorship is what we propose here as an element of the design methodology. Designing responsive physical environments to enable and support media co-authoring poses a set of alternatives for designers to: (1) impose constraints with media, tools, rules and conventions, in order to facilitate participants' creative work, (2) apply notions of genres and authorship as generative principles to envision new practices. Concerning the 'outcomes' of the design sessions, we retain forms of cooperative work that emerged in the setting. The scope of the following discussion is to bind the design approach and its 'outcomes' in a unified account addressing both 'form' and 'participation' in our setting.

4.1 Authoring: Exploration and Expression

A major aim of the practices around the installations is to provide participants with the skills and the knowledge they need to reach beyond the act of *reading* intended as a sole interpretation of an original media text. Such an aim can be addressed by allowing for forms of explorations that stress the alternatives of editing and framing. When done relying on the spatial and responsive features of the physical environment, these operations acquire particular forms. They can enable practices that open a variety of composed media to inquiries and engage users into exploring the effects of their alterations. In the case of spatial arrangements of multimedia material, we need to review the role of *temporal editing*, and consider structures of a broader nature. Here we can make some considerations on the ways in which participants enriched and recombined the material that was presented in the original version. The design of the physical objects and of their responsiveness, along with rules and conventions permitted cooperative enquiries into the surrounding reality. These could be accomplished through rapid manipulations of the environment. The 'authoring' nature of those cooperative inquiries that can be discussed for how they qualify as *explorations* of the environment. In doing this, we take the meaning of exploration as in reviewed in Section 2. Exploration and digressive actions took participants out of the reading of original forms – as the plot or arguments of broadcast media – and lead them to deconstructing the working of those forms. Artistic practices with tangible objects included copying, modulating, reframing, segmenting, and performing the presentation of installations. In our study these actions suggested design principles for supporting pupils in acting as critics and as designers. A principle can be drawn from the activities that can be described as *recycling*. Some explorations of the setting aimed to rearrange and compose outcomes of past productions. This involved adapting the resources available in order to accomplish new *functions*. In pupils' work, recycling became a process of finding any kind of *unity* by modifying media texts through a play with modulation and alteration. In particular, the augmented physical objects enabled the institution of specific *motifs* and forms of recycling.

4.2 Cultivating the Emergence of ‘Genres’

As Frow postulates, referring to the general practice of creating intertextual links in several forms in the literary and visual arts: “What is relevant to intertextual interpretation is not, in itself, the identification of a particular intertextual source but the more general discursive structure (genre, discursive formation, ideology) to which it belongs.” [Frow 1990: 46] These forms are defined by such features as *repetition* and *motif* and far as they provide some unity, because unity in the composition is what frames peoples’ reading. The creation of such genres can be postulated to be motivated and dictated by the constraints in cooperation. A similar problem relating to the nature of ‘genres’ has already been considered in film studies. In fact, if we take common definitions of *genre*, they bind artistic aspects to production and marketing issues, as in Gledhill’s [2000] definition of genre as a ‘conceptual space’ in which “issues of texts and aesthetics ... intersect with those of industry and institution, history and society, culture and audience.” [*op. cit.*: 221] Other definitions also describe different genres in terms of their collective significance. Some critics suggested abandoning the term ‘genre’ itself in favour of such terms as repetition, seriality, cycle, trend and mode. The main concern in the type of setting we address here is that defining and recognising genres has implications on the working of pupils’ collaborations in production, spectatorship and criticism. To those who participate as authors it gives stylistic guidelines. It also provides those who review the work of others with tactical means of evaluating a composition’s achievements in terms of the ways it affords particular effects by extending, challenging or reinterpreting particular features of a genre [Bordwell and Thompson 2004]. By establishing features of unity and continuity, conventionalised genres guide participants in activities of composition and criticism as they can be used as: (1) a composition paradigm providing a model for rearranging stylistic elements; (2) a set of rules and expectations for spectators to organise their reading; (3) a critical framework for reviewers.

4.3 Media in Space: Form and Participation

The setting addressed above enables forms of exploration and expression that are constrained, supported or motivated by the alternatives available to ‘reconcile’ physical and digital aspects. Investigating the motives and the quality of such ‘reconciliation’ can provide us with a ground for understanding how matters of form relate to the nature of participation. In the history of media we know of different established production practices that aim to create forms in our physical environment that change our behaviour and motivate proactive responses. In the design of visual and tangible advertisement, for example, the design of contents and their medium is driven by a general principle according to which their design should ‘create new needs’ [e.g., Berger 1977]. These needs are often researched either by putting constraints to our perception of space or representations, or by creating conflicting representations or enigmas, calling for attention and for reconciliation. Similar principles hold in our setting, but they allow for different sorts participation. Digital representations such as pictures, video sequences and

sounds needed to be 'evoked' through physical actions. The digital environment needed to be 'evoked' by acting on the physical, contrasting with the ever-visible and ever-accessible physical pictures, surfaces and other features. Moreover, digital representations could be 'condensed' into physical ones, in the sense that they were linked to static displays while they were distributed on a timeline. Accordingly, in their designing tasks pupils were led to investigate the effects of triggering, meeting, and evaluating the expectations of viewers. This is exemplified by how they handled alternative 'versions' of media texts. Physical compositions acquired the abstracting function of standing for different versions of the same media texts. This came at the expense of having to rebalance the role of physical details compared to wider structural properties. In fact, by looking at a physical composition, pupils could better understand that once an editing sequence is given – i.e., physical objects are displayed in a spatial arrangement – a lot of editing details still need to be fixed in order to have a film which sorts a desired outcome.

5 Conclusion

This paper has described an approach to integrating responsive and digital features into physical environments in order to enable collaborative authoring practices. Such applications can open media genres to inquiries and engage users into exploring the effects of their alterations by acting on a physical setting. As a critical issue in directing open-ended tasks, the introduction of conventions and procedures, and their influence on the creative use of resources, has been discussed. In particular, we have argued for an open treatment and exploitation of the constraints imposed by media to physical action, and their reformulation as directives in such a way that they can become resources for creativity in the practices. We have addressed the need to understand the virtuous role of constraints in instructing and directing participants activities in design. In our specific case, this effort concurred to favouring the emergence of composition 'genres'. Such effort can be inscribed into a wider struggle in the study of aesthetics and the experience of art, in which for every new field there is the need to find ways of linking structural analyses of form to the nature of participation.

