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Drawing Thinking: Exploring the Alignment of Visual Languaging with a Pluriliteracies Model for Deeper Learning

– Experimenting with Visualisation and Languaging for English Language Teaching and Learning in an Online Primary School Classroom in China

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Table of Content

Chapter 1 Introduction

This study explores the potential of visualisation created by learners to support their conceptual knowledge and language learning in language classrooms. Given the context is situated in English language learning classrooms in China, the development of English language education in international and national contexts (i.e., China) will be addressed first in this chapter. And in so doing will consider current thinking and contextual variables including cultures, pedagogies, and policies in terms of the quest for developing pluriliterate citizens (Coyle et al., 2018; Bower & Cross, 2019) and realising a global culture of lifelong learning –

> "A vision of lifelong learning needs to be framed within a broader understanding of the future…this collective vision was organized around the idea of a culture of lifelong learning, one that shapes how learning and knowledge production are understood and take place. The vision focuses simultaneously on the learner (motivation, abilities, and ways of learning) and on the social dimensions of learning (learning as a collective endeavour, strengthening a sense of community)" (United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2020, p. 12).

Aligning with such global goals, supporting younger learners to take agentic roles to direct and sustain their own learning, through promoting their confidence, motivation, and engagement in school and beyond is one of the drivers of conducting this study. Moreover, the researcher's personal experience as an English language learner, teacher, and developing researcher also drove the emergence of exploring learning through learners' visuals, thereby working towards identifying and potentially finding ways of addressing existing gaps in the Chinese education system (this will be discussed further in 1.4). This interdisciplinary study from a broader sense draws on the fields of art (i.e., visual creation), education (language learning), and applied linguistics, which may crucially open dialogue about the potential of adopting and adapting interdisciplinary visual strategies for scaffolding other language learning in wider contexts.

1.1 The International Positioning of English

It is well documented that English as a lingua franca (Kirkpatrick, 2020; Schreier et al., 2020; Eurydice Report, 2006) has been increasingly adopted by speakers of other languages for meeting

their future needs in a rapidly moving and internationalised world. This in turn provides a valuable contribution to the global Millennium goals including enabling all learners to access equitable, quality education (United Nations General Assembly, 2000; UNESCO, 2000). Through this lens, English can be seen not only as a linguistic medium of education rapidly expanding during the last two decades in both Anglophone and other countries (Holliday, 1994) but is globally accepted as *linguistic capital* (e.g., Sung-Yul Park & Wee, 2012). This sociolinguistic term coined by Pierre Bourdieu has been used to describe multiple linguistic skills and sources accumulated over learners' lifetimes with values associated with different cultural, educational, economic, and social purposes (Nyatuka, 2021; Farrelly & Fakhrutdinova, 2020). From this perspective, English as a linguistic strength or asset plays an important role in mediating interactions and relations at individual, institutional, governmental, and international levels, for example, enhancing individuals' life-long learning, supporting the economy in terms of business and employment opportunities as well as societal shifts in travel and migration.

With the growing trends of current global communication and the movement of people, the perceived future needs to be underpinned by developing literacy and proficiency in the dominant language of the migratory country or the world are increasing. English, therefore, is associated with learners with multilingual or bilingual identities. Attention to cultivating multilingual and multicultural citizens not only for social communication but also for developing academic language proficiency for further study or employment in the increasingly changing global marketplace has led to the promotion of language education through bilingual programmes across compulsory education (Graz Group et al., 2013; García, 2014; Cummins, 2000; 2008). In this sense, students engaging in bilingual programmes are expected to learn more languages in addition to their first languages which widens the potential for living, studying, or building a career in a global landscape.

Moreover, as Lasagabaster and Sierra (2010) point out the aims of bilingual programmes offer migrant learners not only opportunities to enhance their language competence but also to avoid exclusion and foster their engagement in multilingual local communities. Indeed, students from Asia with first languages including Chinese, Korean, or Japanese who migrate to English-dominant

regions (e.g., Britain, Australasia, and North America) can benefit linguistically from experiencing bilingual classes for adapting to the local life and involvement in communities including schools, neighbourhoods, and online social platforms. In a similar vein, students from Europe or America studying or working in Asia have led to increasing bilingual classes in Asian countries including India (Anuradha & Viswanath, 2019), Korea (Lee, 2020), Japan (Tsuchiya, 2019), and other south Asian regions (e.g., Tsang, 2020; Yang, 2015).

Owing to sociocultural changes of globalisation, English as a world language has been the most widely implemented language in bilingual education across Europe from the 1990s onwards alongside the rest of the world (Baratta, 2019; Graddol, 2006). As the paramount importance of English in bilingual education becomes broadly recognised and valued on a global scale, educators and researchers have been exploring the potential and developing the principles and practices of integrating subject or content learning with language learning (Dalton-Puffer, 2011). Increasing researchers in the field provide evidence to suggest that traditional approaches (e.g., didactic, grammatical, or exam-oriented) to both language and subject teaching and learning are insufficient to equip learners with the necessary skills and knowledge fitting for near-future employment and well-being (e.g., Coyle & Chopey-Paquet, 2020; Dale, 2020; Nikula et al., 2016).

Over the decades, this has led to a wide range of different models and pedagogic approaches that bilingual education encompasses. According to García (2009), bilingualism is not about maintaining two languages or subtracting learners' first languages, instead, it is a plural "involving a much more dynamic cycle where language practices are multiple and ever adjusting to the multilingual, multimodal terrain of the communicative act" (p. 53). One particular bilingual learning model reflecting this dynamic concept of bilingualism is known as content and language integrated learning, which has exponentially expanded globally over the last three decades in response to the linguistic complexity, societal changes, and reforms of the 21st century. This model will be further discussed in detail in chapter two. Having introduced generally the positioning of English on the world stage, the next section will explore specific developments of English as an additional language in China.

1.2 Overview of English Language Developments in China

1.2.1 From Chinese Historical Perspectives

Situated in the Chinese context, it is necessary to succinctly contextualise how English learning has evolved over history under different political, economic, and cultural developments in China influenced by international trends and domestic priorities. The initial contact with the English language was established for international trade in 1637. It wasn't until the late 18th century of the Chinese imperial era that English language teaching (ELT) was initiated in China's last dynasty – 'Qing' (established from 1644 to 1911). It was introduced by western missionaries and Chinese reformers through private missionary schools and government translator schools (Bolton & Graddol, 2012; Yang, 2000). The founding of a government interpreters' college - 'Tongwen guan' in Beijing in 1862 marked China's own initiative in English language teaching in addition to missionary schools, which offered a range of courses including English and other scientific subjects, for example, physics, chemistry, anatomy, geology, and mineralogy (Adamson, 2002; Lam, 2002).

However, after the overthrow of the Qing government in 1911, the role of English became a controversial subject in the Republican era due to political and ideological uncertainty. For example, by 1927, the political climate turned against missionary schools that were considered manifestations of imperialism for westernising local Chinese people. Instead, English language teaching in government-funded schools was advocated (Ross, 1993). From an ideological perspective, social and philosophical theories were introduced to China by western educators and philosophers during the early nineteenth century. For example, John Dewey's (1973b) democratic theory advocated child-centredness in education and emphasised language as core to children's personal and intellectual development. This theory influenced the teaching objectives and teaching resources in China that placed English as one of the core subjects in secondary school at that time. Meanwhile, most English textbooks had no Chinese explanations and scientific subjects were taught in the medium of English by the missionaries (Fu, 1986). This marked the initial trial of integrating other languages with subject-area knowledge learning in mainland China.

With the introduction of Marxism during the late nineteenth century as the China Communist Party (CCP) took power from the Nationalist Party in 1949 with assistance from the Union of Soviet Socialist Republics (USSR) (Adamson, 2004), the use of English was brought into question. Most English-speaking countries refused to recognise the CCP government and English was replaced by Russian as the main foreign language for bilingual education in Chinese schools (ibid.). However, with the need for industrial and diplomatic expansion in the late 1950s, the importance of learning English increased after political struggles nationwide and worldwide involving Anti-Rightist moves, the Cultural Revolution in China, and the Sino-Soviet split (i.e., the conflict between the CCP government and the Soviet Union) (ibid.). It is against such a political and social climate that English officially became one of the formal subjects for the national college entrance exam in 1962 and was subsequently considered a compulsory subject in formal schooling at all levels (i.e., primary, secondary, and tertiary schools) in 1978. This change also conformed to the first unified national syllabus for primary and secondary school English language teaching (ELT) in China promulgated by the Chinese Ministry of Education (MOE) in 1978 (Hu, 2005). Since the 1980s, English language teaching and learning has received support from the government and citizens for the purpose of commercial and social reconstruction to facilitate the modernisation of China and promote personal enhancement of becoming government officials (Fu, 1986).

1.2.2 The Shift of Focus on English Language Learning in China

From the later stages of the 20th century, English learning in the school curricula has shifted the focus from political ideologies to economic development and international knowledge and technology transfer. For example, the first unified national syllabus for English language teaching (ELT) at primary and secondary levels specified the curriculum content, requirements, and pedagogies for developing students' skills for reading and independent learning (Hu, 2005). It focused on building English literacy through extensive reading in order to practice and master the rules of translation, word formation, and phonology. The components of the curriculum included conversations, English stories, folk songs, vocabulary, and syntax that were instructed through major pedagogical approaches. Such methods included direct instruction and lecture-based learning involving the adoption of worksheets, drills, and practice, and some western modules of teaching methods predominant in the 1970s and 80s, for example, the translation

method that emphasises memorisation and translation of linguistic representations between English and Chinese; and the audiolingual method that focuses on the grammatical structure of sentences via listening and speaking activities including drills in dialogical sentence patterns, yet which limits meaning-making and social interaction (Asher, 2012).

However, it must be emphasised that such curricula and the corresponding pedagogies for English learning were still implemented under Chinese *academic rationalism* – an ideology or orientation to curriculum that focuses on teacher expositions and didactic teaching (Morris and Adamson, 2010). That is to place teachers as the centre of teaching and encourage students to memorise textbook content through a structural and grammatical translation approach (Adamson, 2004) conforming to the syllabi of the curriculum produced by MOE. With the impact of globalisation and China's drive to modernisation, increasing exposure to English relating to cultures beyond schooling – for example, western-style fast-food restaurants, traffic signs, western social media, movies, and TV series – have been permeating Chinese people's acknowledgment and acceptance of English as being part of their life and culture (Adamson, 2004).

In recent years, the scale of English language learners including adult learners in China is increasingly not only driven by social, economic, and political reasons as discussed above but also their personal motivation. For example, in order to enter and graduate from prestigious universities, obtain better positions in overseas companies, and read and communicate international academic papers and technical materials (Jin & Cortazzi, 2002). Moreover, researchers reported that children learning languages at a very young age is important for their academic achievement and intellectual and cognitive development (Tekin, 2015; Sun et al., 2015; Martin-Rhee & Bialystok, 2008). Therefore, the now contested notion that the crucial period for children to learn a second or foreign language (e.g., English) is in the age range of three to six years (Adžija & Sindik, 2014; Brumen, 2011) still holds.

This is reflected in the beliefs of Chinese parents who have high expectations for their children in building English competence. They continuously invest in English learning that will support their children's academic and career achievement (Zhou, 2019). For example, due to the Chinese

education system where English is not set up as a mandatory subject in public kindergartens (Ran & Lu, 2020), some parents choose to send their children to private, for-profit Chinese-English bilingual or English immersion kindergartens, preschools or language training schools that adopt English as the only medium of instruction (EMI). In addition, some children also receive family education for enhancing their interest and English proficiency through learning daily English words and songs and doing English homework while being supported and tutored by their parents.

With intercultural and parental influences, many children in China gradually build up their motivation and curiosity to learn English, which has led to the exploration of learner-centred, interest-based pedagogical approaches by researchers, teaching practitioners, and policymakers. For example, given that the status of English learning has shifted over time from the 'Qing' dynasty to the founding of the CCP government and onwards as shown in Diagram 1, its curriculum and pedagogies have changed accordingly to the political, economic, and social changes in China. However, although the contemporary English curriculum in China is still strongly oriented toward linguistic forms in order to meet the requirements of the national exam as the main pathway for entering universities, gradually teaching and assessment practices are moving away from *academic rationalism* (Leung & Ruan, 2012). Instead, they are becoming more aligned with social and economic efficiency such as combining listening and speaking tests for communicative competence rather than simply focusing on the grammatical aspect of English (MOE, 2001).

As China develops and becomes more modernised and internationalised, this social and economic efficiency calls for embracing and adapting pedagogies from other countries into the Chinese context, responding to the Belt and Road initiative (BRI) announced by the Chinese government in 2013 (Xi, 2017a, 2017b; OECD Business and Finance Outlook, 2018). This initiative also known as the New Silk Road aims to strengthen economic development and interregional collaboration between China, other countries in Asia and beyond, which is summarised by President Xi:

> "China will actively promote international co-operation through the Belt and Road Initiative. In doing so, we hope to achieve policy, infrastructure, trade, financial, and people-to-people connectivity and thus build a new platform for international co-operation to create new drivers of shared development" (Xi, 2017b, p. 61)

The BRI in terms of its educational implications and possibilities can be captured from Xi's emphasis on "people-to-people connectivity" (Xi, 2017b, p. 61) that involves education, cultural and scientific exchanges (Peters & Zhu, 2021). From this perspective, developing educational strategies and practices in China for all school level learners to engage in quality learning has to establish linkages with global emergent pedagogies. For instance, adapting content and language integrated learning (CLIL) for Chinese younger learners' English learning (e.g., Wei & Feng, 2015), investigating Chinese-English bilingual education for science courses in tertiary institutions (Tong & Shi, 2012), exploring English immersion in Chinese primary schools (e.g., Knell et al., 2007) and the Montessori approach in Chinese kindergartens (e.g., Yao, 2006), have led to the immense popularity of learning English in China today. The following diagram succinctly reviews how the English language gained its popularity through its ups and downs in Chinese history.