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References

- Bell, A. [1991], *The Language of News Media*, Oxford: Basil Blackwell.
- Berger, J. [1977], *Ways of Seeing*, London: Penguin.
- Binder, T., De Michelis, G., Gervautz, M., Iacucci, G., Matkovic, K., Psik, T. and Wagner, I. [2004], Supporting Configurability in a Tangibly Augmented

- Environment for Design Students, *Personal and Ubiquitous Computing*, Vol. 8, Num. 5, Special Issue on Tangible Interfaces in Perspective, Springer 2004
- Boles, D. [2002], The Language of Media Literacy: A Glossary of Terms, currently available at: http://www.medialit.org/reading_room/article565.html
- Bordwell, D. and Thompson, K. [2004], *Film Art: An introduction*, Mc Graw Hill.
- Chalmers, M. Book review: P. Dourish, [2001], Where the action is: the foundations of embodied interaction. *Computer Supported Cooperative Work*.
- Cioffi, L. and Bannon, L. [2002], Designing Interactive Museum Exhibits: Enhancing visitor curiosity through augmented artefacts, in S. Bagnara, S. Pozzi, A. Rizzo and P. Wright (eds), *Proceedings of ECCE11*, European Conference on Cognitive Ergonomics, Catania (Italy) September 2002.
- Dourish, P. [2001], *Where the action is: the foundations of embodied interaction*. MIT Press.
- Fawcett-Tang, R. and Mason, D. [2004], *Experimental Formats and Packaging*, RotoVision.
- Ferris, K., Bannon, L., Cioffi, L., Gallagher, P., Hall, T. and Lennon, M. [2004], Shaping Experiences in the Hunt Museum: A Design Case Study, *Proceedings of DIS, Designing Interactive Systems 2004*, 205-214.
- Frow, J. [1990], Intertextuality and Ontology, in: J. Still and M. Worton (eds), *Intertextuality. Theories and Practices*, Manchester University Press, 45-55.
- Gledhill, C. [2000], Rethinking Genre, in C. Gledhill and L. Williams (eds), *Reinventing Film Studies*, London: Arnold.
- Heath, C. and Luff, P. [2000], *Technology in Action*, Cambridge University Press.
- Holmquist, L.E., Redström, J. and Ljungstrand, P. [1999], Token-Based Access to Digital Information, in *Proceedings of First International Symposium on Handheld and Ubiquitous Computing*, Karlsruhe, Germany, Springer-Verlag, 234-245.
- Iacucci, G., Iacucci, C., and Kuutti, K. [2002], Imagining and experiencing in design, the role of performances. In *Second Nordic Conference on Human-Computer Interaction*, (Aarhus, Denmark, 2002), ACM Press, 167-176.
- Iacucci, C., Pain, H. and Lee, J. [2003], Collaborative Authoring Practices with Video Episodes: Designing for accountability of learners' methods in re-using video material. In B. Wasson, S. Ludvigsen and U. Hoppe (eds) *Designing for Change*, Kluwer Ac. Publishers.
- Mackay, W. and Pagani, D. [1994], Video Mosaic: Laying out time in a physical space, *Proceedings of the second ACM international conference on Multimedia*, San Francisco, California, United States, 165-172.
- Marshall, P., Price, S., & Rogers, Y. [2003], Conceptualising tangibles to support learning, *Proceedings of Interaction Design and Children*, 101-110.

Rogers, Y. and Muller, H. [2004], A framework for designing sensor-based interactions to promote exploration and reflection. *International Journal of Human-Computer Studies*.

Schmidt, K. and Bannon, L. [1992]. Taking CSCW Seriously: Supporting Articulation Work, *Computer Supported Cooperative Work (CSCW)*, 1: 7-40.

Sokoler, T. and Edeholt H. [2002]. Physically Embodied Video Snippets Supporting Collaborative Exploration of Video Material During Design Sessions, in *Proceedings of NordiChi02*, the second Nordic conference on Human-Computer Interaction, Aarhus, Denmark, ACM Press, 139-148.

Stanton, D., Bayon, V., Neale, H., Benford, S., Cobb, S., Ingram, R., O'Malley, C., Ghali, A., Wilson, J. & Pridmore, T. [2001], Classroom Collaboration in the Design of Tangible Interfaces for Storytelling. *CHI 2001*, ACM Conference on Human Factors in Computing Systems, *CHI Letters* 3(1), 482-489.

Vygotsky, L. S. [1978], *Mind in Society: The Development of Higher Psychological Processes*, in M. Cole, V. John-Steiner, S. Scribner and E. Souberman (eds), Harvard University Press.

Watson J. and Hill A. [2000], *Dictionary of Media and Communication Studies*, V Edition, Oxford University Press.

Guiding Design with Approaches to Masked Performance

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Abstract

This paper proposes a reinterpretation of practical approaches to masked performance to articulate design activities that make use of performances and embodied artefacts. In particular, the paper relies on examples from design research to explore the application of performance work based on 'neutrality', expressivity and 'incompleteness', which have been developed in theatre to devise performances with 'neutral', 'characterised' and 'larval' masks.

A more general argument in the paper is that the project of applying performing arts into interaction design can be usefully extended beyond the boundaries that have so far characterised applications from the performing arts. These have been limited to the direct staging of the performances which are meant to provide the evidence for design inquiries. Instead, design activities can proceed by working in a more indirect way, by researching variations of the achieved performances, and by using multiple performance genres, including masked and stylised ones.

“I don’t follow a method in the form of conceptually definable procedures, a list of rules, precepts, norms or conventions. A method is something quite different: a collection of organic impulses that have to be rediscovered – or reinvented – within us. Individual experiences and acquired knowledge constitute a shell within whose depths there exist lesions. These “wounds” are part of the method. Does this mean that a method is absolutely personal and impossible to pass on? This is not true either. It can be transmitted by means of that long route consisting of contradictions and apparent betrayals that is a process of symbiosis. If the method is passed on, it becomes unrecognisable. When it is recognisable, then it is an illusion, a crutch or a parody¹.”
E. Barba

1. INTRODUCTION

Today, even if several practices have been imported in design from theatre and other ‘live arts’, including Johnston’s approach to improvisation, Boal’s Forum Theatre, elements from Aristotle’s Poetics and Greek tragedy, and Brechtian dramaturgy, the vast body of practices in the performing arts still remains mostly unexplored by researchers. Overall, it is the techniques, the theories or the procedures that have been imported. The practical approaches guiding the creative work of rehearsals in theatre, which is based on variation and repetition of performances, have not been transposed so far. Moreover, a considerable part of design research that made use of performances employed props, mock-ups and incomplete artefacts. But the design of the embodied artefacts and of interactive features has not been addressed with a language that links design qualities of the embodied artefacts to qualities or modes of performances.

Strangely, a whole area of the performing arts which provides such a language, and which is articulated in practical activities to devise performances with and through artefacts, has so far been totally neglected. This area is made of the various approaches, schools and traditions that train and devise masked performance. It constitutes a rich repository of practical knowledge and activities, which, if transposed and reinterpreted in design, could help better articulating design inquiries based on performances with and through artefacts. This paper proposes a reinterpretation of a particular instance of such approaches in design contexts. One which is derived from Lecoq’s (1997) work.

2. BACKGROUND AND RELATED WORK

Among the various design approaches that instantiated theories, ideas, techniques, strategies, tactics and procedures from the performing arts (e.g., Binder 1999, Brandt & Grunnet, 2000; Dolonen et al., 2003; Dworaczyk et al., 2005; Engeström & Kallinen, 1988; Fjuk & Sorensen, 1997; Iacucci et al., 2002; Iacucci & Wagner, 2005; Iacucci et al., 2005a; Kankainen et al., 2000; Mørch et al., 2004; Read, 2005; Salvador & Howells, 1998; Strömberg et al., 2004; Turley, 1997) little has been done to date to substantially overcome naturalistic acting in staged scenarios. Or, in general, no research works have proposed to compare alternative performance genres within the same setting,

¹ Quoted from the audience notes to the performance ‘Salt’.

or overcoming the mere transposition of ‘procedures’ from theatrical practice. Those works that systematically introduced variations of performances did so at the level of narrative, plot or characters substitutions, as for example Kankainen et al. (2000), Mørch (2004), Strömberg & Pirttilä (2004) and Turley (1997), who applied Boal’s (1974; 1995) forms. However, no research works have devised performances by crossing genres, decomposing or constraining movements, comparing different levels of acting, filtering perception, masking, or moulding time with changes of speed, rhythms or interruptions.

Performances have been mostly used to provide the evidence for the actions which are meant to be interpreted in the search for design ideas. However, the most influential and effective approaches to train or to devise in the performing arts devote most of the time to working in an indirect way. Their search for ways to relate to life and audiences usually proceeds by repeatedly introducing variations and by re-enacting the achieved forms. They explore stylised forms, other than naturalistic ones. Also, the choices about how to inspire, direct or to constrain performers are done explicitly and articulated in exercises.

The following review aims to show that research applying performances with objects, even if not referring to the arts, already embodies similar questions. The remaining part of the paper will indicate how these questions can be addressed more explicitly by reinterpreting practical approaches from the performing arts, and in particular, from masked performance. To this end, a first step here will be to distinguish among different roles of the ‘incompleteness’ of design artefacts among cases reported in the literature. This will motivate further questions about how to articulate performance inquiries with objects, with reference to a case of performative development of an interactive installation.

2.1 Performances with incomplete designs

Incomplete designs in the form of props, mock-ups or parts of settings have been employed in different ways. Not only the methods, but also the driving motives have been quite different. For instance, incomplete forms have been created to bring design questions near the situations of everyday life, as in the SPES methodology (Iacucci et al., 2002). Here, the incomplete objects were introduced in a person’s every daily life, and came about as forms upon which to project contingent needs in unplanned situations (Figure 6.a). Elsewhere, they have been used to try out different uses for a an interactive tool for which the design idea was only partly determined, as in (Brandt & Grunnet, 2000). In this case, the incomplete objects were used to try out and match design ideas with a number of predetermined situations (Figure 6.b). They have also been used to create a situation for use, as in (Strömberg et al., 2004). Here, behaviours and embodied actions were assessed to find more design ideas, with a focus on the staged situation, more than on a design concept embodied by an artefact (Figure 7.c). And they have been used to inspire activities by virtue of their symbolic meaning, as the magic tools in (Brandt & Grunnet, 2000). Here, the incomplete objects where not the repository of the main idea to be developed, but props for thinking in action (Figure 7.a and 7.b).

In these examples, searching for new design ideas has ranged from introducing a new (even if not completely formed) object in common situations, to creating new situations with objects endowed with ad hoc and familiar features. The search for novelty has ranged from seeking totally new situations and action – as if *future* requirements and needs were to be invented from scratch – to assuming that novel needs and attitudes are already implicitly present in actual life, and need to be acted out.

In all these cases, the creative use of embodied but incomplete artefacts is tightly related to the act of performing. And in all cases, the use of performances has served to address the assumption that novel design ideas need to be created with a concrete reference to familiarity and habits. It is important to note that, in all cases, the application of performances had to couple familiarity and novelty, abstraction and detail, practical accomplishment and symbolic signification, and individuality and universality. Furthermore, if these applications constituted the act of devising a show in an artistic context, the success would depend on the seek for a good balance within each couple. But these issues have not been addressed explicitly in the literature. Research so far doesn't provide alternatives to articulating rehearsal processes that permit to explore design spaces by introducing variations. As mentioned above, those works that reproduced the procedures of Boal's theatre forms are an exception. However, their alterations of the achieved performances are at the level of plot and characters substitutions. They don't articulate the performance exercises along dimensions that link expression and exploration through the aesthetic and technical qualities of the designed artefacts.

As in the cases mentioned so far, also in theatre there is the need for a balanced orchestration of the use of designs in action. And the sources of creativity are both in designs and in skilled use, and there is a co-presence of different driving motives in using objects. In the performing arts, these aspects are tackled by articulating the rehearsal process with principled approaches to directing with a frequent use of the ability to create variations of achieved forms. An important improvement in the design practices mentioned above can be achieved by reinterpreting the ways in which approaches to training and devising performances can proceed by re-enacting and introducing relevant variations. For example, relevant dimensions can be those between neutrality and expressivity, pace and rhythm, incompleteness and characterisation.

In order to clarify what relevant variations can be introduced, it is useful to distinguish different uses that are made of embodied and incomplete objects. In particular, some approaches (e.g., Iacucci et al., 2002; Brandt & Grunnet, 2000) devised performances in which the incomplete forms worked purely as props. In these cases, the core of the creative attempt consists in stretching the imagination to fill the incompleteness of props, while they are applied in real contexts (Figure 6). Other approaches use performances within the world of incomplete forms, or in which incomplete forms influence creativity as symbols (e.g., Brandt & Grunnet, 2000; Strömberg et al., 2004) (Figure 6), or in which markers or props are worn, to constrain or drive movement, as in the Manipulate Media Worksop (Iacucci et al., 2005a).

In the first instance, the advantages of adopting incomplete forms is that they suggest wider ranges of actions. In this particular way of using performances, performers address their task by adding details to their actions. These works suggest a number of questions which still need to be addressed in the literature. One order of questions concerns the way in which the work of performers should be facilitated or directed. These include:

- How can variations be introduced?
- In particular: what are the relevant dimensions in the definition of props and artefacts for performances and in the definition of performing exercises, along which to try out alterations of achieved performances?

Other questions concern the ways performances should be interpreted and intermediate results expressed. These questions include:

- How to link exploration and expression?

- And, in particular: how to frame the evidence which from performances can characterise design ideas and design abstractions?
- Should performances be understood as being ‘reproductions’ or ‘representations’ of aspects of life? And, relevantly to this question, what alternative ways to devise and study them can be learned from the performing arts?

Concerning the last question, as mask work can teach, a distancing and a stylisation of the performance can be induced by using the incomplete objects to deconstruct movement. Before coming to pen and paper reporting, partial results can be created in an embodied form. This can be done not necessarily in one single step, but also in different steps, implementing particulars along specific dimensions.

In this paper, these questions will be addressed by transposing specific approaches to masked performance.

2.2 A case: objects shifting from props to masks in performative development

An example of the use of incomplete artefacts which makes use of variations according to their different qualities as props, tools or masks, and which researches through non-naturalistic acting can be reported from the Manipulate Media Workshop, which is introduced in (Jacucci et al., 2005a).



Figure 1. Performances with visual markers to trigger projections in the Manipulate Media workshop (Jacucci et al., 2005a).

One of the interactive installations in this event was meant to provide a setting to explore the act of meeting between people, as it happens in architectural settings such as the areas in front of shop windows, elevators, ticket queues, pay machines and the like. It consisted of a camera recognition system that triggered video or image projections on walls, upon the recognition of visual markers which could be worn by participants in performance exercises. The installation was intended to create situations in which two people meet in the place and compose an image (made of two parts) which they eventually interpret as being meaningfully related to the act of meeting.

The installation had been implemented and exposed in a modern art museum, and then used in performance exercises and redesigned according to the outcomes. One of the observed outcomes from these activities are alternative roles the markers could play in influencing performances. These could range from the functional use of a tool, to the covering of body parts, to the lead for movements explorations.

The interactions with the installation changed when a participant covered parts of his body with markers and tried to create a specific rhythm by repeating a sequence of motions that would reveal the various markers to the camera. From this moment, participants' shifted from interpreting the content of the projections, to watching and repeating the movements to create image composition as a meaningful performance in itself. In this performance, the use of visual markers had shifted from an utilitarian use, as in the use of a tool, to a wearing that influences a performance, in a similar way in which some type of masks do.