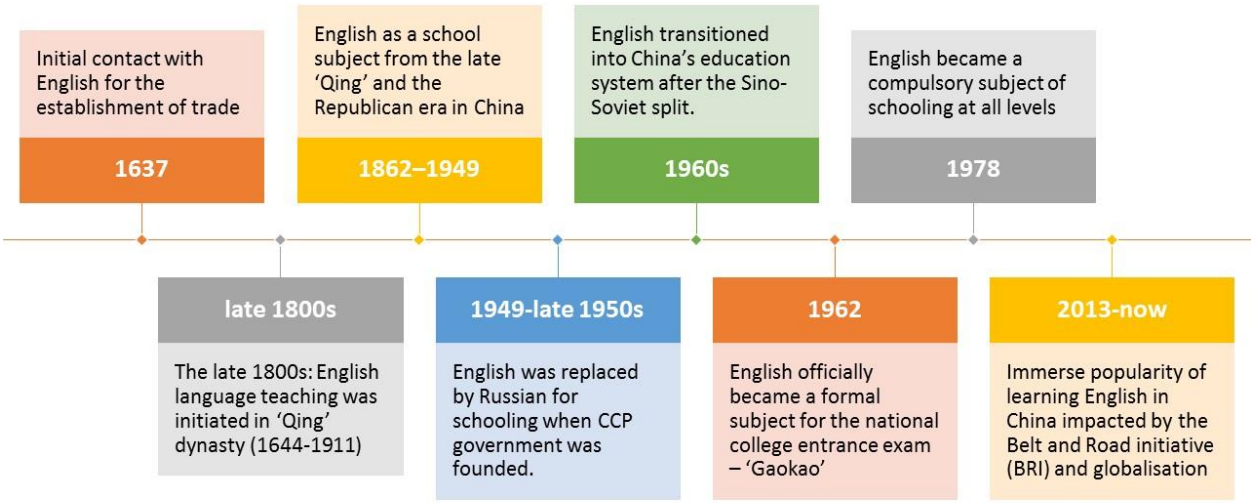


Diagram 1: A timeline of English language developments in China

1.3 The Study

Having discussed English in the international and Chinese contexts, this study is driven by three key factors –

- the need to investigate the impact of emergent pedagogies on younger learners' learning.
- personal experiences which have influenced the researcher's thinking.
- identified gaps a) in current teaching practices in China that are inadequate to build learners' agentic mindset for learning and b) in researching how learner-created visuals might support learning.

1.3.1 Integrating Current Pedagogic Thinking in Language Classrooms

Given the historical background of English learning in China, this study investigates the application of alternative approaches to language learning that are in line with contemporary shifts in pedagogic trends. Such developments go beyond the more traditional interpretation of language teaching that focuses on the enhancement of linguistic systems (de Saussure, 1959; Chomsky, 2009). As Llinares, Morton, and Whittaker (2012) suggest, repositioning languages as fundamental tools for complex meaning-making processes in and beyond schooling that value both the importance of language forms/structures and language meaning is necessary for meeting current global and societal demands. Building on their perspectives, interpreting language as both linguistic systems and social practice (e.g., Van Lier & Walqui, 2012; García, 2014) may offer new thinking for language teaching practices. This stance on the nature of language will be further discussed in chapter two.

Moreover, given the impact of globalisation, the study identifies the need to explore language classroom practices that not only value the structures of language or linguistic forms (e.g., syntax, lexis, grammar) but also consider the multicultural and multilingual changes in the class room and society. For example, as indicated by the 'multilingual' and 'literacies turn' (ACARA, 2012), developing learners' literacies across languages beyond generic or traditional literacy skills (e.g., reading, writing, speaking, listening) is of paramount importance, extending to digital or visual

literacies (Bower et al., 2020; Dale, 2020). Such new thinking stresses the essential role of cultures inherent in languages for classroom teaching and suggests the integration of content, language, and literacies from varied cultural contexts. For instance, interpreting content and language integrated learning (CLIL) within the Chinese context, and rethinking how this might impact English language learning (Wei & Feng, 2015). Also, the researcher's reading of CLIL and experience of working in a CLIL school in China led to exploring its potential and value to the Chinese educational system.

China perhaps is not as advanced in CLIL as some European countries (e.g., Martyn, 2018; Tsagkari, 2019), so exploring its relevance with the Chinese context and more precisely, facilitating a *context-sensitive* (Kumaravadivelu, 2001) approach is necessary. Therefore, this study acknowledges current pedagogical thinking and practices and further explores complementary approaches from the cultural context of China for language teaching. That is, to encourage learners to make use of cultural tools for thematic content learning in language classrooms, from which their linguistic literacies and other literacies skills develop by using or creating cultural tools. The following section will further address the emergence of this study from another driver – personal experiences of learning and teaching, which brought visuals as a cultural tool into the research inquiry.

1.3.2 Personal Experiences

As a developing researcher, the inspiration that generated the focus of this study was based on her academic and professional background. The researcher studied animation and illustration for her Bachelor's and Master's degrees which developed her skills and artistic intuitive ways of creating visuals as an illustrator. She gained clarity and insight into visual interpretation and representations by appreciating the expressive and evocative power of images. During her studies, she created a series of watercolour paintings to illustrate a horror story – 'The Black Cat' by American writer Edgar Allen Poe, using distinctive dark tones of colours, shapes , and lines to convey the main character's radical emotions within the atmosphere of the story (e.g., fear and despair). This later inspired the thematic design of the pilot study for this research. Moreover, she made illustrations to raise awareness of global issues, for example, wild fur animals'

protection, by depicting and celebrating their peaceful wildlife and habitats. As Sava and Nuutinen (2003) suggest, pictures can function as "illustrations of the text", as well as "text as illustrator of the pictures" (p. 532), forming a hybrid or 'third space' where visuals and words meet making art both a process of inquiry and creating meaningful forms. From this perspective, when these words and meaningful forms cross languages, the spaces they create have the potential to enrich meaning-making.

Furthermore, based on the researcher's language teaching experiences in China with English language learners, visuals are commonly used by teachers to illustrate the challenging content, as well as to support explanations of inherent concepts to the learners (da Rocha, 2016). Yet visual practices *initiated by learners to explain their learning* remain limited. Moreover, given the fact that the Chinese education system prioritises passing the national examination as the main learning goal and means of receiving higher education, teacher-centred didactic teaching, therefore, remains dominant in many English language classrooms in China (Leung & Ruan, 2012). It has been argued that such a rote-learning approach may influence learners' affect, emotion (Vermunt, 1996; Panksepp, 2005), and motivation (Fuster, 2017), which in turn may negatively influence learning progression involving cognitive, behavioural, and physiological changes (Tyng et al., 2017). Instead, as Fuster (2017) espouses, learning that connects with learners' daily life and interests can encourage and support the development of their civic knowledge and digital literacy, echoing 21st-century education that calls for a range of competencies or pluriliteracies from younger learners beyond core subject literacies, such as digital literacy, life skills, and learning skills.

Based on the issues rooted in the Chinese education system, personal learning, and teaching experiences, the researcher is inspired to link the fields of language learning and visualisation to explore the complementary possibilities for effective learning. It is acknowledged that visualisation is not a new idea; what differentiates the visual strategy in this project from visualisation is that it provides a space for cognitive and linguistic development by using learners' *own visuals and words to express their thinking together* as a scaffolded endeavour for learning and teaching. This study, therefore, investigates a visual-based approach that is learner-driven

and explores the affective roles of such learner-created visuals in fostering their interests, motivation, and confidence in learning. This may have a significant influence on generating learners' agentic roles in terms of their commitment to develop and adapt their acquired knowledge and skills in other learning contexts independently, which aligns with the conduits to deeper learning (Coyle et al., 2018).

1.4 Research Gaps and Value

Taking into account global and national changes and developments in English language learning and personal experience and research, the existing research gaps can be identified as:

- current English language teaching in China impacted by its exam-oriented education system is not sufficient to develop learner agency for in-depth lifelong learning.
- practices and studies that investigate learner-created visuals for conceptual and language development using the lens of pluriliteracies development have been hitherto unexplored.

These gaps raise the importance of creating alternative ways of enhancing learner agency, thematic content, and language learning in language classrooms. The researcher positions the context of this study in English language classrooms in China not only for complementing the traditional pedagogies of the Chinese education system but also for investigating how younger learners within that system use visuals for supporting their own learning.

Therefore, in this study, it is proposed that integration of visual creation processes into language education may offer learners ways of building on their own unique ways to understand, represent experiences, and make meanings. This linkage involves not only an understanding of visualising learning from learners' perspectives but also the need for both teachers and learners to use visuals as a tool to foster student-centred learning – a first step focussing on learner agency ultimately leading towards learner and teacher autonomy (Benson & Lamb, 2021). Moreover, it enables the researcher to observe and analyse the data needed to create an initial pedagogic strategy – *visual languaging* (see Figure 39 in chapter 6), delineating the alignment of a pluriliteracies model with visualisation. This strategy can be informed and developed in, with,

and through an expansive research agenda, exploring the potential contribution of visual arts to language or subject education in wider learning contexts.

1.5 Thesis Outline

This chapter draws attention to the background of English teaching and learning from the international context to the Chinese environment, from which the relations between different key concepts are introduced and evaluated: traditional English pedagogies in China; globally recognised alternative approaches, for example, CLIL despite its limited implementation in South East Asia and China in particular (Martyn, 2018); alongside the emergence of pluriliteracies development responding to global demands and reforms. In sum, it thus far has brought to the fore three areas that underpin this study:

1) building on, and distilling existing and alternative knowledge and understanding of language teaching and learning (e.g., CLIL, visualisation, literacies, and pluriliteracies, which will be explained in chapter two),

2) being context-sensitive (i.e., Chinese cultural ways of learning and teaching in classrooms experienced as a language student and teacher),

3) addressing the gaps and feeding forward to broader educational contexts (e.g., other cultural contexts or subject-focused classes) as a researcher with visuals as cultural tools for learning created by learners themselves. These drivers have led to the exploration of visual approaches to deeper learning of content, language, and literacies.

Chapter two continues to elaborate on such sources associated with the proposed visual strategy to learning from a broader picture by conceptualising language as both linguistic and social practice (Flores & García, 2013; Juffermans, 2011; Blommaert, 2010) in and beyond language classrooms. This involves a process of languaging (Maturana & Varela, 1998; Becker, 2000) which can be scaffolded by Learning Conversations (Harri-Augstein & Thomas, 1991; Norris & Bullock, 2017) and visualisation (Görg et al., 2007) in language classrooms. Moreover, the pedagogical potential of translanguaging (Rajendram, 2021; Li, 2018) for supporting learners in languaging or articulating their learning will be discussed. Whilst this concept remains contentious, it was

spontaneously practised by the younger participants during the data collection. Furthermore, within the same chapter, a pluriliteracies approach that synergises with the above concepts to deepen learning will be unravelled as an ecological growth model with its evolution (from Figures 2 to 3 in chapter 2) for deeper learning (Coyle & Meyer, 2021; Coyle et al., 2018). This serves as a core theoretical underpinning of this visual-based study.

With a review of the literature in the field, the emergent research questions in chapter three explore the value of visuals as a heuristic tool for languaging, focusing on linguistic and conceptual development (Meyer et al, 2015), mentoring (Nikula et al., 2016), and learner agency (Blaschke & Hase, 2019), all of which have guided the research design of this study. This includes the chosen methodologies, methods of data collection and analysis, and their alternatives, which will be subsequently discussed in detail. Furthermore, based on the nature of this study, the research timetable including the Pilot Study will be addressed followed by ethical considerations.

Chapter four focuses on presenting and analysing the Pilot Study data in order to provide insights for designing the Main Study, for example, designing the online experimental thematic English language lessons that interested the younger respondents, encouraging them to make drawings for languaging. Chapter five continues to analyse the Main Study data with emerging themes and categories (Elo & Kyngäs, 2008). Chapter six further discusses the Main Study data with considerations of related literature from chapter two to answer the research questions, respectively. These three chapters not only feedback to the former chapters but also feed forward to the final chapter – chapter seven. It concludes the potential of the visual strategy – *visual languaging*, emphasises the implications of the Main Study findings for all stakeholders (e.g., teachers, learners, researchers), limitations of this study (e.g., the researcher's subjectivity, sample size, research methods), and recommendations for future research in other educational contexts (e.g., modern languages or subjects teaching in different educational levels, underpinned by pedagogies focusing on agency and ultimately promoting learner and teacher autonomy).

Chapter 2 Literature Review

This chapter justifies the emergence of a pedagogical visual strategy – *visual languaging* by interweaving linguistic, pedagogical, and visual strands to review and discuss relevant theoretical perspectives and pedagogical strategies for content and language teaching and learning under the ecological shifts. Given the complex nature of this study, this chapter will be divided into two parts.

Part I focuses on language and language learning in different contexts. It first addresses the linguistic strand. That is the nature of language, which will be addressed through the lens of language forms and language meaning to explore approaches for supporting learners to use appropriate discourses (Dalton-Puffer, 2013) when communicating and languaging (Swain, 2006) in different learning or social settings. This will be followed by the pedagogical and visual strands discussed as the integration of Learning Conversations (Norris & Bullock, 2017), visualisation (Causey, 2017), translanguaging (Rajendram, 2021).

Part II focuses on ecologies for pluriliteracies learning and suggests the alignment of the visual-based strategy with a pluriliteracies model (Coyle & Meyer 2021) for deeper learning to enrich ways for supporting learners in developing conceptual and linguistic understanding, visual and digital literacies, and progressively work towards becoming agentic learners. Part I will now be discussed as follows.

PART I

2.1 Positioning Language

2.1.1 Language Interpretation- From Linguistic Systems to Social Practice

The concept of language itself is complex, multi-perspectival, and open to wide interpretations. Van Lier and Walqui (2012), for example, define language as "an inseparable part of all human action, intimately connected to all other forms of action, physical, social and symbolic" (p. 152). For Saussure (1959), language is a system of signs that combines the signifier (i.e., the sound associated with or image of something) and the signified (i.e., the idea or concept of the thing). His 'langue' and 'parole' binary represent language as a *'langue'* or structural system (i.e., the abstract, systematic rules of a language that are independent of individuals' actions with others) and *'parole'* or utterance (i.e., the spoken words and phrases used in actual situations by individuals) (Stawarska, 2020). Moreover, for Chomsky (2009), *'langue'* can be conceptualised as competence (the knowledge of the structural properties of a language, e.g., grammatical sentences) whilst *'parole'* is distinguished as performance (transformation of the linguistic competence in everyday speech) (Barman, 2014).

Their interpretations of language emphasise how language as a linguistic system and as social practice are very different yet interrelated phenomena embedded in broad fields of study including linguistics, applied linguistics, sociolinguistics, psycholinguistics, and sociocultural theories. With the rise of post-structural sociolinguistics influenced by the globalisation of contemporary society since the late 20th century, language is increasingly conceptualised as mobile resources or actions that are reappropriated by language users in an ongoing process of interactive meaning-making within social, cultural, and historical contexts (Blommaert, 2010; Flores & García, 2013). García (2014) summarises this position by referring to language as 'action and practice' rooted in the context in which language is used and uttered.