The subsequent redesign of the installation learned from these performances and introduced interactive features which allowed them to be extended. The new design of the installation allowed for a more articulated exploration of relationship between time and space, instead than having a one to one relationship between marker and projection. The images composition were made in three instead than two parts. The projections' qualities was made to depend on the position of people wearing markers in the installation. This articulated the ways in which the installation reacted to the relationship between people in its space. Also, by the delay between a physical movement in the space and the triggering of a projection, it became possible to play with time and pauses, other than with static body positions.

The ways of employing markers in this installation had shifted from the use of tools to the wearing of artefacts that motivate or constrains behaviours, even without consciously suggesting a function. Markers were quite different from the props treated in the previous Section. But still, being incomplete artefacts, and being used to motivate performances in the search for new needs and design concepts, they provided a different but relevant employment. Another novelty in the use of these objects is the fact that they are 'uncharacterised'. Markers didn't express features that characterise a motive or a type of object. They can be called 'neutral' with respect to the characterisations of the mock-ups of Figures 6 and 7. The latter use encouraged movements and behaviours that resemble the use of masks in that they favour the decomposition of body movements. The design activities carried out on this installation partly answer the questions outlined above and raise other ones.

- What are the possibilities to devise relevant performance exercises that make use of incomplete objects within the range from characterised to neutral?
- What are the possibilities to ground a definition 'characterisation' or 'neutrality' of design props upon specific performance types?
- What ranges of hybrid uses of incomplete objects can be developed to devise performances for design, between props and tools, and between props and masks?

3. PERFORMING WITH AND THROUGH ARTEFACTS

Unlike all the artistic practices that have been applied so far in design, approaches to masked performances directly and overtly address the quality of embodied actions in relationship to the qualities of a designed artefact, that is, the mask. Approaches to masked performance link the design of artefacts to qualities of performances. Masks are divided into categories, according to specific modes or levels of acting explorations that they enable. Also, in these practices, different mediating roles of masks are related to design decisions, at different levels of detail or abstraction. Furthermore, design decisions are researched, defined and assessed through ad hoc performing exercises.

For these reasons, at least in the abstract, practices of masked performance can be perceived as relevant to the general problem of applying performing arts practices in design contexts. However, a

transposition from these artistic contexts to interaction design is not simple. In fact, only a few objects of design can directly be considered as masks, and they cannot all be worn, or used to signify in performances.

In this paper, the interest to reinterpret these practices from performing arts contexts is still motivated by the powerful analogy between design props and masks. The power of this abstraction can come from an extensive definition of 'mask'. The latter can comprehend several mediating roles which are acquired in embodied action by objects of interaction design. However, the scope within which this analogy will be interpreted here is restricted. The scope is, in particular, on addressing some specific questions which pertain to masked performance. This paper will address questions that are already implicitly present in actual design contexts – as outlined in the review above. Basic phenomena in the use of masks in theatre – in particular, the working of neutral, expressive and larval masks – are already present in design works which make use of props, mock-ups and other objects in practical attempts through embodied action.

The questions indicated above will be addressed here in the light of practical approaches to masked performance. The aim is to articulate the creative work of performers and directors to explore action with and through objects. In particular, movement work based on 'neutrality', the definition of 'expressive' and 'played' masks, and the research of design spaces through different forms of 'incompleteness' (at the basis of the meaning of 'larval') can be imported from practical approaches to masked performance. They can serve to structure different levels of creative work in design. This will also provide a terminology to understand different aspects of performances in design. In this paper, they are put in relationship with aesthetical features of specific artefacts, which can acquire the role of masks.

One first aspect is how masked performance can permit to research on movement and space that would not be favoured without masks. By covering parts of a performing body, one can achieve a state of inquiry through movement which permits to be more economical, neutral, free or focused. This can also simplify a performance and uncover human behaviours and inner traits, which would not be apparent otherwise. This aspect will be related, in particular, to the need to structure the search when exploring a design space through performance. A specific case of the design of interactive installations relating to a similar concept of *neutrality* that is researched with 'neutral masks' will be discussed.

A second aspect is that expressive (characterised) masks can permit to explore breadth and focus of embodied action by imposing structures, and facilitating digressions. For example, characters are not neutral, in that they are subject to predefined structures. By researching on variations on the expressivity and characterisation of masks, the work is complementary to that done with neutral masks. One can introduce structures and driving features that are alien to the original context and to the people involved.

A third aspect is how masks can permit to explore the use or mediation with artefacts that retain different degrees of 'incompleteness'. This can be done by first finding those masks that work well thanks to the fact that they are incomplete but potentially expressive. Then the search can proceed by attuning the levels of detail of the incomplete masks. Important principles can be gathered from performance work with 'larval' masks. This points to questions about design done with props and mock-ups. In particular, the practical work that is taught with larval masks shall be transposed to discuss the tension between uniformity and universality with props and mock-ups in design.

3.1 Basic terms for the use of masks and mediating artefacts on stage

There are several ways in which a theatrical mask works as a ‘mediating’ artefact. A mask can have different roles in both driving and inspiring the masked performer and in guiding spectators’ interpretation of her performance. Masks can work as tools for imagination and control. This happens both from the point of view of performers and from that of spectators. For example, with a face-mask an actor’s face disappears and her body becomes far more noticeable. With some types of masks the whole body is moved in function of endowing the mask with life. Moreover, a mask can work as a constraint, a filter, a means and a vehicle. It can *show* a character in its broad outlines, it can *structure* or simplify the playing style, it can *delegate* to the non masked parts of a body to express essential attitudes, it can *filter* out the complexities of psychological aspects, and it can impose guiding *attitudes* in embodied actions.

Lecoq (1997) refers to dramatic masks as “those which can serve as vehicles for human qualities, setting up a transposition and thus achieving a certain level of acting”. (Lecoq, 1997, p. 61) “In masked performance, gestures are expanded or reduced and the eyes, so important in psychological playing, are replaced by the head and the hands, which assume great significance”. (Lecoq, 1997, p. 62) Consequently, real objects add so effectively to the power of the performance of expressive masks. Dynamic features of theatrical masks can be applied to studying entities such as media, technologies and ordinary events, which can acquire similar masking roles in life and in design practices. To this end, relevant terms of the working of masks in theatre need to be outlined.

3.1.1 Dualities in working with masks in theatre

A mask can be an active element both for who wears it and for who watches. The act of masking an actor gives rise to a number of ambiguities. In order to take advantage of the approaches to masked performances in design, a consequent terminology must be adopted. Masks introduce several dualities in the practical accomplishment and in the interpretation of performances: inward *vs* outward, showing *vs* hiding, constructing *vs* deconstructing, immobility *vs* movement and reality *vs* illusion. The following definitions can be used to detail a description of design objects that are meant to acquire masking roles in performing activities.

- Inward *vs* outward: masks always work in two ways. They project the awareness of a form to the performer, and they project images to the audience.
- Showing *vs* hiding: masks show and hide, for example, they hide a face and show a different one. Artefacts which only show or only hide, might not work as masks. An example of artefacts that only hide are the white masks used in protest marches (also called ‘dead’ masks). They neither show a character (as expressive masks do), nor an abstraction or an incomplete one (as larval masks), nor do they facilitate performing modes as neutral masks do. They are designed only with the aim of adhering to faces and hiding them. An example of artefacts which only show are watches, they show a designed figure but usually don’t hide a feature which has a significant role in the interpretation of a performing body.
- Constructing *vs* deconstructing: masks construct and at the same time deconstruct bodies. They construct the composition of a static figure and a moving body. The construction is meant to result in an uniform body. In fact the disconnection between performer and mask is commonly not supposed to be perceived. Masks can deconstruct bodies by impeding natural movements, or motivating stylised behaviours that acquire significance in relationship with

the mask. In fact, masks can be used to train deconstructed movements that are functional also to unmasked performances.