Acknowledging the pluralism of epistemologies for language learning and language use across decades (The New London Group, 1996; Cope & Kalantzis, 2009), in this study, language is broadly positioned within social practice. These involve processes of 'languaging' – a concept that

captures the constant reconstruction of language shaped and created within social contexts as people interact with the world linguistically (Maturana & Varela, 1998; Becker, 2000). This concept will be further discussed from Swain's (2006) perspective in section 2.2.1. In this sense, language is seen as more than a system of semiotic resources (as in Saussure's *langue*) or a product located universally in the mind of the speaker (as in Chomsky's universal grammar) but, as Juffermans (2011) argues, language is turning towards "a sociolinguistic system that is constructed and inhabited by people" (p.165), which reflects the positionality of language in this study as social practice.

2.1.2 The Roles of Language in Content and Language Learning Classrooms

Language as social practice (i.e., from a sociocultural and sociolinguistic perspective) impacts the design of teaching approaches in classrooms and emphasises the distinction between language learning as a linguistic system (e.g., grammar) and language using (i.e., ways in which individual learners use the language for social communication and learning communication) (García, 2014). These strands of language use resonate with Gee's (1999) and Cummins' (2000; 2008) positioning of the differences between basic interpersonal language and subject-specific academic discourses. From this perspective, language is not only for daily communication but also for building knowledge through every day *and* academic discourses, respectively. As learning becomes increasingly subject-focused throughout schooling, the language of mathematics, science, or history requires the use of academic discourses related to the disciplines (Llinares et al., 2012). In language learning classes, content is often embedded in themes or topics (e.g., sustainability, lifestyles, cuisine, art) which have the potential to support the development of academic discourses with increasing appropriateness under scaffolding. One conceptualisation of language for subject and language learning, which goes beyond focusing on the linguistic system only, is content and language integrated learning (CLIL). It involves not only learning *through* an additional language but also expanding understanding of thematic, cultural, and language content (Dale et al., 2018a), and school subjects (Coyle, 2018).

This nature of CLIL compared to some other approaches to bilingual education, for example, content-based instruction or task-based learning, and English as the medium of instruction is

open to debate and wide interpretation since CLIL is not practised consistently across national boundaries (Brown & Bradford, 2014; Dalton-Puffer et al., 2014). For example, in content-based instruction classes, teachers often pay more attention to content development whilst language is regarded as a medium for learning the subject content (Baker & Wright, 2017; Cenoz, 2015). English as the medium of instruction, on the other hand, tends to focus on the proficiency of the target language in teaching and learning academic subjects and according to some reports (e.g., Macaro, 2018) may discourage the use of first or home languages. In contrast, since CLIL focuses on *both* the content and the vehicular language (English and other modern languages) in principle, it promotes both subject learning and language learning simultaneously (Bower et al., 2020; Coyle & Meyer 2021). Such distinctions suggest that CLIL can be described as "a dual-focused educational approach" (Coyle et al., 2010, p. 6) that fuses both subject content and languages including the learners' first language (L1), which can be naturalistically acquired in a joint learning practice of topic and language (Smit & Dafouz, 2012; Marsh, 2008). From a holistic perspective, CLIL is preparing learners to acquire additional languages to support learning and more importantly enabling them to learn how to "function across cultures and worlds, that is beyond the cultural borders in which traditional schooling often operates" (García, 2009, p. 6).

This signifies the roles of language in CLIL used by learners that are not only for making sense of the curricular subjects but also for developing the use of languages as both a communication tool and a learning tool for meaning-making (of ideas, information, and concepts). In a similar vein, drawing upon Vygotsky's (1978) sociocultural theory that demonstrates the critical role language plays in mediating learner's cognitive processes and increasingly gained popularity, a *dialogic* view of language characterises the practices of using language to construct communicative and linguistic meaning in dialogues within various contexts and with a range of interlocutors (Linell, 1998). From this perspective, attention to more holistic, sociolinguistic, and sociocultural interpretations of language has gained importance in bringing together cognitive processes and concepts of language practices (Lantolf, 2018). This resonates with Li's (2011b) rendition of the focus of languaging, which is on the speaker's critical use of linguistic resources "to gain knowledge, to make sense, to articulate one's thought and to communicate about using language"

in cognitively complex activities or tasks (p. 1224). Derived from these perspectives, in order to use specific discourses related to theme-based language learning - either for interactive social communication or learning communication - learners need opportunities to *language* their understanding and learning of new things (e.g., conceptual knowledge), thereby enhancing knowledge building beyond the study of language *per se*.

Therefore, CLIL in this study is fundamentally positioned under the 'umbrella term' of bilingual education. It refers to using language(s) to learn other curriculum subjects which also include topics or thematic content and reciprocally learning to use that or those language(s) through the development of content (Coyle et al., 2010). Topics or thematic content are considered part of a subject or the subject itself. That is, as learners construct knowledge of thematic content that is associated with a subject, the roles of language (first or additional languages) in use are not only about communicating but also about mediating meaning-making of the content with subject-specific discourses. These processes can simultaneously provide learners with experiences of the language system including linguistic forms (e.g., lexis, grammar, cultures, and literacies) (Llinares et al., 2012). Such roles of language can be supported when learners use their own language and communicative resources to talk through their understanding and thinking of their learning with peers and teachers (Swain & Lapkin, 2011). This process of comprehensible output can be mediated through social interactions to further scaffold target languages (e.g., the languages needed to demonstrate understanding), content learning, and promote cognitive development and affective engagement.

2.2 Linguistic Demands for Meaning-making

The phases of learners using the language needed to output their learning of the content are characterised by Hood and Tobutt (2015) as the 3Ms cycle – *meeting language, manipulating language and making language my own*. Building on their approach to language learning in schools, the language learning encountered in this study will be related to new thematic content in English language classrooms. With appropriate scaffolding, learners can *manipulate* the language (i.e., practising, expanding, and increasingly being able to discuss the content using appropriate language forms) through meaning-making tasks involving thinking and challenges to

develop higher-order thinking, which generates new language and content that is the learners' own. Whilst there are many pedagogic ways of scaffolding learning, this study focuses on two ways of supporting learners to use the language in ways that are meaningful for learners themselves (i.e., meaning-making), namely through languaging (Swain, 2006) and using cognitive discourse functions (Dalton-Puffer, 2013).

2.2.1 Languaging Learning

In order to make transparent an individual learner's understanding of both content meaning and language forms, Swain (2006) advocates a pedagogic strategy – languaging – to facilitate such cognitive processes of producing meaning. She further highlights the interdependence of language, communication, and cognition in dialogic classrooms as "the process of meaning-making and shaping knowledge and experience through language" (Swain, 2006, p. 97). This can be interpreted as using language as the means to linguistically externalise cognitive processes through verbalising or visualising (e.g., drawing, writing) the new content in learners' own words or symbols either to others (i.e., social communication) or to themselves (i.e., private speech). Moreover, Swain (2006) suggests that languaging is fundamental for meaning-making as it demonstrates how learners articulate and negotiate meanings during class communication and how they *language* the objects of learning (i.e., language or subject learning). In this sense, the processes involved in languaging link thinking processes and languages used by the learners, from which their linguistic skills in social or academic communication can be developed and understanding of complex concepts can be deepened.

Such thinking processes are realised in specific linguistic forms needed to express or communicate the content. More precisely, languaging as a form of communication in classrooms involves cognitive or thinking operations including defining, evaluating, and explaining things. These processes underpin the educational objectives planned by the teachers regarding the school or national curriculum or teaching agenda. It is worth mentioning that these cognitive operations have specific linguistic realisations through which the conceptual knowledge is elaborated. From this perspective, languaging integrates the content, the cognitive functions, and their linguistic realisations (i.e., the language needed to express the content learning

objectives) that can be taught to learners. Reciprocally, the cognitive functions direct learners' languaging in a specific linguistic way that links to the content, thereby reinforcing learners' content learning.

2.2.2 Cognitive Discourse Functions

This cognitive-related communication resonates with the construct of 'Cognitive Discourse Functions' (CDFs) formulated by Dalton-Puffer (2013). Based on her research, CDFs are viewed as "verbal routines that have arisen in answer to recurring demands while dealing with curricular content, knowledge, and abstract thought" (Dalton-Puffer 2016, p. 29). In this sense, CDFs can act as an essential bridge linking subject-specific learning objectives with linguistic representations to express thinking. Additionally, she identified the key uses of CDFs with academic language into seven types of communicative processes labelled as reporting, describing, classifying, explaining, defining, exploring, and evaluating (Dalton-Puffer, 2016). In this study, the learners were encouraged to focus on three of the most contextually relevant language functions describing, explaining, and evaluating to express their understanding of the content in increasingly sophisticated ways (to be discussed in Chapters 5 and 6).

Morton (2020) further broadens the focus of CDFs for teaching and assessment in content and language integrated learning (CLIL) and postulates that –

> "CDFs form a link between cognition and language or thinking and speaking/writing. As such, they are a bridge between content learning objectives, the specific types of communication (literacies) associated with academic subjects, and the language used to express knowledge and thinking (p. 8)."

Based on Morton's (2020) stance, the centrality of CDFs for CLIL is to achieve a deeper integration of content, language, and literacy. He emphasises literacy (further discussed in section 2.5.1) as a key component in CLIL as it represents the way learners think and communicate the different subject-specific content (ibid.). Such ways can be taught and guided by teachers focusing on the form of key genres (i.e., text types, e.g., description, explanation, narrative, argument) specific to subject/discipline-based learning tasks (ibid.). For example, when learners are asked to write up an experiment report in science, they will need specific language features (e.g., grammar or

sentence patterns) to produce a scientific report. While learners are being taught and scaffolded in their language uses pertaining to the 'reporting' cognitive task, the learning objective of practising and assessing their academic language performance, content, and literacy (e.g., the report text type) can be achieved. Since CDFs provide teachers with more focused and clarified learning intentions, learners' language and subject literacy may be better supported in tasks developed from such learning objectives (Coyle & Meyer 2021).

CDFs can be seen as the language used in cognitive tasks which develop specific discourses for expressing the content knowledge within academic subjects. Such academic discourses are derived from the medium of instruction itself. According to Putra and Tang (2016), the effectiveness of the medium of instruction is usually manifested through learners increasing ability to use specialised academic discourses in practices (e.g., reading, investigating, speaking, writing) to navigate, learn, and form complex content knowledge appropriate to a particular subject or discipline, thereby nurturing their disciplinary literacy. In this sense, CDFs are key to academic performance (inextricably linked to teaching and learning) not only for their close relationship with expressing thinking related to subject-specific content via appropriate language features but also because they consider the medium of instruction as the main learning tool in the classroom. Based on this positioning, teachers need to develop and teach the linguistic forms needed to express and communicate the content in a way that is acceptable, approachable, and comprehensible for learners. Therefore, a fundamental factor in language learning is the construction of meaning by using cognitive discourse functions in increasingly complex ways through language or subject-related tasks which guide learners to elaborate their learning (Coyle & Meyer, 2021).

In sum, CDFs operate at the interface between thinking, concept formation, and communication by providing linguistic evidence of individual learners' thinking as they *language* their understanding. This allows both teachers and learners to reflect on their teaching and learning. Simply put, CDFs link and enhance concept and language learning by making thinking transparent via audible languaging, affording evidence for teachers to adapt their scaffolding emphases or strategies to meet individual learners' needs – such as providing learners with specific linguistic

forms necessary for *communication with others* about their understanding of the content (e.g., subject-specific concepts, facts).

By drawing on the above review and rethinking of language, languaging, and cognitive discourse functions for communicating meaning with appropriate linguistic forms, the following diagram emerged to visualise the dynamic synergies of these theoretical concepts (Diagram 2). More specifically, it represents how the elements of language meaning and language form can be integrated when learners use their own language to articulate their thinking processes. This leads to the discussion of how to support learners' languaging by adopting Learning Conversations and visualisation, forming the integration of pedagogical and visual strands emphasised in this study.

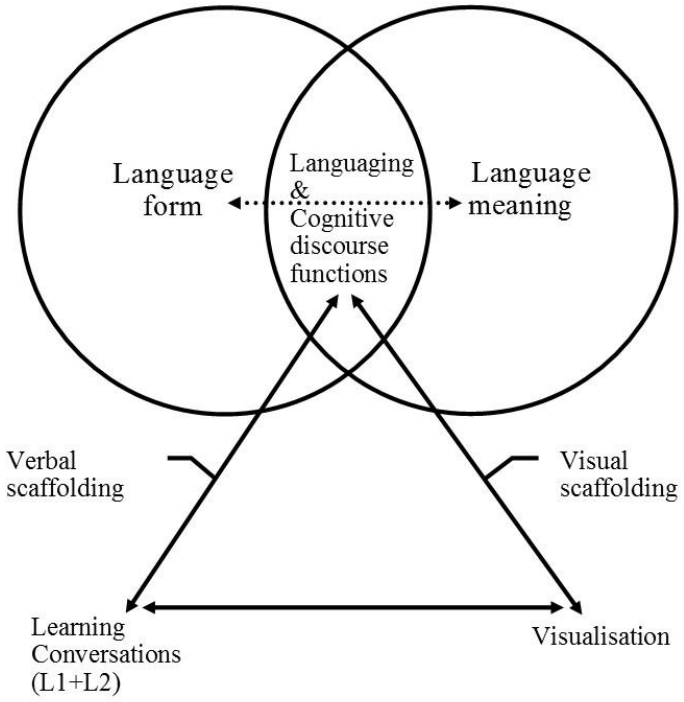


Diagram 2. Language and languaging

2.3 Scaffolding Languaging

2.3.1 Learning Conversations as Formative Feedback

If learners are to use their language for learning as well as learning to use language, then they need to have opportunities to language their understanding at given points to demonstrate the

depth of their understanding and provide teachers, peers, and self with ways of monitoring progression in learning. As already discussed, to do this, they need linguistic tools including explicit awareness of discourses (i.e., CDFs). Such linguistic tools can be provided and scaffolded by their teachers or peers reflecting the sociocultural perspective that knowledge can be acquired and internalised interpersonally (Vygotsky, 1978; Mutch, 2005). Learners need to be linguistically scaffolded or supported by 'knowledgeable others' (e.g., teachers and/or peers) in language learning contexts to increasingly use more nuanced and appropriate language for languaging learning (García, 2009, Swain & Lapkin, 2011). This can be facilitated by collaborative dialogues (Swain & Watanabe, 2013) or dialogic (Alexander, 2017a), explanatory, cumulative, disputational talks (Mercer, 2008) among teachers and peers acting as a source to produce, question, refine, and correct language use. For example, teachers can engage learners in using their linguistic resources through classroom conversations that focus on learners being made aware of and supported in using specific language functions needed to construct meaning according to the cognitive demands of learning tasks (e.g., expressing positive and negative perspectives or cause and effect in topic-based discussions).

This dialogic scaffolding resonates with the notion of 'Learning Conversations' that use explorative, empathic, collaborative discussions with respectful listening, shared between interlocutors including learners and teachers in classrooms (e.g., Harri-Augstein & Thomas, 1991; Norris & Bullock, 2017). Therefore, Learning Conversations are underpinned by principles of active learning and acute observation in positive and supportive learning climates. Drawing upon their seminal stances, Learning Conversations are socially positioned in what Street (1984) regards as a *shared thinking space* where teachers and learners work together in cognitively challenging ways to solve a problem, evaluate an activity, and clarify a concept with both parties contributing (Siraj-Blatchford et al., 2003). By observing and/or participating in Learning Conversations, teachers can define learners' needs and adapt dialogic strategies. For instance, by encouraging collaborative working and promoting more flexibility to probe questions (Boyd, 2014), thereby sustaining learners' creative thinking demonstrated through languaging their learning.

Such teacher and peer conversations for learning can serve as a dialogic approach to formative feedback. This involves strategies generated by teachers to encourage learners to constantly reflect on their learning whilst continuously supporting them, for example, via both written and spoken forms (Shute, 2008). It can be envisaged that when teachers purposefully guide Learning Conversations to emphasise learners' language use of cognitive discourse functions (CDFs) to scaffold their languaging of conceptual understanding, the ongoing focused and explicit teacher feedback on language or content can be naturally embedded in the conversations without direct correction. During the Learning Conversations, teachers can also scaffold learners by encouraging learners to reflect on their learning by describing what they learned or understood whilst appropriate their language use of CDFs. This may trigger learners to rethink and consider what else needs to be done to improve either their linguistic or conceptual knowledge. For example, when learners are asked to explain a cause or define terminology, their language of explanation or definition can be regarded as evidence of their understanding, in which relevant language and literacy are needed for languaging the content. This resonates with Morton's (2020) perspective of CDFs that link language, content, and literacy (subject-specific ways of communication). Based on what teachers have observed from such evidence, they can provide formative feedback on learners' linguistic forms or conceptual understanding and make decisions on revising scaffolding strategies to promote learning (Black & Wiliam, 2009).

According to Black and Wiliam (2009), when formative feedback is mediated by Learning Conversations, learners and teachers can jointly discuss, negotiate, and assess the results of conceptually challenging tasks. Such feedback not only comprises ongoing guidance from the teachers but also involves learners in directing their own learning. It is argued that if learners collaboratively interact with teachers in such a dialogic way, they may realise what they could have done better (Alexander, 2017a; Swain & Watanabe, 2013). For example, self-correcting their linguistic form (e.g., spelling or grammatical errors) or clarifying conceptual uncertainties by posing questions to teachers or peers, thereby facilitating future learning and class discussions.

Moreover, the potential of Learning Conversations may support teachers in carefully guiding learners to identify problems that were overlooked or too difficult for them to solve

independently. These problems could be misinterpretations of content captured from learners' languaging at sentence level with specific language functions. In this case, teachers can point out the key components of their utterances that are linguistically or conceptually inappropriate in a cognitively comprehensible and conversational way, so learners can receive explicit feedback that they need to build knowledge and confidence in learning (Juwah et al., 2004).

Therefore, one of the tenets of this thesis is that interactive episodes focusing on encouraging and scaffolding learners' language use of cognitive discourse functions for languaging can be facilitated by Learning Conversations. During such conversations, learners may increase their awareness of critical and reflective analysis of their own learning by doing conceptual- or language-related tasks and foster their capabilities needed for becoming self-regulated learners.

Learning Conversations between teachers and learners can be regarded as a form of social communication, which suggests language as the embodiment of social practice is essential for scaffolding learning and supporting meaning-making. This also reflects García's (2014) interpretation of language as rooted in the 'action and practice' in section 2.2.1.

Nevertheless, it is worth noting that scaffolding through Learning Conversations may become more complex when learners are learning in a context where more than one language is needed (e.g., in bilingual or multilingual classrooms). For example, some of the L1 learners may not have the level in the language used as the medium (e.g., L2) necessary for languaging understanding during Learning Conversations. This concern is also addressed in studies exploring and revising the strategies that learners use for learning and using second languages (Macaro, 2021, Cohen & Macaro, 2007; Lee & Oxford, 2008; Oxford, 1989). Based on their perspectives, one element of scaffolding in second languages classrooms is to enable learners to develop and deploy strategies (e.g., metacognitive, social, affective strategies) that help them learn and use the additional target languages, as in learning English as a second or foreign language (Cohen & Macaro, 2007; Lee & Oxford, 2008). Such strategies brought by learners for language learning and/or language use can be described as 'language learner strategies' (LLS) (Macaro, 2021; 2006), which are interrelated with learner motivation, identity, and autonomy in the process of language learning (Murray, Gao & Lamb, 2011).

The extent to which learners effectively use the strategies not only varies based on individual learner differences, and their prior knowledge of content and language, but is also affected by appropriate instruction or training (Oxford, 1989; Macaro, 2006). Macaro's studies (2006) found that instructing learners on how to develop communicative strategies can improve their oral interaction, and adopting interventions may enhance their vocabulary acquisition, reading, and listening skills in the target languages. The pedagogies for eliciting learners' strategic behaviours and subsequently influencing their potential for promoting successful learning appear to be effective despite criticisms regarding its lack of theoretical rigor (ibid.). Macaro (2006) suggests such theoretical limitations can be resolved through time and metacognition-focused elicitation:

> "the methodology for eliciting learner strategy use, although imperfect, is at an acceptable level of validity and reliability…if it is carried out over lengthy periods of time and if it includes a focus on metacognition" (p. 321).

This implies that eliciting learners should not only guide them to use strategies for additional language learning but also support them to be knowingly and explicitly aware of their thinking in the process of using such strategies. In a similar vein, Lamb purports an approach – 'flexible learning' to develop such metacognitive awareness, featuring learner-centred practices, such as learners determining their own objectives and methods to attain their goals as well as self-monitoring and self-evaluating their own learning (Benson & Lamb, 2021). By encouraging learner motivation and attainment whilst meeting their diverse learning needs, aptitudes, and interests impacted by their multilingual and multicultural backgrounds, such flexible, learner-directed practices can ultimately foster learner autonomy for enhancing learning (ibid.).

Building on research and practices into learner strategies, the researcher proposes visualisation as a learner strategy for scaffolding English language learning as it can provide tangible evidence that represents learner conceptual understanding and learners can be aware of their thinking in the process of making visuals. This is crucial especially when learners' linguistic level in English as L2 is low, which makes describing or explaining their thinking with peers and teachers challenging. Through visualisation, learners can complement their linguistic deficiency when languaging their understanding via English and communicating their thinking with teachers and peers during

Learning Conversations. Moreover, learner-created visuals can act as a catalyst that triggers further discussion and provides insights into more focused and personalised teacher mentoring.

This study thus far focuses on scaffolding learner languaging that uses cognitive discourse functions in two specific processes:

- Learning Conversations building on the perspective of language as social practice.
- Visualisation in contexts in which a language other than the learners' first language is used as the medium of instruction.

The latter process will now be discussed in detail.

2.3.2 Visualisation

Visualisation is often adopted to record, analyse collected data, and transform information into a visual form (Morris et al., 2003; Ingold, 2011; Taussig, 2011; Causey, 2017). It is considered fundamental to meaning-making ranging from simple maps and schematic diagrams to computer-generated 2D and 3D forms to convey information to the users (Görg et al., 2007). In classrooms, visualisation can be used by teachers as a scaffolding tool to support learners in comprehending and building knowledge, especially regarding more abstract concepts and solving related problems across all areas of the curriculum (e.g., Ben-Ari et al., 2002; Törley, 2014; Herga et al., 2014). Furthermore, teachers can guide and encourage learners to use or make visuals in different learning activities to gain evidence-based reflection on learners' understanding of the problem and to help them find a solution (e.g., Schwamborn et al., 2011; Chun et al., 2015). Such visual evidence can support teachers to provide ongoing formative feedback and complement learners' verbal languaging facilitated in Learning Conversations.

This is the reason the researcher suggests the combination of visualisation and Learning Conversation as scaffolds for supporting learners languaging as it takes account of multimodal evidence that may create greater potential for teachers and learners to identify and reflect on their teaching and learning effectively. This might include ways of approaching, orienting, and evaluating what teachers have designed, instructed, or mentored and what learners have

understood, clarified, or learned. Therefore, this process of reflection as supported by visual and verbal evidence may act as a heuristic tool for accelerating learning constructed by both teachers and learners in classrooms.

Studies on using visuals for language and subject learning including English as a foreign language (da Rocha, 2016), cognitive science (Scheiter et al., 2017; Forbus & Ainsworth, 2017), engineering (Alias et al., 2002), biology (Sheredos & Bechtel, 2017), chemistry (Cooper et al., 2017; Ryan & Stieff, 2019), all provide an increasingly robust foundation upon which pedagogic practices are based. This raises attention to the potential of learners in designing and creating visuals for supporting their own learning. According to Ainsworth et al. (2011), sketching or drawing made by learners to represent scientific phenomena, for example, evaporation, photosynthesising can not only provide visible evidence to facilitate learners' communication and reflection on their learning but also support teachers to observe individual learners' thinking, understanding and make adaptations to their teaching strategies.

The visuals themselves can be considered as a hybrid form with constituent parts including drawing, writing, and notations, either on paper or on the screen. These illustrative marks can be used in conjunction with multiple interactions around visualisation, involving annotating, reflecting, and talking. In other words, visualisations can be used alongside other modes to develop and demonstrate understanding. This integration for meaning-making resonates with the multimodality theory (Kress, 2009; Tang et al., 2014) that advocates a combination of words, visual, audio, spatial, and gestural modes to enrich, modify, and enliven meaning. Such purposefully constructed visualisation provides a shared artefact or evidence that can be visually examined, annotated, or discussed by learners and teachers, providing a means of grounding communication, reinterpreting thinking, and generating insights for learning (Siemon et al., 2017; Brewer et al., 2000; Grave 1994). Their studies confirm ways in which concepts, cognition, and communication are involved in visualisation (e.g., sketching, drawing, painting, 2D/3D images, etc.) across a range of domains or disciplines through using different multimodal resources or texts.

Though texts are traditionally interpreted as textual genres corresponding to thematic or subject content, such as stories, topic-based essays, laboratory or experiments reports, it is essential to clarify that texts in this study are conceptualised in the widest sense including written, oral, visual, digital, and kinaesthetic modes for communication, aiming to develop learners' *textual fluency* with a focus on the visual text. This aligns with Coyle and Meyer's (2021) position of textual fluency – "the ability to critically evaluate and produce a wide variety of plurimodal texts and text types" (p. 163). Texts from this perspective encompass five semiotic modes: "spoken language, written language, visual, audio, gestural and spatial" (ibid., p. 170). Building on this definition of textual fluency, guiding learners to express their thinking and understand how meanings are holistically produced through individual text or integration of texts is increasingly important for deepening and developing their conceptual understanding and fluency in strategically using multimodal texts for learning (Siefkes, 2015).

This study is built on the premise that the integration of visual text with verbal, written, and digital texts for enhancing language use and language learning provides a means for experimenting with 'alternative' approaches appropriate for the Chinese context. This integration was experimented with by encouraging learners to create visuals (which may contain written notes) and verbally languaging with their visuals for demonstrating conceptual understanding whilst being dialogically scaffolded by teachers and peers via Learning Conversations in an online learning environment.

Language use from the lenses of systemic functional linguistics (Halliday, 1975) and sociocultural theory (Vygotsky, 1978) is interpreted as the expression of meaning made and developed through interactions in social settings. In the same vein, language learning occurs when learners understand how meanings are created by using and interacting in that language with others (Mickan, 2013; Halbach, 2020). Therefore, language use in this study is the *languaging activity* that encompasses dynamic ways that individual learners engage as they articulate their visuals with the target language and language functions needed for meaning-making. As learners experienced and acquired various personal lived-through life episodes, skills, and knowledge, their ways or extent of using the target language for languaging may subsequently differ. This

raises the importance of scaffolding to sustain their languaging, which can be learners' visuals and teachers' dialogic support via Learning Conversations as previously mentioned. From this perspective, language learning not only amounts to learning how meaning is made by using that language but also to scaffolding language use towards increasingly appropriate discourses.

Drawing on the arguments of multimodal evidence for learning, the researcher was keen to investigate the joint potential of visual, spoken, and written resources in supporting learners to make meaning and gradually build an increasing capacity in using or creating different resources or texts when their linguistic level is not sufficient for putting their thinking into words in L2. In this sense, the broader concept of textual fluency in this study is conceptualised through the visual lens to explore how the fluency of visual text can act as an alternative way to scaffold languaging for enhancing learning. This positioning investigates how visual text can represent learners' thinking or act as the catalyst for articulating their conceptual understanding. This hypothesis of visual fluency in this study can be explored through:

1) learners creating visuals to represent their understanding of thematic English content,
2) learners articulating their thinking or conceptual understanding with their visuals,
3) teachers supporting learners in the process of visualisation and languaging via Learning Conversations.

In sum, this study uses visuals in learning contexts where more than one language is being used and the language of instruction is both the object of learning and the medium. In contexts where learners don't have appropriate linguistic forms to articulate their understanding of concepts, this research investigates the effects of learners' visuals as a scaffold for meaning-making and communication with teachers and peers in Learning Conversations. Moreover, it aims to find out whether learners' conceptual or linguistic learning can be enhanced and deepened when they elaborate and communicate their thinking through increasingly nuanced and appropriated use of language and language functions whilst being supported by teachers. Having made explicit

visualisation as a scaffolding tool for learning, the next section explores its theoretical links with languaging in additional language classrooms where the language itself is a focus of learning.

2.3.3 Visual Languaging in Additional Language Classrooms

As stated previously, learners' thinking during learning is not directly observable for both learners and teachers to assess or reflect on. Language, or more precisely, languaging as the externalisation of cognitive operations, is considered accessible evidence of learning (Mohan et al., 2010). In other words, languaging realises learners' thinking processes through demonstrating and communicating their understanding of the specific content within social and cultural settings (e.g., in or out of school). However, in language learning contexts, learners may not have the linguistic tools to express their understanding via a second or third language. In this sense, as has already been suggested in first language classrooms, scaffolded learning that encourages learners to articulate their thinking in increasingly abstract and sophisticated ways needs specific attention when using additional languages.