- Immobility *vs* movement: masks are immobile figures, but the whole point in performing with them is to endow them with life, through movement. Hence, mask work always addresses both immobile and moving features, in isolation and in conjunction.
- Reality *vs* illusion: masks work through two simultaneous worlds. One is the picture displayed by the mask, which is a real object that constantly addresses the audience frontally. The other is an illusion of life, which the performer might succeed in showing for limited amounts of time when wearing the mask. Mask work always addresses both worlds.

3.1.2 *Masks as tools for inquiry*

In Lecoq's approaches, masked performance became an important step or tool in the training of actors. Similarly, in design, these practices can be transposed and reinterpreted in order to constitute tools and activities for inquiry, instead than solely leading to a single performance to be staged and used as direct evidence for design. Here the focus will be on those effects of masked performances which permit masks to be tools for inquiry. The 'design space' to be explored is the range of ways in which embodied actions mediated by artefacts can be related to life. This relies on how masks can uncover ('unmask') human traits and attitudes.

In theatre, a major goal in devising masked performances is to give *life* to the mask. The hoped effect is that spectators reach the illusion that the mask is alive, and that at times they forget that the performing body belongs to a person. The eyes of a director can be more critical than those of spectators. Here, the scope will not be to look solely from the perspective of the audience, nor to give a definitive, even if critical, interpretation of the achievements of performances. It is along the director's participative and inquiring look that an object for design can be made to evolve as a consequence of the inquiry. By exploring the dualities outlined above, training and devising masked performance can be an act of inquiry. Relevantly to design, the object of the inquiry can be both on: (a) the possible roles of (masking) artefacts in life – to be researched through variations of performing exercises – and, (b) on possible traits and attitudes – to be researched through introducing variations in the designed (masking) artefacts, according to relevant categories.

3.1.3 *Inquiry and distancing*

Through masked performance, essential features of movement can be researched in a biased and deconstructed way. By hiding their face, which usually bears the most observed features of their individuality, performers acquire an awareness of the significant movement of their body in space. Having covered their face, with a signifying but depersonalising trait, performers' body and its movement becomes far more noticeable for spectators. The interpretation of movement is biased by the presence of the mask, which 'comments on' or 'adds meaning to' the performance.

Also, performers can take a better distance. Masks permit them to distance themselves from their own personality and even from the role of the characters they play. Ultimately, these distancing effects can articulate the inquiry by transforming the act of 'seeing' in order to make it more conscious.

The benefits to design research are at least because of two orders of reasons. On the one hand, approaches to mask work can provide a practical method to research on the relevance of aesthetic principles. On the other hand, some specific objects of interaction design, such as artefacts, environments, events, can be understood and studied better according to a terminology and the principles of the mask work approaches considered below. A reconsideration of the definition of 'mask' is needed at this point. This will be used to relate the practical work done in masked performances to the objects of interaction design.

3.2 An extensive definition of 'mask'

Mediating artefacts and technologies can work and acquire roles that are similar to those of theatrical masks. In order to apply approaches to mask work in the performing arts, it is useful to detail definitions of the term 'mask' in everyday language. The word 'mask' is commonly used to refer to an artefact which covers the whole or part of the face. It can also refer to a likeness of a face or head, or to a fact or action that conceals traits of humans in a static or dynamic way. In this sense, even a car, a telephone, or a webcam can acquire masks roles. Similarly, other artefacts that are object of design can be considered as having qualities of masks. They can conceal aspects of human behaviours, or, by doing this, they render inner traits more evident, or they add characterising traits.

Other connotations of the word 'mask' come from the fields of surgery, sports, photography, electronics, computing or entomology². Beyond the meaning of 'a protective covering for the face or head', masks can include: devices worn to facilitate or prevent contact with environments, shields placed over areas to control exposure, a natural feature or artificial object which conceals features or events from view, material from which a pattern has been cut so that objects can be formed on the exposed areas, a pattern which, by convolution with a second pattern, can be used to isolate a specific set of the second pattern for examination. The actions included in these definitions – such as protecting, examining, isolating, exposing to the environment – point to a variety of applications.



Figure 2. Examples of designed artefacts that, according to their use, can acquire masking roles: shooting settings and stages, props and mock-ups used in participatory design – from (Brandt & Grunnet, 2000) – interactive tangibles to digital videos of participants – from (Jacucci et al., 2005b).

Several common technologies conceal features of human action, thereby better uncovering human inner traits, personalities and characters. The definition can be extended more explicitly, in order to name those essential features of masked performances that can be found in common objects of interaction design. For example, artefacts and objects of design are used to feature in performing intents. Among these there are props, mock-ups and mediating tools. These will be addressed in the

² From the Collins English Dictionary & Thesaurus, 2004 edition.

following with the help of terms of practical methods, neutrality, expressivity, and the incompleteness of larval masks.

3.3 Neutral

The work with neutral masks aims to achieve the ‘depersonalisation’ of the performer. The result that is sought are performances endowed with ‘universal’ qualities. That is, a performer wearing a neutral mask tries to achieve a state of neutrality, and moves on to represent traits of life which belong to everyone. This is only a particular territory for exploration in masked performance. It retains an importance across theatre schools and traditions, and it encompasses styles and cultures. Its definition as a specific practice can be worked out also in design contexts. In fact, similar states of neutrality when acting with or through the objects of interaction design, or the ‘neutral’ qualities of some of such objects, are evident in design activities. They can be found, for example, when design seeks universal abstractions by starting from particularities in design sessions.

Two common examples of ‘neutral’ masks are shown in Figure 3. The aim of a neutral mask is “to open up an actor to the space around him and to put him in a state of discovery” (Lecoq, 1997, p. 38). But, more than on identifiable formal aspects of the mask, the definition rests upon the way in which the performance is achieved through that mask.

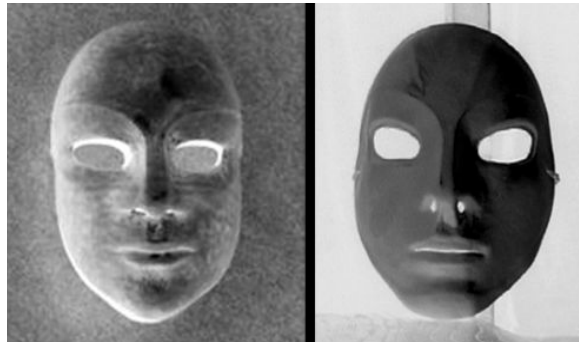


Figure 3. Examples of ‘neutral’ masks.

Performances with neutral masks aim to discover movements and behaviours that belong to everyone, without imposing specific ‘characters’. An additional effect in training with neutral masks is that, through the seek for neutrality, it becomes evident what we are and what we want as individuals. The ways these goals can be achieved in theatre is relevant for design practices that make use of props or artefacts which have effects in performed actions. Some of them can be studied according to how they can be associated to similar definitions of ‘neutrality’.

By using the extended definitions of mask that is given above, important principles from practical work with neutral masks can be reinterpreted. Two relevant points will be addressed here to guide design: (1) one is the definition of ‘neutrality’ as a performance state which is induced by the conjunction of the mask as an artefact and a particular exercise. This constitutes a mode of research which is complementary to explorations based on expressivity and characterisation, and can be used to motivate further inquiries by comparison; (2) the other one is the consequent meaning that is acquired by the ‘universality’ or the ‘uniformity’ of design features.