According to Coyle et al. (2010), "when learners are encouraged to articulate their understanding, then a deeper level of learning takes place" (p. 37). She argues that in second or other language learning contexts, exploring effective ways to scaffold and develop learners' abilities to communicate thinking through which conceptual knowledge is constructed, plays a key role in successful learning. Such abilities involve not only the appropriateness of language use specifically related to the subject or thematic discourses but also the strategic adoption of other communication means for making meaning of the content. In this study, visual is regarded as a communication means or medium to complement learners' existing linguistic competence for languaging especially at moments when their second or other language capabilities are not compatible with their level of cognition to sufficiently express their conceptual understanding.

As such, visualisation is proposed as a mechanism that not only stores conceptual understanding but also 'transforms' thinking into a visual form to offset learners' lack of verbal resources for languaging and class communication. As emphasised by Bobek and Tversky (2016), visualisation as a pedagogic strategy can enhance engagement and complement the language forms of

languaging, thereby improving learning. In this sense, if learners are encouraged to use or create visuals in the style they prefer (e.g., drawings, doodles, sketches, and photographs) to complement their use of second or other languages for representing and communicating their thinking, their engagement in learning may be enhanced. Moreover, if they articulate their understanding with their own visuals *and* first languages while being linguistically and conceptually supported by teachers, they may not feel as self-conscious or pressurised as in scenarios where they can only use the second or other languages for learning and class communication. For example, if they were expected to use the correct linguistic forms in monolingual immersed classes, they may become afraid of making mistakes, which may discourage their agentic roles in learning including class engagement, learning motivation, and confidence (Ulbig, 2010).

Having laid out these hypotheses by drawing on studies advocating visual scaffolding for learning (e.g., Park, 2022; Lestari & Misdi, 2018), it is worth exploring visualisation from the learners' perspective of *languaging* and teachers' *mentoring* in classrooms where a second language (L2) is considered as the learning object and a language medium for conceptual and linguistic learning. The arguments presented position visualisation as potentially scaffolding learners to express thinking and understanding of abstract content (e.g., Matusiak et al., 2019) whilst complementing languaging in terms of speaking or writing in the target second language. Such a combination of visuals and languaging for externalising and communicating learning is referred to as ***visual languaging*** in this study. Thus, visualisation can be considered as tangible support for learners to enhance their cognitive processes. That is, it provides learners with an alternative means to express what they are in the process of understanding and suggests the next directional move using non-linguistic multimodal texts (digital, written resources). Moreover, the visuals may not only support languaging conceptual understanding but also provide evidence for mentoring, thereby triggering more meaningful discussions as scaffolded by teachers with adapted strategies during Learning Conversations for enhancing understanding and extending learning.

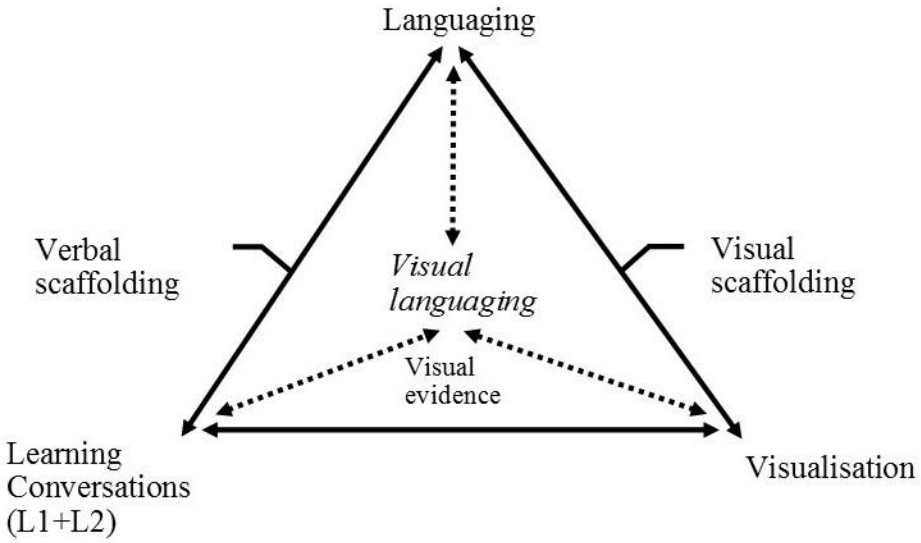


Diagram 3. Visualisation and Learning Conversation for languaging and mentoring learning

This study investigates how visualisation complements verbal languaging to enrich the language needed including specific cognitive discourse functions required for task-related classroom communication. As depicted in diagram 3, visualisation provides teachers visual evidence to ascertain learners' thinking and needs, which via Learning Conversations scaffolds learners' languaging in comprehensible dialogic ways. This is crucial especially when learners conceptualise the content through languaging in additional languages but lack the linguistic capacity to articulate with fluency or appropriacy. In this way, *visual languaging* provides opportunities for teachers and learners to generate an understanding of why developing such a multimodal repertoire is necessary for effective knowledge building across cultures, languages, and disciplines (Lantolf, Poehner, and Swain, 2018). In this study, such a strategy that describes the role of visuals and languaging in supporting younger learners' English language learning has two emphases – to encourage learners to visualise conceptual understanding that they are unable to express in words and to trigger explanation and discussion – all of which have implications for the pedagogic strand of language learning and language use.

2.4 Translanguaging

Given that languaging learning through the medium of a language that is not the learners' first is the essence of this study, then understanding the role of *visual languaging* and its relationship with linguistic languaging (e.g., verbal or written form of languaging - articulating understanding via speaking or writing) is fundamental. This combination of using multiple modes of languaging aligns with the conceptualisation of *translanguaging* which considers meaning-making as being processed through one coordinated and meaningful repertoire with multilingual, multisensory, and multimodal resources (García & Li, 2014). In other words, translanguaging not only focuses on linguistic means of communication but also values non-linguistic resources including gestures, postures, facial expressions, and visual resources like drawings to create meaning, resonating with the aforementioned theory of multimodality (Kress, 2009; Kress & van Leeuwen 2001). In a similar vein, Lin's (2015a) 'trans-semiotising' theory also espouses the coordination of language with other semiotics (visual, physical movement) involved in the dynamic process of collective meaning-making in speech or action events (e.g., classroom learning and teaching activities) (Wu & Lin, 2019).

Contrasting with a monolingual viewpoint of codeswitching, translanguaging or trans-semiotising theory epistemologically builds upon a multilingual and multimodal foundation forming a 'translanguaging space' –

> "a space created by and for translanguaging practices, a space where multilingual individuals integrate social spaces…that have been formerly practised separately in different spaces by 'bringing together different dimensions of their personal history, experience and environment, their attitude, belief and ideology, their cognitive and physical capacity into one coordinated and meaningful performance' (Li, 2011, p. 1223)" (Zhu et al., 2015, p. 9).

This space allows language users to integrate social spaces through interactions between the societal and the individual, the social and the psychological with the capacity of "different linguistic structures, cognitive and semiotic system and modalities" (Li, 2018, p.23). Given that learners' personal experiences, beliefs, ideologies, cognitive and linguistic capacities are different

impacting how they select and employ multimodal features to accomplish their learning purposes, Li (2011; 2018) reminds us that the relationship between language, thinking, and multimodal translanguaging is therefore dynamic. Learners' translanguaging practices may move among, break, or adjust the boundaries of socially constructed language categories (e.g., Spanish, French, English, Chinese, Korean, and other languages). That is to say, learners may use a whole range of their linguistic knowledge interchangeably (e.g., moving between L1 and L2 within learners' repertoire) for speaking, writing, communicating, or learning purposes.

This brings pedagogical insights into language learning contexts where the target language, the language of instruction, or the school language is different from the learners' first language(s). According to Creese and Blackledge (2010), translanguaging practices adopted by teachers can support learners to draw on all language resources for learning. For example, enabling learners to use multimodal resources either provided, encouraged by teachers, or invented by themselves to demonstrate their understanding (García & Li, 2014) and develop academic ways of languaging (García & Sylvan, 2011), reveals the potential of a translanguaging pedagogy. Based on such perspectives, translanguaging can offer scaffolding opportunities for developing learners' other languages and subject-based conceptual knowledge in the academic context (e.g., in CLIL classrooms) (Nikula & Moore, 2016).

In this study, a translanguaging space is interpreted as a teaching and learning space embodied in online English language classrooms with younger learners in China. The translanguaging pedagogical practices developed within the space involve the coordination of learners' first language (i.e., Mandarin), the target language (i.e., English), and visuals to scaffold languaging and trigger more thematic content-related learning discussions for deepening learning. This space involves the dynamic integration of L1, L2, and visuals as a catalyst for representing and languaging their thinking and conceptual understanding, thereby forming a process of knowledge construction. In this sense, *visual languaging* aligns with translanguaging to support learners using English in verbal, written, and colloquial circumstances for concept building and communication, which can be grounded in learners creating visuals to complement their

languaging in L2 (English) while keeping their L1 (Mandarin) as an additional linguistic tool for meaning-making and flow of communication in Learning Conversations.

Having set out the alignment of translanguaging with this study, three resources in relation to translanguaging will be emphasised to promote linguistic and other semiotic modes for facilitating English language learning. That is using learners' L1, L2, and visuals to explore how translanguaging support L2 learning with visuals. This involves analysing the potential and the tension between learners' language(s) use and their self-generated visuals. When both are integrated into meaning-making in English language classrooms, insights into how *visual languaging* triggers verbal and written forms of languaging as proposed at the beginning of this section can be gained. Hence, further discussions of translanguaging as a theory, practice, and pedagogy and its alignment with this study will be outlined to underpin its potential for *visual languaging*.

2.4.1 A Translanguaging Theory and Practice

With the impact of intensified globalisation, the dynamic and fluid nature of languages used by bilingual learners in classrooms, for example, other languages learning including English as an additional language (Turnbull, 2018) and CLIL (Nikula & Moore, 2019) have created growing interest, attention, and debates between researchers on the study of translanguaging in education (Canagarajah 2011; Hornberger & Link, 2012; García & Li, 2014). The concept of translanguaging was originally coined by Cen Williams in the Welsh term – trawsieithu in 1994, offering an approach to language learning employed in bilingual Welsh and English classrooms where learners are asked to alternate between both these two languages to make meaning comprehensible for productive use (García & Lin, 2017). Responding to this Welsh perspective and reconceptualising the construct according to other contexts, researchers including Seals (2021), Canagarajah (2011), and Otheguy et al. (2015) posit an alternative view of translanguaging as a practice normalised in societies all over the world –

> "the deployment of a speaker's full linguistic repertoire without regard for watchful adherence to the socially and politically defined boundaries of named (and usually national and state) languages" (Otheguy et al., 2015, p. 283).

Derived from their stance, the language use of bi/multilingual individuals for meaning-making appears to draw on one integrated linguistic repertoire rather than two or more autonomous language systems. This refutes more traditional cognitive theories of bilingualism, for example, the separate underlying proficiency (SUP) premise (Vogel & García, 2017) which suggests that a medium of instruction only leads to proficiency in that language rather than deepening learners' first language awareness and use or a combination of L1 and L2 (Cummins, 1980a). Increasingly, critique of the SUP raised attention to exploring the role of languages in constructing meanings alongside non-linguistic repertoires, paving the way for an alternative model – common underlying proficiency (CUP).

The CUP emphasises the shared and transferable competencies between L1 and L2 as two interdependent language systems (Cummins, 2001). Conceptually, Cummins' CUP idea, to some extent resonates well with translanguaging as they both agree on the benefits of transfer between different languages. Nonetheless, translanguaging also differentiates from and further develops CUP by involving multimodal non-linguistic resources in learners' repertoire. The inclusiveness of such a repertoire integrates linguistic features (e.g., lexical, morphological, and grammatical features) of two or more languages with other semiotic tools for communication and learning. It supports speakers to choose certain appropriate resources to achieve their learning goals, thereby enabling the transfer of languages, conceptual knowledge, and skills.

In addition, it is worth clarifying the nuances between translanguaging and code-switching as they are often studied and compared by scholars (e.g., Baker & Jones, 1998; Coronel-Molina & Samuelson, 2017). Based on their studies, code-switching builds upon a monolingual viewpoint and is considered as the back-and-forth alternation between two or more languages depending on the purpose and environment of the communication (e.g., in bilinguals' daily conversations or email exchanges). In other words, it features the shift between languages at a given time while maintaining the dependence on different language systems (Li, 2018), which to some extent resonates with the SUP. However, translanguaging rejects the monolingual bias and holds that all learners be they monolingual, bilingual, or multilingual, draw on a semiotic repertoire without separating languages (García & Li, 2014). More specifically, learners construct and develop this

inclusive repertoire through linguistic and non-linguistic practices to enhance learning. Furthermore, the multimodal feature of translanguaging suggests interactions through different types of languaging (e.g., verbal languaging, visual languaging, or written languaging) in two or more languages and other communicative means. Hence, as previously stated, translanguaging is underpinned by a different epistemological foundation from codeswitching, yet according to Seals (2021), "a translanguaging lens does not preclude the existence or use of codeswitching and codemeshing" (p. 122) as they both provide opportunities for learners to improve their communicative abilities for social or pedagogical aims.

As Baker (2011) suggests, multimodal ways of learning in classrooms may promote a deeper and fuller understanding of a subject, reinforcing the improvement of target and additional languages, thereby increasing learners' confidence in speaking in the target language(s) and developing their literacies through multiple resources for learning (Lewis et al., 2013). This study concerns not only how learners use their L1 and L2 but also how they create visuals for English language learning, which may enrich their translanguaging practices and offer them more potential to perform and appropriate these tools needed for learning.

2.4.2 Translanguaging as a Pedagogy

Translanguaging that facilitates learners' multimodal interaction using different resources requires appropriate pedagogical practices provided and guided by teachers (e.g., Rajendram, 2021; Conteh, 2018). As Rajendram (2021) notes, translanguaging not only focuses on the semiotic repertoire for social communication but also on teachers' pedagogical practices that scaffold learners' dynamic translanguaging practices for classroom communication and learning purposes. In line with this perspective, researchers have been investigating and developing teachers' explicit strategic use of translanguaging, aiming to support learners' use of linguistic and nonlinguistic tools for doing challenging conceptual or language-related tasks. Such translanguaging strategies in classrooms may include scaffolding the teaching of additional languages (García, 2009; Creese & Blackledge, 2010) and leveraging learners' use of two or more languages whilst focusing on one (Celic & Seltzer, 2013; García & Sánchez, 2015).

In this study, translanguaging is considered a pedagogic approach that provides younger learners with opportunities to use their language resources appropriately. Such opportunities for example in English language classrooms, can be purposeful activities that increase understanding of keywords or concepts by guiding learners to notice and discuss a topic with visuals (e.g., photos, pictures, drawings) and encourage them to visualise and write their understanding in English (García & Lin, 2017). Meanwhile, learners' first language can be used judiciously and appropriately for discussion and explanation of complex information that requires a high level of command of English. As specified by García (2014), translanguaging as pedagogy builds upon "the ways in which [multi]lingual students and teachers engage in complex and fluid discursive practices that include, at times, the home language practices of students in order to *make sense* of teaching and learning, to communicate and appropriate subject knowledge, and to develop academic language practices" (p. 112).

According to García, Johnson, and Seltzer (2017), translanguaging can enhance learners' experiences of using multimodal resources for language and conceptual development, especially when teachers revise their pedagogical practices based on learners' classroom interactions, to identify their individual needs and provide appropriate scaffolding. This might involve focusing on meaning-making tasks and problem-solving encounters using different sources including visual, physical body movement, and learners' first languages. Reciprocally, the process of teachers designing, applying, adjusting, and reapplying their pedagogical strategies can develop their professional knowledge and skills that fit the purpose of teaching and learning, as well as enhance their teaching profile. Therefore, as Conteh (2018) suggests, translanguaging has the potential to nurture mutual empowerment for both learners and teachers and construct relationships that foster learning in classrooms.

2.4.3 Aligning Translanguaging with This Study

Whilst acknowledging the potential of translanguaging as proposed above, the acceptance of using translanguaging in classrooms remains controversial. For example, the theoretical and pedagogical foundations of translanguaging challenge traditional monolingual teaching methods such as the 'two solitudes' approach to bilingual education (Cummins, 2008). It refers to the

divide between French and English in curriculum and instruction in Canadian classrooms where there are two official languages (ibid.). This approach disregards the contexts when learners feel they are lacking particular words or phrases needed for learning and communication in a monolingual environment (i.e., French, or English-only classrooms). Additionally, it overlooks the full range of learners' language repertoire that is inclusive of not only the prevailing languages in Canada (i.e., French and English) but also the languages of immigrants or indigenous learners (Prasad & Van Viegen, 2019).

In a similar vein, one distinctive feature of online English classes in China caught the researcher's attention. That is the younger English language learners in China who often purposely avoid using Mandarin, which appeared striking even when they did not have the appropriate linguistic resources to communicate in English unless they felt they were permitted to do so. Such classroom behaviour might have been gradually cultivated by the socially and politically regulated education system in China. This promotes constructing English language classrooms as monolingual English-speaking environments believed to enhance learners' English fluency efficiently. However, taking into account more recent research (May, 2013), the medium of instruction in one language may not be sufficient for learners to master using the target language in different contexts and develop multiple competencies or more precisely *a semiotic repertoire* for successful language learning. Therefore, all participating younger learners in this study were explicitly told that Mandarin was allowed given the possibility that their language choices for English learning may be affected by their own schools' language of instruction.

Researchers who partially embrace translanguaging also offered other terms that capture the fluid, mobile resources of languages in different contexts, for example, polylingualism (Jørgensen, 2008), translingual practices (Canagarajah, 2013), metrolingualism (Pennycook & Otsuji, 2015), and the aforementioned languaging (e.g., Makoni & Pennycook, 2007; Swain, 2006). To reiterate, in this study, the uniqueness and potential of translanguaging will depend on how it aligns with *visual languaging* to scaffold younger learners' English learning development. In other words, as the learners are experiencing the visual nature of learning, their integration of linguistic languaging (e.g., verbal or written forms of languaging) in English and Mandarin with

visualisation is proposed to help them reflect, refine, and deepen thematic content learning in English language online classrooms.

Hence, encouraging learners to create improvised visuals for scaffolding their expressions of thinking via both English and Mandarin is essential for them to experience translanguaging for English learning. In this sense, the translanguaging practice in this study draws on three resources as previously articulated – learners' L1 (i.e., Mandarin), L2 (i.e., English), and visual creations (e.g., drawings). The younger participants can use both languages and visuals to *verbalise* their ideas, thinking, and understanding of concepts in the online English language classroom. Their visuals then act as a non-linguistic tool to promote their conceptual understanding. Such a verbal and visual combination also resonates with the dual-coding theory that explores the effects of verbal and non-verbal codes on language learning (Sadoski & Paivio, 2001). For example, non-verbal codes may convey pictorial information that inspires learners to build mental imagery addressing abstract concepts and language for articulation and discussion (ibid.). Similarly, in this study, learners are encouraged to create visuals with their own flow of ideas to address their own learning and communicate with the class how their visuals represent conceptual understanding via languaging to generate critical thinking and reflection, thereby deepening that learning. Drawing on the discussion thus far, the alignment of translanguaging and *visual languaging* can be succinctly depicted in the diagram below.

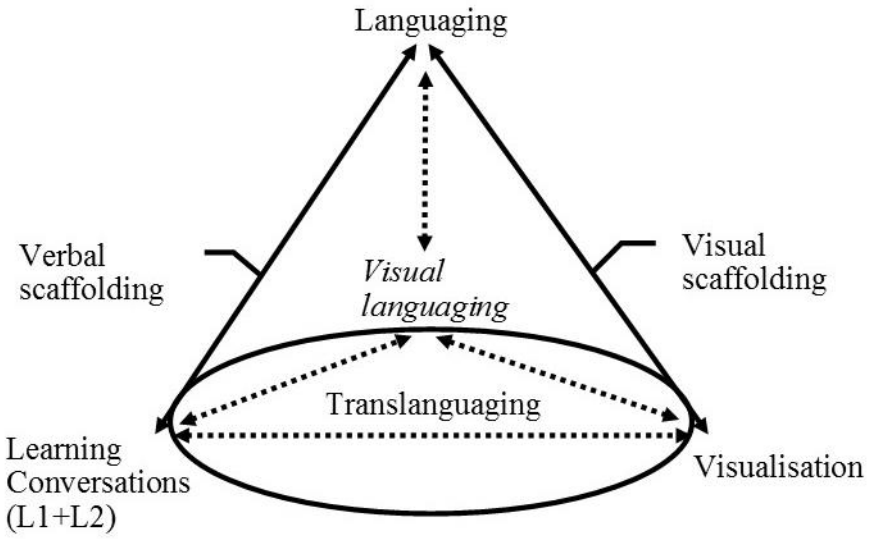


Diagram 4. Aligning translanguaging with *visual languaging*

It is necessary to clarify that visuals in this study encompass two dimensions. The first concerns the *teacher-led* visual resources (e.g., PowerPoint presentations) corresponding to the learning objectives for facilitating learners' understanding of the thematic content. The second is more *learner-led* as they may draw on teacher-provided visual or linguistic resources to create their own visuals for languaging their understanding of the content. The latter visual is the embodiment of visualisation. In the process of visualisation, learners may also select and use their own learning resources, such as referring to their prior knowledge and looking for relevant information on the internet to support their visual creation for doing different learning tasks. Such creative learner-led practices may trigger their engagement in class activities and communication as they realise they can take control of ways to create visuals and articulate their learning via either English or Mandarin or both.

Nonetheless, learners also need to be supported in the process of visualisation and languaging. Teachers can guide learners with appropriate language use and enhance their conceptual understanding through Learning Conversations that offer a natural dialogic scaffold in classrooms. Individualised Learning Conversations integrate linguistic and non-linguistic means for meaning-

making. The purpose of combining whole-class Learning Conversations and individualised Learning Conversations is to provide more opportunities for learners to develop their multimodal repertoire to exchange thoughts, ideas, and understanding for English language learning. The latter activity will be further justified and elaborated on in section 4.4.2 in Chapter 4.

The next part focuses on the ecological shifts impacted by more holistic ideals in the digital era, from which a pluriliteracies model is developed for deeper learning, lending ecological coherence to the emergent visual pedagogic strategy – *visual languaging* for conceptual, language, teacher, and learner development.

PART II

2.5 Ecological Shifts

2.5.1 Fundamentals of Literacies

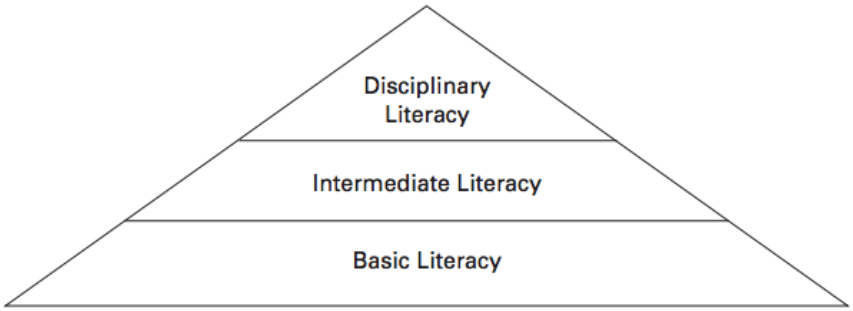
This multimodal repertoire theoretically draws upon the notions of multimodality, visualisation, and translanguaging, integrating linguistic and non-linguistic resources for meaning-making. This calls for a repositioning of *literacies*, given the rapid expansion of the term over the last two decades. Impacted by digitalisation and globalisation, more recent concerns including the need to shift our understanding of literacies are gaining momentum. With a growing range of technologies for communication, attention to developing learners' literacies beyond traditional literacy skills (e.g., the ability to read, write, speak, and listen in the first and additional languages) is growing as learning is no longer limited to face-to-face mode (Bower et al., 2020; Dale, 2020; Wolf & Gottwald, 2016; Tompkins et al., 2014). Simply put, learning spaces have expanded exponentially in the digital era (Sharples, 2016).

This *digital turn* to language learning calls for the need to equip learners for multimodal communication and learning, which requires a shift of focus from more conventional pedagogies (i.e., grammar training, repetitive drills, and recitations) to more socially constructed models mediated by digital technologies. This is the main reason that this study is designed to be conducted online with younger learners in order to provide them opportunities to use online sources and digital tools, enriching the traditional ways of teaching and learning in their own schools. As Fuster (2017) states, the demand for digital literacy (e.g., proficiency in digital reading, assessing the credibility, evaluating the usefulness of online sources and information, producing, and sharing appropriate digital content) has become increasingly important in response to the rapid growth of the digital arena where learners use multimodal ways to communicate both offline and online. It could be argued, therefore, that the affordance of technological advancements not only enriches students' online learning experiences but also draws attention to the necessity of promoting the transition of face-to-face pedagogies to support online contexts (Ko & Rossen, 2004) by merging technology into face-to-face teaching and learning (e.g., Frey et al., 2010; Herrington, 2009; McVay Lych, 2002). Moreover, as Palloff and Pratt (2007) suggest,

developing digital literacy in academic contexts needs to consider the demographic of learners, for example, their informal language use (e.g., emoji, abbreviations, or internet language) for social communication (e.g., chatting online, writing microblogs, posting on fan websites, sending emails).

Therefore, the researcher posits it is now critical to rethink the language in use for effectively communicating and critically analysing knowledge (Coyle & Meyer, 2021). That is integrating language with dynamic, multimodal ways of communication to develop various literacy skills for learning corresponding to demands and shifts in education. As previously noted, the shifts including May's (2013) *multilingual turn* impact the dynamics of classroom practices that require socially inclusive, linguistically and culturally diverse pedagogies for supporting all learners to develop as pluriliterate citizens (Coyle et al., 2018; Bower, 2019; Cross & Gearon, 2013). In a similar vein, the *literacies turn* in Western contexts is characterised by a shift from generic skills (reading, writing, speaking, listening) to disciplinary literacies (subject-specific knowledge and abilities) (ACARA, 2012) and from multiliteracies to pluriliteracies (García et al., 2007; Cazden et al., 1996).

Such a shifting landscape again suggests a repositioning of the very nature of literacies for in-depth and lifelong learning across cultures, languages, and disciplines influenced and facilitated by social, local, global, and technological changes. This is also in the quest for realising UNESCO's (2020) vision of a global culture of lifelong learning, which draws increasing attention to how to meet the demands of new literacies for lifelong learning (Coyle et al., 2018). As shown in figure 1 below, Shanahan and Shanahan (2008, 2012) suggest and outline the stages of learners progressing through basic literacy and intermediate to disciplinary literacy, promoting the fluidity and variability of literacy practices in equipping learners with appropriate literacy skills within and across subjects of schooling.



Basic Literacy: Literacy skills such as decoding and knowledge of high-frequency words that underlie virtually all reading tasks.

Intermediate Literacy: Literacy skills common to many tasks, including generic comprehension strategies, common word meanings, and basic fluency.

Disciplinary Literacy: Literacy skills specialized to history, science, mathematics, literature, or other subject matter.

Figure 1. The increasing specialization of literacy development (Shanahan & Shanahan, 2008)

The subject content in this study is thematic-based English lessons and the target language needed for learning this content is English. English, therefore, is regarded as both the subject/discipline and the language itself. Derived from Shanahan and Shanahan's (2008) literacy model, an approach to learners' development can be understood as the growing ability to listen, speak, read and write in English (basic literacy), use appropriate cognitive discourse functions to articulate the English thematic content (intermediate literacy), and to construct a conceptual understanding of the content (disciplinary literacy).

This approach to language learning potentially paves the way for promoting transferable literacy skills (e.g., higher-order thinking skills, study skills) to other disciplines beyond the English language (Halbach, 2020; Beacco et al., 2015; Llinares & Morton, 2017b; Bloom, 1956). As explicitly outlined by Beacco et al. (2015), six overarching dimensions of literacy skills need to be substantiated in order to apply them to all disciplines. The following six dimensions represent the process of knowledge building and application from the stages of understanding and communicating knowledge to applying that knowledge in other learning or social settings.

1. Comprehending/understanding in depth;
2. Communicating and negotiating knowledge;
3. Reflecting on the acquisitional process, the learning outcomes and their personal as well as social uses;

4. Applying knowledge to and within other contexts;
5. Participating in the socio-scientific world;
6. Transferring generalisable knowledge, skills, and attitudes.

(Coyle & Meyer, 2021, p. 40)

Considering both Shanahan and Shanahan's (2008) three literacy stages and Beacco et al.'s (2015) six dimensions of literacy skills, the language used to construct and communicate knowledge in various disciplines has to become increasingly sophisticated for learners to make progress in learning. This raises challenges on how to develop subject or disciplinary literacy and the specific use of language and language functions needed to appropriately demonstrate and communicate that knowledge, especially in contexts where learners use more than one language or mode in their languaging or learning process. Therefore, this study aims to investigate how the coordination of language and non-linguistic texts can be effective in enhancing younger learners' cognitive and language learning through meaningful input (i.e., visuals integrated teaching content; conceptual and linguistic scaffolding), interaction (i.e., Learning Conversations), and output (e.g., visual creation and languaging understanding of the content). Whilst younger learners communicate the thematic content using functional English complemented and triggered by visuals within such learning activities, their general language use and content-specific language may be improved.