3.3.1 *Exploring by defining neutrality through performance*

In the case of masks, the word neutral can still bear some of the meanings it has in everyday language. Three main connotations are: “being with no distinctive quality”, “harmonising” with most other aesthetic forms, and “being indifferent”³. But the definition of neutrality for mask work is not purely a quality of the mask as an artefact. It refers to the specific performance work that is done with it. Such practical work can inform design in contexts outside theatre.

Improvisations with neutral masks aim to be favoured by a state of openness and freedom to ‘receive’. This state is a quality of the performance which stems from the relationships between the performer and the mask. The intention is to go back to the origins, and to relate to the most basic elements of life and nature (Lecoq, 1997). The neutral mask aims to put us in touch with what belongs to everyone. Getting a person to work on themes with the neutral mask permits to observe her presence, and her sense of space. In the seek for neutrality a director will look if her movements and her body belong to everyone, if she can find the common denominator of embodied actions, which everybody could recognise.

Explorations with neutral masks are articulated in practical exercises which include both discovering the mask as an object and experiencing movements through journeys and identifications. They permit “to watch, to hear, to feel, to touch elementary things with the freshness of beginnings.” (Lecoq, 1997, p. 38) Traditionally, creative exercises with neutral masks include awakenings, journeys, encounters and farewells. It is not the incidental details in the performance that are retained. Rather, it is the driving motive that these exercise try to bring out that is researched. The motive is intended as not being linked to a particular context or character.

There are additional principles that drive movement work based on neutrality as an inquiring tool. On the one hand, such work can provide a series of fulcrum points (key embodied states) that are essential for embodied actions, but that cannot be researched without the deconstructing function of neutral masks. On the other hand, having experienced balance through work based on neutrality, a performer is better equipped to express a character’s imbalance or conflicts (Lecoq, 1997).

3.3.2 *Uniformity and Universality*

The scope of exploring design features through performances based on neutrality is to achieve embodied actions that have a degree of universality. This relates to a major problem in addressing design with performances: how to move away from individual and particular instances and reach ‘design abstractions’ endowed with ‘universal’ qualities? Relating to machinery, to be ‘universal’ includes being designed or adapted for a range of sizes, fittings or uses. More commonly, ‘universal’ qualities of performances and in design are meant to be generalisable or capable of being used and understood by all. The seek for ‘universality’ can be addressed in different ways. In the arts, and in particular in the performing arts, universality can be sometimes related to ‘uniformity’. In this sense, being uniform coincides with being ‘regular’, ‘homogeneous’, ‘unvarying’, ‘monotonous’, ‘lacking diversity’. But uniformity and universality are different aspects of design features.

Performance work based on neutrality addresses precisely this issue. The exercises developed for neutral masks foreground the fact that in order to achieve performances that are endowed with universal qualities, one cannot rely solely on uniform aesthetic qualities. For example, the shape of

³ From the Collins English Dictionary & Thesaurus, 2004 edition.

masks must be attuned to individuals and to performance activities in order for them to work as neutral. At the basis of this search there is the study of how humans are different and, at the same time, how they can share experiences helped by the design of mediating artefacts.

3.3.3 *Example of the design of an interactive installation*

Given the definitions above, cases of design of interactive systems can be studied accordingly. Figure 4 shows a performance of participants in the Manipulate Media Workshop, who made use of visual markers that were part of an interactive installation to be re-designed in that session. In this case the performer placed several markers around his body, and performed the use of the installation by triggering digital representations by moving in front of the camera of the installation.



Figure 4. Performances with visual markers in the Manipulate Media workshop (Jacucci et al., 2005a). They can be worked out and studied relying on the tradition of movement work based on neutrality.

The masking role the visual markers achieved in his performance have some of the essential driving feature of neutral masks. Even if they don't cover the person's face, they take the attention away of the characterisation of the performer. They motivate an exploration through movement that is not structured by a character's objectives, and, in this sense, is neutral. The performer embodies a generic person. The markers drive and highlight his movements and depersonalise them. Furthermore, like in the use of neutral masks, this way of placing the markers on his body has the effect of triggering or suggesting a series of explorations through movement that would not follow from the personal motives of a character. The new exploration is motivated by a new way of structuring the performer's body in front of the marker-reader. It develops in the opposite direction of characterisation or expressivity of masks or objects. The way the attached markers look don't lead to interpreting him as a particular character. As figures, markers express nothing. But they have the effect, like neutral masks, to motivate a state of exploration through deconstructed movement.

Until this performance was made, participants had been relating to the installation as persons, with their own personality and characterisations. Explorations with worn markers or other objects, as in interactive installations, can range at least between two poles: 'characterised' and 'neutral'. The effects of explorations at the poles are not necessarily similar across different contexts. The presence of these modes of practical attempts articulate the inquiry through movement. In the case discussed here, neutrality stemmed at least from: (1) the markers outlook, (2) the placement of the markers over specific body areas: those between junctions, and (3) the presence of multiple markers worn over the same body.

3.3.4 Conclusion

One of the ways in which performances with design artefacts can contribute to design inquiries is through exercises of movement based on neutrality. Such activities explore different aesthetic qualities of the design artefacts, in order to find those which can make them work as neutral masks. The activities also explore universal traits of embodied action, thanks to the functions of neutral masks, if acquired by the design artefacts.

According to the principles governing masked performances with neutral masks, the exploration proceeds by trying out alternatives in which those artefacts can guide or constrain embodied action. In order to acquire functions that are similar to those of neutral masks, the artefacts can be mediating tools, physical constraints or framing devices. The explorations aim to rely on them in order to induce performances which: (1) are characterised by a depersonalisation of the performer, and (2) express traits of action that are understood by all, or that are present to some extent in everyone's action in the same circumstances.

This is only a particular performance work that can be used to explore design features with the same artefacts. The inquiry can move on by applying different degrees of expressivity, incompleteness or abstraction, in order to research on other design qualities of the artefacts or the embodied actions. These are the other practices of masked performance outlined below.

3.4 Expressive

Masked performance with expressive masks always depends on a basic structure which is not there in unmasked performance. Expressive masks show characters in their broad outlines. By imposing structures, they order and simplify the playing style (Lecoq, 1997, p. 54). The relevance of these aspects in design is in the way practical approaches to masked performance link expression and exploration by providing activities to 'play' the characterising features.

3.4.1 Exploring by playing expressed characters

An important feature of expressivity and of the term 'played', which is usually attached to characterised masks, is the presence of a character. Masks that express traits and characters can drive performers into expressive uses of space. They determine what movements give life to the character. More in general, the presence of a character can be intended as the presence of aesthetic motives, which, as with 'expressive' masks, impose a structure in the performance. Neutral masks lack this feature. Explorations with expressive masks can be 'played' in the sense that the characterisations present in the embodied artefact (or 'characters' for the case of theatrical masks) are used to 'play' the situation. This is not the only choice possible, as one can choose to work on neutrality instead. The latter use differs from an expressive use in that it uses the artefact's characters to depersonalise or to induce a state of inquiry that leads to representing universal features of embodied action. Not all embodied artefacts can work as neutral or expressive, and the assessment needs to be tried out with performance exercises.