2.5.2 Pluriliteracies Momentum

Taking into account the shifts as addressed before, literacies can be regarded as an inclusive repertoire that encompasses traditional literacies, multiliteracies interrelated with semiotic systems (audio, gestural, linguistic, spatial, and visual) afforded by new technologies (e.g., digital literacies) (European Commission et al., 2012), and competencies in critical thinking and complex communication (Levy & Mundane, 2004). Learners develop such literacies when they are "creating oral, print, visual and digital texts, using and modifying language" (ACARA, 2012, p. 16) for different learning purposes in various sociocultural contexts involving knowledge construction, application, and communication, social participation within and beyond schooling. To emphasise such roles of literacies for learning when using more than language, García and her colleagues (2007) introduced the term – *pluriliteracies* to capture this dynamic and creative

hybridity and interconnectedness of literacy practices. Coyle and Meyer (2021) maintain this concept and further specify it to accentuate the integrated, dynamic nature of pluriliteracies with multicultural, linguistic, and social contexts impacting learners' literacy practices:

1) disciplinary literacies within and across individual subjects of schooling, focusing on subject-specific ways of co-constructing and communicating knowledge with peers and teachers,
2) pluriliterate appropriate language use for knowledge communication across languages and cultures,
3) plurimodal text types for communication afforded by digital technologies and semiotic systems.

Based on their definition, pluriliteracies integrate content and language by focusing on developing the appropriate use of language functions for languaging subject-specific content across languages (plurilingual) and curricula themes (transdisciplinary), from which subject literacies develop (Coyle & Meyer, 2021). Using language functions appropriately to support increasingly sophisticated multimodal languaging also involves a shift in teacher thinking for both teachers and learners to work towards effective knowledge building and communication.

This study proposes that if learners can strategically use a range of modes or resources needed for languaging, they can also gain mastery of the increasing complexity of language use. As already discussed, this process requires teachers' scaffolding that guides learners' growth, which in return develops teachers' growth in professionalism and profile. Such teacher-learner partnerships can be initiated when teachers rethink and adapt ways of teaching by taking into account learners' needs that emerged and embodied from their application of different resources (Fullan & Langworthy, 2014). In other words, learners' adoption and adaption of modes for languaging provide insight or tangible evidence for teachers to seek and develop new pedagogical ways to support learning. This is the angle of teacher-learner partnerships that this study takes.

Adopting a pluriliteracies position, it is indicated that teachers can design learning tasks using plurimodal texts to demonstrate how meaning can be made and encourage learners to select and create their own texts or resources to assist their understanding and learning of the content. This suggestion is also inspired by the increasingly hybrid nature of communication and semiotic systems in our digitised world. Such co-occurrence of purposefully designed teaching and pathways for both teachers' and learners' growth are therefore non-linear and multidimensional. As Coyle and Meyer (2021) point out, whilst learners manipulate plurilingual or other multimodal tools for language and subject learning, their literacy skills are evolving into cross-language/subject pluriliteracies with increasing awareness of the nuances of language functions. Their work indicates that pluriliteracies not only underline the importance of adopting different modes for learning and communicating via tools that are multimodal but also highlight the roles of languaging with specific language functions.

As learners experience the integrated process of language and thinking needed to demonstrate and communicate knowledge, they can also be supported in developing transferable competencies and knowledge for life skills (Meyer et al., 2015), which aligns with Beacco et al.'s (2015) six overarching dimensions of literacy skills. Such interdependent ways of transferring knowledge and skills resonate with the notion of deeper learning supporting the depth and breadth of learners' literacy development across subjects, languages, and cultures.

2.6 Deeper Learning

2.6.1 Conceptualising Deeper Learning

Deeper learning can be defined as "the process through which an individual becomes capable of taking what was learned in one situation and applying it to a new situation" (National Research Council, 2012: SUM-4). Pellegrino and Hilton (2012) from the angle of subject discourses note that deeper learning necessitates applying "intertwined knowledge and skills" to different contexts through the development of subject-specific discourses rather than "disparate superficial facts or procedures" (SUM-5). In a similar vein, Coyle and her colleagues (2018) further specify deeper learning as "the successful internalisation of conceptual content knowledge and the automatisation of subject-specific procedures, skills, and strategies" (p. 2). This definition

emphasises two key mechanisms of deeper learning – internalisation of conceptual knowledge and automatisation (i.e., acquisition) of procedural knowledge or skills. In this sense, knowledge transfer concerns factual, conceptual, and procedural knowledge (i.e., subject-specific skills and methods) and dispositions, which are requisites for deeper learning (di Sessa & Wagner, 2009).

Hence, attention drawn to how learners can successfully internalise and automatise conceptual knowledge or skills is increasing. As Coyle et al. (2018) and Meyer et al. (2018) suggest in their work concerning *knowledge ecology* and *learnscaping* for pluriliteracies growth, learners need to 'own' conceptual content knowledge, subject-specific procedures, and skills before they can transfer and apply their growing depth and breadth of understanding to other learning tasks or contexts. This implies that the internalisation of conceptual understanding has to be controlled and consolidated by learners themselves before they can reach the stage of automatisation that supports them to transfer and use conceptual knowledge appropriately in creative ways.

Moreover, Lantolf and Poehner (2014) advocate four stages of knowledge construction: from initial understanding (i.e., surface learning) to emerging patterns of abstraction to consolidation to internalisation. The abstraction stage is supported by a fundamental verbal phase, that is through learners communicating their growing understanding of concepts to gain mastery or control over the concept and its use through language in different contexts (ibid.). Such process of verbal phrase aligns with the conceptualisation of language as social practice (García, 2014) in this study – as learners articulate their understanding in creative ways with others, their conceptual knowledge can be expanded, extended, and deepened, thereby enabling the next stages of consolidation, internalisation, and possibly transfer. For example, when learners are engaged in concept processing and internalising practices (e.g., languaging) in increasingly abstract contexts including decision-making or problem-solving activities, they are encouraged to connect new information and skills with prior knowledge and apply them in such activities. Such expansion and extension of information and skills are therefore stored in their procedural memory, thereby enabling procedural knowledge automatisation (ibid.).

Drawing on the definitions and ways of realising deeper learning as discussed thus far, the paramount importance of languaging is raising as a key step in knowledge building and transfer,

which resonates with how Swain (2006) defines languaging – "the process of meaning-making and shaping knowledge and experience through knowledge" (p. 98). As learners *language* what they have conceptuliased and understood in their own words, their thinking becomes visible and accessible which allows teachers to mediate the conceptual structures of knowledge via appropriate pedagogic scaffolding, thereby deepening academic knowledge and literacies, developing cognitive patterns or mental models stored in long term memory (Christodoulou, 2017; Ormrod, 2011) to facilitate their transfer (Coyle & Meyer, 2021). Therefore, this study aims to highlight teaching that includes developing material (i.e., visual artefacts) and verbal (e.g., Learning Conversations) forms of practice to create opportunities for languaging and supporting learners' language use through comprehensible ways for their conceptual and linguistic knowledge progression and transfer.

2.6.2 The Pluriliteracies Model for Deeper Learning – PTDL

With the implications of pluriliteracies and exigency for achieving deeper learning, an evolving pedagogical model known as Pluriliteracies Teaching for Deeper Learning (PTDL) was developed by the Graz Group (i.e., a trans-European Group of researchers, academics, teachers, and teacher educators contributing to learner growth and progression) (Coyle & Meyer, 2017). It postulates that for learning to be successful, learners need to acquire competencies that not only enable them to deal with learning in school but also life issues.

This model aims to support learners to develop a repertoire that reaches out to a much broader agenda across subjects, languages, and cultures to foster learner progression beyond learning in language classrooms or subject classrooms. This is in line with the notion of deeper learning that is "situated within, and emerge from, the practices in different settings and communities […] with their own cultures, languages, tools, and modes of discourse" (National Research Council, 2012, 4-4). Its underlying tenet is to work towards the conditions needed for teachers and learners to co-create inclusive contexts across cultures, languages, and modes of communication that take into account the diversity and hybridity of learning environments and learners' backgrounds (Coyle & Meyer, 2017).

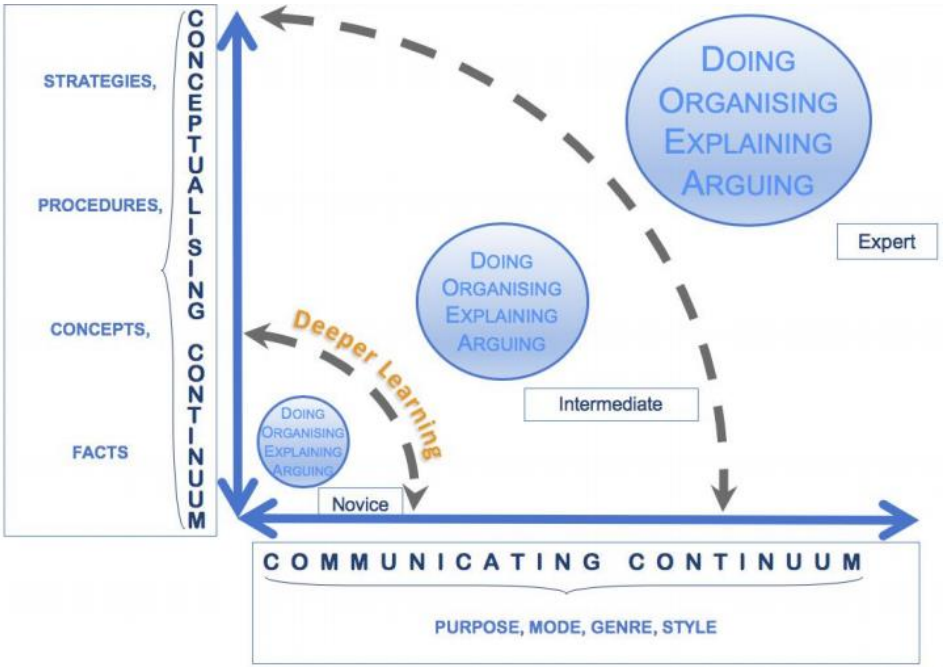


Figure 2. A pluriliteracies approach to teaching for learning

In order to deepen learning, the model first builds upon the cognitive and language elements focusing on using specific language functions to express learners' thinking and understanding of content knowledge. Figure 2 shows how conceptualising and communicating continua are interconnected by cognitive discourse functions through four domains of subject-specific activity – doing, organising, explaining, and arguing paving the *knowledge pathway*. On the left axes of figure 2 – conceptualising continuum, knowledge is further specified as factual, conceptual, procedural, and metacognitive/strategic knowledge upon which different types of thinking intersect and act from simple to challenging complex taxonomy of cognition (i.e., remember, understand, apply, analyse, evaluate, and create) (Anderson et al., 2001; Bloom, 1956).

Scientific Processes	Genres	Purposes
doing things scientifically	• Experiments & Protocols	Instruct someone how to do things
	• Laboratory reports	Provide a recount of the method, as well as the results, discussions and conclusions.
	• Investigations	Set out the design and decisions behind students' attempts to behave scientifically
describing & organising the world scientifically	• Descriptions	Describe multiple aspects/features of a natural or physical phenomenon
	• Comparisons	Compare features of two or more physical phenomena
	• Compositions	Present (describe and or define) component parts of a physical phenomenon
	• Classifications	Present different types/classes of a phenomenon
explaining phenomena scientifically	**temporal explanations**	
	• sequential explanations	Explain physical phenomena by presenting the events producing the phenomena in chronological order
	non-temporal explanations	
	• factorial/consequential explanations	Explain the multiple factors/consequences that contribute to a particular event or phenomenon
	• theoretical explanations	Define and illustrate a theoretical principle
arguing scientifically	• Arguments	Persuade to agree with a particular point of view on an issue and some exhort the reader/listener to take action
	• Discussions	Present the case for more than one point of view

Table 1. Scientific processes, genres, and Modes (based on Polias, 2016)

(Meyer, Coyle, and Schuck, 2018, p. 23)

These different types or levels of knowledge and cognition require different use of cognitive discourse functions and language skills for exploring, constructing, and languaging learning, which leads to the right axes of figure 2 – communicating continuum. It conflates everyday language and academic language (i.e., generic and subject-specific language) in a non-linear way depending on the activity domains and their specific genres, purposes, modes, and styles. This is what learners need to do with languages for communicating learning, such as organising information and resources (graphs, tables) in their schema or brain, explaining that thinking process to others, and possibly leading to arguing or debating their thoughts or positions.

Language and content learning through these activity domains facilitated by cognitive discourse functions (e.g., organising, explaining, arguing) are in line with Polias' (2016) scientific processes of constructing knowledge with corresponding genres and purposes (see Table 1 above), which are considered common for all subject or discipline. For example, if learners are engaged in scientific experiments (genre), they can use colloquial language (i.e., expressing meaning with everyday personal language) and scientific language (subject-specific language) with experiment formulas, tables, charts (modes) to describe, explain or discuss (cognitive discourse functions) with peers about how and why they did the experiments in certain ways. This dynamic and complex nature of using language with non-linguistic modes/texts also reveals learners' preferred styles (e.g., auditory, visual, reading/writing, kinaesthetic) for learning.

Emanating from the complexity of a theoretical basis integrating content and language learning through specific cognitive demanding activities using discourse functions, the researcher is drawn to exploring further a visual approach to enrich traditional (verbal, physical) ways of English language learning. More specifically, visual-verbal-digital integration may enrich and offer younger learners flexible, alternative resources when languaging and dialoguing learning with peers and teachers in Learning Conversations, potentially triggering more discussion and eliciting thoughtful language output to improve their understanding of the English thematic content.

As learners operate in cognitive and language learning through the scientific processes (Polias, 2016), it is fundamental to consider ways to scaffold them to generate and sustain learning that

can be situated in the broader context beyond the confines of language or subject (thematic content) classrooms. In other words, cognitive and language understanding and development for deeper learning need to be supported by teachers who can guide learners in their learning processes. In this case, the researcher explores how visuals provide guidance for mentoring younger learners' conceptual and language understanding to promote teacher-learner partnerships and learners' agentic roles in their own learning. As teacher-learner partnerships play a key role in mentoring learning and supporting learners to promote sustainability, commitment, and achievement in learning, it is with this pedagogical stance that PTDL holistically integrates four dimensions for deeper learning. As shown in figure 3, it involves conceptualising knowledge, demonstrating understanding, teacher mentoring, and learner affect (motivation, abilities, and ways of learning). Simply put, the model brings together the content, language, teachers, and learners as one interactive ecological framework highlighting the inclusive nature of learning. The latter two elements will now be discussed now given that conceptualising and communicating knowledge are addressed already.