An important element of design inquiries based on expressive and played features is the choice of amount of detail to be introduced. Also mock-ups used in design, such as those reviewed in Section 2, address this aspect. The use of props can be linked to performance work with expressive masks also through the way the inquiry can proceed along the dimension of incompleteness, as with 'larval' masks.

3.4.2 Conclusion

One way to explore design issues through performances with embodied artefacts is by following the practices of expressive or 'played' masks. These approaches are based on the presence of characterising traits. These either qualify the performer as a character, or introduce a structure in the performance by suggesting motives or ways of using the artefacts. Expressive (played) or neutral are two particular dimensions along which to introduce variations during rehearsals of performances with and through embodied artefacts. As the next Section argues, another choice is possible. Given a characterising form to be introduced in design, variations in the rehearsal process can be introduced according to specific degrees of incompleteness.

3.5 Larval

The work to devise masked performances with larval masks is usually directed as with other types of expressive masks. However, larval masks (see examples in Figure 5) have peculiar features that enable to research by exploiting incompleteness. These activities aim to foster spectators' imagination. This is a key motive in design based on performance work in general. But larval masks specifically rely on the incompleteness of features.



Figure 5. Examples of larval masks.

3.5.1 Exploring by the means of incompleteness

The incomplete forms embodied by larval masks enable specific sorts of exploration. They permit to work in two alternative directions. The focus can be either on transposing reality into the mask and to work in the imaginary realm of the mask. The exploration can proceed either by focusing on how the mask inhabits the situation with its form or by focusing on how the situation can be fitted towards 'entering into the form' of the mask (Lecoq, 1997, p. 59).

Again, as with neutral masks, this duality can be transposed in design contexts to articulate the inquiries through performance exploration. Also, practical attempts with the same performing

activities can be carried out by trying out with different incomplete bodies. By comparison, the qualities of incompleteness can lead to design abstractions.

One way to proceed in the exploration is to link the design of the mask to the qualities of the embodied actions. But this is not the only path. Lecoq's exercises are arranged in separate phases. Working on incompleteness permits to explore along at least two paths. One way is to work towards characters and situations which are caricatured by the form of the mask itself. These situations are transposed on the level of the mask. The cases of Figure 6 (Iacucci et al., 2002; Brandt & Grunnet 2000) are consistent with this way of performing. That is, performing "with an incomplete form in the world". Another way is to search for a dimension of the mask in non realistic settings. The search in this second, imaginary realm, is favoured by the presence of the incomplete body, but its interpretation is just a driving motive. This can be considered as a performance "within the world of the incomplete form", which is consistent with the cases of Figure 7 (Brandt & Grunnet, 2000; Strömberg et al., 2004).



Figure 6. Uses of mock-ups in performing activities for design. Figure 6.a is from (Iacucci et al., 2002). Figure 6.b is from (Brandt & Grunnet, 2000).

In Figure 6.a: "With the pointer Claudia explores places in one direction. She gets a list of places like a museum, opera, and a shopping centre. She selects the museum. Information is shown about the exhibits. A map is also rendered describing the way." (Iacucci et al., 2002, p. 6) In Figure 6.b: "Joachim operated the 'Dynabook-prop' while Mike was searching the engine. The prop became an interactive error-detecting device for car repair." (Brandt & Grunnet, 2000, p. 6)



Figure 7. Uses of mock-ups in performing activities for design (Brandt & Grunnet, 2000).

Brandt & Grunnet (2000) experimented with the use of 'dream tools' as props in the design process. Their dream tools (Figure 7) are taken from the world of fairy tales. They included, for example, a crystal globe "where you could see whatever you wanted", a magic wand where "you could do whatever you felt like", and a magic box "where you could store whatever needed". "Like in the

world of theatre and when children play, known objects often change meanings while other objects are created for specific purposes.” (Brandt & Grunnet, 2000, p. 7) In these cases, incomplete artefacts contribute to creating situations (an ‘incomplete’ reality), within which performers can explore through “play”.

3.5.2 Conclusion

Practical approaches to masked performance with larval masks can be considered to guide design activities which make use of incomplete artefacts under the form of props or mock-ups. Exercises with larval masks are developed to manage incompleteness, abstraction and imagination. These practical approaches can guide design activities which rely on incompleteness of design artefacts.

4. DISCUSSION

Artistic practices of masked performance, for example those developed in Lecoq’s (1997) teaching, have developed practical approaches that exploit the ways masks feature aesthetically in relation to specific performing activities. These approaches to devising performances can help reflecting aspects of life when applied to the design of artefacts that acquire a masking role. To this end, this paper proposes how the abilities to create variations and the principled ways of directing rehearsals can be reinterpreted in design.

The following discussion aims to clarify how such artistic practices, even when transposed into design contexts can retain some core aspects of an approach to the arts. These are: (1) a commitment to providing abilities to proceed in devising performances through introducing variations of the achieved forms; (2) a non-prescriptive approach to directing performance by introducing constraints, in which the relevance of the constraints that are introduced is guaranteed by their importance as aspects of masks; and (3) an approach to the arts which relates to life by producing stylised forms that are relevant to producing design abstractions.

4.1 The ability to create ‘variations’

The applications of performance in interaction design can be described relying on a vast range of practical methods that make us capable of creating ‘variations’. This is recognised as a fundamental ability in devising theatre (e.g., Brook 1968; Barba 1995). When a performance piece gets devised (forms of theatre, dance, music), it is common to repeatedly rehearse by introducing variations. Usually the following two steps are taken:

1. some performance, phrase, action or form is ‘achieved’ by a performer(s) under some guidance, practical or aesthetic constraints (such as scripts, instruments, senses, physical constraints, aesthetic styles);
2. rehearsals proceed in the search of variations of that ‘achievement’. This is a common creative attempt to both fix the ‘achievement’ as a result and to proceed further. Because of the ephemeral character of performances, the original ‘achievement’ is lost. It will not be reproduced as such during staged performances. One can only re-produce it in the form of variations. This is a specific feature of the performing arts.

The approaches to masked performance described above provide specific activities through which designers can articulate the exploration of the design space with the use of artefacts that have or acquire a masking role.

4.2 Inspiring, constraining, directing

The approaches outlined in Sections 3 have a common commitment as art forms, which is relevant in design as well. In design session, as in the traditions of theatre directors such as, for example, Jacques Lecoq, Keith Johnstone, Peter Brook, Augusto Boal, the main concern of a director is to avoid telling performers 'what to do', but at the same time to drive the creative process in order to make them work creatively and 'make things happen'. The problem is known in most approaches to directing in the performing arts, as much as in design. In fact, the major goal is to devise a performance by making it emerge by imposing a minimum control, and by being ready to take advantage of unexpected outcomes.

A particularly relevant aspect to design activities is how the role of constraints can be developed within collective activities. As summarised in (Jacucci et al., 2005a), one can facilitate creativity in design, as in the performing arts, by carefully introducing constraints in performance activities. To this end, the particular approaches to masked performance described above are an approach to improvised drama which makes an overt use of constraints to practical action. This can be an arbitrary choice to be made among other approaches to devising theatre performances.

The practices addressed in this paper are particular instances of approaches to devising performances that:

- *Are loosely structured.* Consistently with design intents, one wants to achieve the participation of performers without prescribing action. The practices described in this paper provide categories of masks and dimensions for exploration, without prescribing what should be done. At the same time, the terms of mask work structure the space of possible performances. They suggest ways of exploring specific masking roles of the artefacts, which have been proved to be fruitful in performance training.
- *Tend to put meaning at the end of the creative process.* Another need in exploring design issues through performance is to make meaning emerge from practical action, in such a way that the interpretations are relevant to participants' life. Consistently, these approach to mask work aim to not fix meanings in the first place, but to make the performance evolve.
- *Avoid planning and control.* When exercises are planned and controlled, this is done only to constrain the explorations within the relevant dimensions of neutrality, expressivity and incompleteness. Within these territories of mask work, the planning and control of the creative contribution of performers is carefully avoided.
- *Aim to achieve 'acting as play', more than as cathartic experiences.* The activities are directed as exploratory games, in which the rules serve to motivate the exploration of design features. The performances are not aimed at achieving spectators' identification.

4.3 Defining design as an approach to the arts

Applying performances in design can be a wider project than the adoption of an art form to “improving communication” in design, “communicating design challenges”, or “collecting requirements” for product development. More widely, design based on performances can be defined as an art. Designers can extend the alternatives available when transposing artistic practices from different schools, styles and genres. Design inquiries can be a form of production that is articulated and guided by practical approaches from the performing arts. As it happens, reality doesn’t suffice in representing design problems. This is one of the motives for using performances or, in general, for achieving illusion or imagination, to express and explore in design. In determining design spaces, stylisation provides an understanding of design issues that is not possible through naturalistic play. In this way, if design based on performances can learn from the performing arts. The fundamental drive should not be based simply on acting scenes or embodying movements, nor on any performance tradition, Aristotelian, Brechtian or other. The primary reference should be life itself. Through performance work, designers can look at relevant aspects of life.

Masks are tools for representation which move away from naturalistic acting and enable actors to take a distance from reality. The work is done through creating illusions, which ‘give life’ to the mask, an unanimated object. By focusing on specific aesthetical qualities of masks, this paper proposes to reinterpret a terminology from masked performance. By studying how artefacts that acquire a masking role featuring according to their neutrality, expressivity or larval (or incomplete) qualities, some aesthetical aspects can be addressed as practical ones.

5. CONCLUSION

This paper has argued that the principles that hold the training and the creative work done in the tradition developed by Lecoq (1997) with neutral, expressive and larval masks can be extended to practical creative work in design. For instance, they can address design with mock-ups and props in participatory design. Design work can be guided by the concepts of neutrality and expressivity, the search for forms of performance through incompleteness, their pedagogical effects on actors and their relationship with different levels of acting. Neutrality of interactive artefacts, their mock-ups and their design abstraction can be researched and defined in ways that are similar to how neutral masks enable exploration and discovery through performances. In the case of larval masks, similar approaches to creative work can lead to explore the design space through the study of how incomplete forms feature in the world or create new worlds to foster imagination and abstraction. Furthermore, the ways larval or expressive artefacts feature in characterised and played performances, can be contrasted with how they work in performance work based on neutrality.

The matter is not so much that the props or mock-ups used in participatory design are incomplete as are the larval masks, nor a novelty that one can use incomplete props to perform or imagine, but rather, the practical work done with masks provides a relevant terminology and practical approaches to articulate the work with props in design.

REFERENCES

- Barba, E. (1995). *The Paper Canoe: A guide to Theatre Anthropology*, London: Routledge.
- Binder, T. (1999). Setting the Stage for Improvised Video Scenarios. *Proceedings of CHI’99*, Pittsburgh, 1999.

- Boal, A. (c1974). *Theatre of the Oppressed*. Pluto Press.
- Boal, A. (1975). *The Rainbow of Desire*. London and New York: Routledge.
- Brandt, E., & Grunnet, C. (2000). Evoking the future: drama and props in user centered design. In T. Cherkasky, J. Greenbaum & P. Mambrey (Eds.), *Proceedings of the 6th biennial Participatory Design Conference (PDC 2000)*, pp. 11-20.
- Brook, P. (1968). *The Empty Space*. London: Penguin.
- Dolonen J., Mørch A., & Åsand, H.R. (2003). Learning and knowledge building at work. *Proceedings of the 2nd European Conference on Computer-Supported Collaborative Learning (CSCL 2003)*, pp. 68-71.
- Dworaczyk, B., Creel, J., Azeez, B., Kerne, A., & Beane, B. (2005). A Gesture-based Hyperrealistic News Space. Last accessed from: <http://ecologylab.cs.tamu.edu/courses/recombinant/gallery/assets/> on January 2006.
- Engeström, Y., & Kallinen, T. (1988). Theatre as a Model System for Learning to Create. *The Quarterly Newsletter of the Laboratory of Comparative Human Cognition*, April 1988, Volume 10, Number 2, 54-67.
- Fjuk, A., & Sorensen, E. K. (1997). Drama as a Metaphor for the Design of Situated, Collaborative, Distributed Learning. *European Journal of Open and Distance Learning (EURODL)*. Vol. 1997/I.
- Iacucci, G., Iacucci, C., & Kuutti, K. (2002). Imagining and experiencing in design, the role of performances. *Proceedings of the Second Nordic Conference on Human-Computer Interaction*, ACM Press, pp. 167-176.
- Jacucci, C., Jacucci, G., Wagner, I., & Psik, T. (2005a). A Manifesto for the Performative Development of Ubiquitous Media. *Proceedings of Critical Computing, Between Sense and Sensibility, The Fourth Decennial Aarhus Conference*, ACM Press, pp. 19-28.
- Jacucci, C., Pain, H., & Lee, J. (2005b). Media Co-Authoring Practices in Responsive Physical Environments. In T. McEwan, D. Benyon & J. Gulliksen (Eds.), *People and Computers XIX – The Bigger Picture*, Springer-Verlag.
- Jacucci, G., & Wagner, I. (2005). Performative Uses of Space in Mixed Media Environments. In E. Davenport & P. Turner (Eds.), *Spaces, Spatiality and Technologies*, London: Springer.
- Johnstone, K. (1981). *Impro: Improvisation and the Theatre*. New York: Routledge.
- Kankainen, T., Rantola, V., Mehto, K., & Tiitta, S. (2000). Interactive Drama and User Centered Product Concept Design. Last accessed from: <http://www.hiit.fi/uerg/publications/> on January 2006.
- Laurel, B. (1993). *Computers as Theatre*. Addison-Wesley.
- Lecoq, J. (1997). *Le corps poétique*. Paris: Actes Sud-Papiers. (Published in English as *The Moving Body*, London: Methuen, 2000.)
- Mørch, A., Engen, B., & Åsand, H-R, H. (2004). The Workplace as a Learning Laboratory: the winding road to e-learning in a Norwegian service company. *Proceedings of the Participatory Design Conference (PDC) 2004*. 142-151.
- Read, G. (2005). Theatre of Public Space: Architectural Experimentation in the Théâtre de l'Espace, Paris, 1937. *Journal of Architectural Education*, 58 No. 4, pp.53-62.
- Salvador, T., & Howells, K. (1998). Focus Troupe: Using Drama to Create Common Context for New Product Concept End-User Evaluation. *Summary of CHI 98*, ACM Press, pp. 251-252.

Strömberg, H., Pirttilä, V., & Ikonen, V. (2004). Interactive scenarios – building ubiquitous computing concepts in the spirit of participatory design. *Personal Ubiquitous Computing* (2004) 8: 200-207.

Turley, S. (1997). Designing for Audience Response. Last accessed from: <http://www.tech.plym.ac.uk/soc/medspace/simon.html> on November 2005.