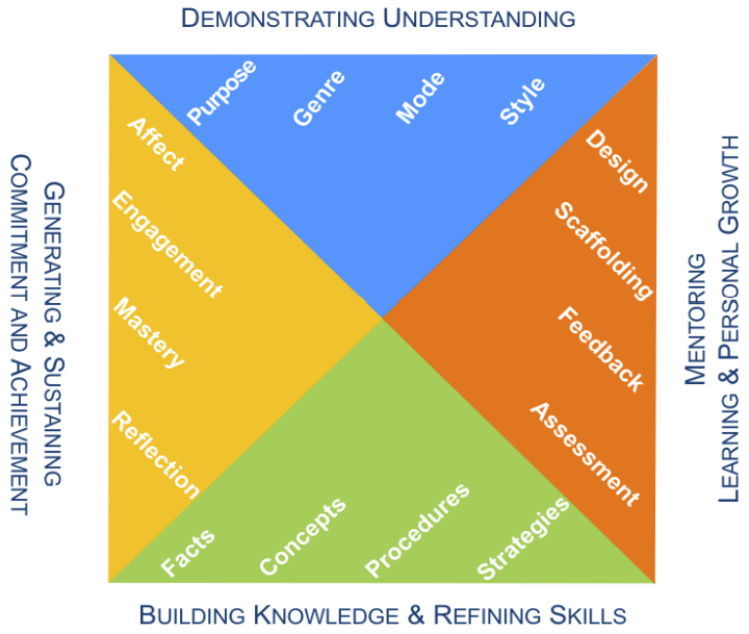


Figure 3: Pluriliteracies teaching for deeper learning (PTDL)

- Teacher-learner growth

As specified by Lantolf and Poehner (2014), mentoring learning supports learners to develop for example in terms of a growth mindset or affective conditions for learning, which from Detter's (2005) perspective is the growth in a range of domains (e.g., cognitive, affective, sensorimotor, and social) needed for developing competencies in and beyond schooling. Therefore, mentoring learning from the angle of learner growth is beyond academic progression but emphasises scaffolding learners to develop complex and challenging types of thinking (e.g., apply, analyse, evaluate, create) (Krathwohl, 2001) and the appropriacy of using language for both learning and social purposes (knowledge construction and social interaction).

Mentoring learning as coined by Tillema et al. (2015) draws on a repertoire of teaching strategies or approaches encompassing guiding, scaffolding, encouraging, and challenging learners in the processes of building and communicating knowledge. As noted by Meyer and his colleagues (2015), such mentoring learning requires both teachers and learners to co-construct learning activities that focus on personalised process of learning by taking into account individual learners' differences (e.g., prior knowledge, interests, strengths, and vulnerabilities, learning needs and goals through joint negotiations). For example, mentoring younger learners when they discuss their learning with individual peers or groups of peers to explore ownership and agency. According to You and Dörnyei (2016), co-constructing learning with individual learners according to their feelings, interests, identities, and learning goals may offer more opportunities to take ownership of their learning and strengthen motivation through different learning activities either offline or online classes (Ubell, 2016).

In this sense, mentoring is not a unidirectional act in which only teachers provide guidance, feedback, and assessment. Instead, it concerns the collaboration of teachers and learners including working with peers to co-construct mutually reinforced learning partnerships that build on "equity, transparency, reciprocal accountability, and mutual benefit" (Fullan & Langworthy, 2014, p. 12). Such partnerships thereby form a shared, safe, and inclusive learning climate that allows learners to gradually take control of their learning while being scaffolded in ways that are acceptable and comprehensible to them – using learners' language or their preferred ways to explain abstract content.

According to Hattie and Timperley (2007), the collaboration of both learners and teachers can be facilitated by the following feedback model (Figure 4), encapsulating the ways of feedback for assessing, guiding, and enhancing learning. From their perspectives, feedback in the broadest sense provides information for learning not only from the support of knowledgeable others (e.g., teachers, peers, parents) but also from learners themselves (e.g., reflecting or using their prior learning or life experiences and relevant learning resources). Such synergies of feedback can *feed up* teacher-learner transparent defined learning goals, *feed back* learners' current task performance, and *feed forward* their desired performance levels or learning outcomes.

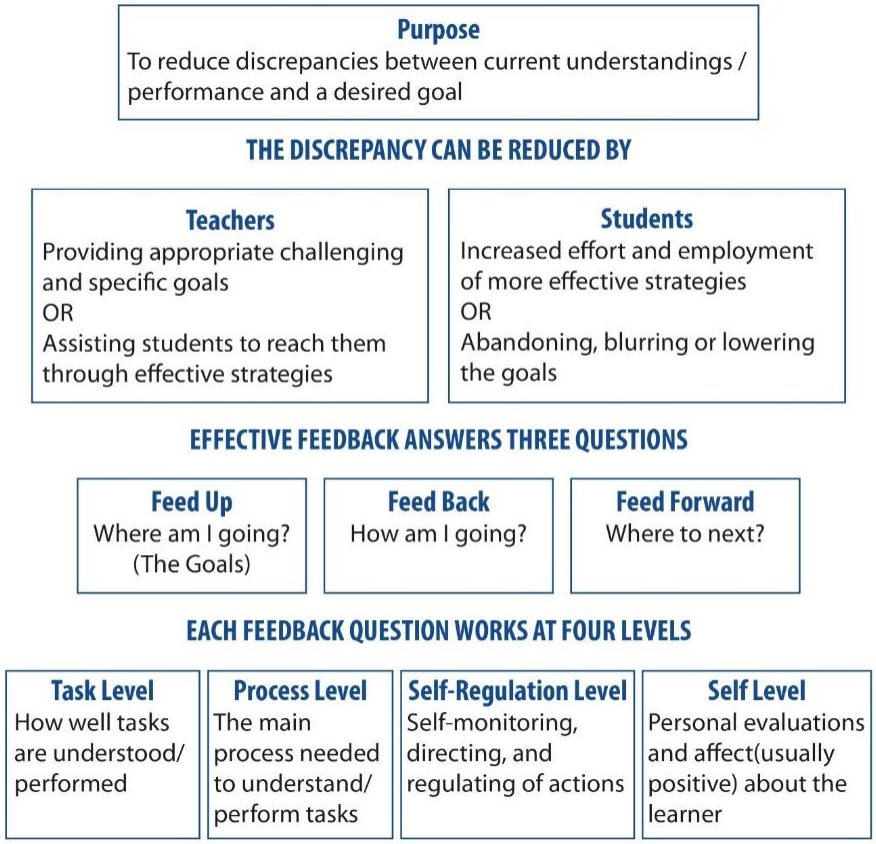


Figure 4. A model of feedback to enhance learning (Hattie & Timperley, 2007)

This teacher-learner joint feedback model facilitates learning partnerships as it involves learners in reflecting on their performance while aligning with teachers' or peers' feedback. This offers opportunities for self-evaluation, which is critical for increasing their self-efficacy and growth

mindset to guide their own learning. In other words, learners are led towards more agentic means for driving and making their learning efficient, for example, by setting personal learning objectives, deciding how best to use their time, knowledge and actions for learning with support and encouragement from teachers.

This draws attention to the development of teachers' awareness and beliefs that play a key role in building rapport with learners and fostering learners' growth mindset to direct their own learning (Brooks et al., 2012). Nikula et al. (2016) call for teachers to consider themselves as *mentors* and learners as *mentees* for setting and achieving shared learning goals. Building and sustaining such mentor-mentee relationships can be nurtured and sustained encouraging learners to become responsible, independent learners while realising their self-value in making achievements and owning their learning.

As learners become more engaged and confident to direct their own learning by reflecting on their learning progress, teachers also need to correspondingly adapt their teaching to fit the extent or level of their progression. For example, designing activities that are cognitively and linguistically challenging as learners advance in their understanding of disciplinary knowledge (concepts, facts) and command over subject-specific skills and strategies for demonstrating understanding. This again raises the necessity of making learners' thinking and learning visible for teachers to provide appropriate scaffolding for individual learners to revise their work with improved understanding. As previously mentioned, language is considered the main tool to externalise thinking, however, considerations over non-linguistic tools chosen or created by learners for learning can also be complementary in this respect, especially when they don't have the linguistic capacity for languaging understanding. This is proposed and discussed throughout the previous sections, especially in section 2.3.3.

To conclude, Coyle and her colleagues (2018) summarise pluriliteracies learning ecologies using the PTDL model as follows:

a) learners learn how to apply subject-specific skills and strategies to solve complex tasks, which enables them to develop and deepen their understanding of the content (factual, conceptual, or procedural knowledge).

b) learners demonstrate mastery of skills and understanding of content by communicating with critically extracted and evaluated information from multimodal texts in an appropriate style fitting for subject-specific genres and purposes.

c) learners' growth mindset (e.g., inter-and intra-personal affective factors – engagement, mastery orientation, and reflection) need to be supported by teachers' mentoring (scaffolding, feedback, and assessment).

2.7 Aligning the Pluriliteracies Model with *Visual Languaging*

As previously discussed (section 2.6.2), the PTDL model integrates not only the conceptualising and communicating dimensions but also explores the nature of mentoring learning to design learning activities that learners need to experience as they move along the *knowledge pathways* to deepen their understanding, in the quest to foster learner agency.

The synergies of these dimensions are in line with the ultimate purpose of this study, which is realising deeper learning by exploring an alternative pedagogic classroom communication strategy – *visual languaging* to build and deepen conceptual and language understanding and offer insights into mentoring. The rationale of this strategy is derived from Learning Conversations and visualisation that are advocated as scaffolds for languaging using specific cognitive discourse functions (CDFs). The anticipated alignment of PTDL with *visual languaging* is represented in diagram 5 below. It shows how *visual languaging* may complement conceptalising and communicating knowledge with CDFs and supporting mentoring with visual evidence for promoting learner agency. This hypothesis will be experimented with by younger English learners during data collection followed by meticulous analysis.

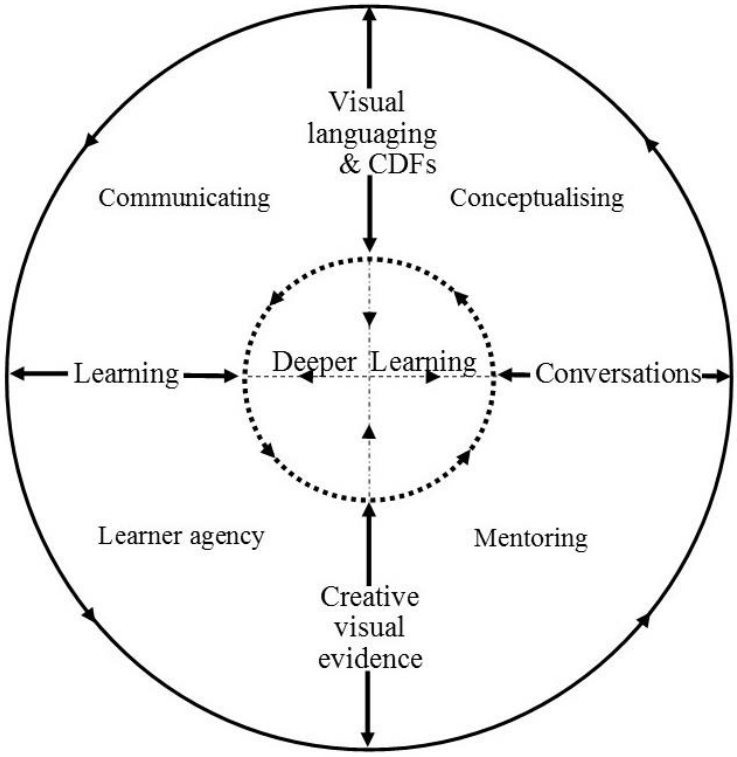


Diagram 5. Aligning PTDL with *visual languaging*

The integration of Learning Conversations and visualisation in this study focuses on dialogues that teachers have with learners in encouraging them to do things (learning tasks) differently and deepen their learning, for example, by supporting, and challenging them to articulate learning through their unique styles of visualisation based on their own interpretations of the content. It is envisaged that learners visualising their own understanding can link their language and thinking, provide opportunities for self-reflection, and enhance their language use and understanding of the thematic content in sophisticated ways with appropriate scaffolding. Their visual creations, in this sense, act as an indicator or trigger for learners to communicate their conceptual understanding with teachers and peers in the class. Moreover, they can support teachers to adequately or transparently evaluate, assess learners' dynamic learning processes for meaning-making, and identify whether they need scaffolding in content or language. Subsequently,

teachers can rethink, and explore appropriate ways to adapt their pedagogic design fitting for the learners' needs and both teacher-learner shared learning goals or desired learning outcomes.

Therefore, this study also considers the reciprocity and respect tenets of teacher-learner partnerships that bring together teachers and learners for quality learning, which again resonates with the pluriliteracies model. Learners' visual creations that encourage both their reflection and teachers' reflexivity are therefore sustained by interactive, respectful learning partnerships or rapport. Such visuals may enact the interchangeable roles between learners and teachers or mentors and mentees as Brooks-Lewis suggests (2012) – everyone as a teacher, everyone as a learner. Teachers becoming learners to enhance their teaching professionalism can be facilitated if they can see "learning through the eyes of their students" (Fullan & Langworthy, 2014, p. 11). This is the key affordance of learners' visuals that in turn nurtures rapport, enabling both parties to see and evaluate the effectiveness and suitability of their teaching and learning.

It is suggested that the integration of visual and verbal modes may trigger more meaningful discussions among learners while being scaffolded in dialogic ways (Learning Conversations) and provide them mutually respective and beneficial learning environments to communicate learning using their own linguistic and non-linguistic repertoire. This repertoire can be enriched when learners are encouraged to choose and create their preferred resources/texts/modes/tools for expressing their thinking and demonstrating understanding, from which the rapport between teachers and learners can be embodied. This rapport may play an essential role in activating learner engagement and commitment to increasingly self-regulate their learning. As learners increasingly articulate academic content with growing confidence and language appropriacy guided and supported by teachers, they may acquire processed knowledge, linguistic tools, and strategies that can be transferred to other situations (e.g., working independently on their own projects). Learners may gradually become pluriliterate in such ways that advance their level and sophistication of understanding, communicating, and using content and language from literacies novices through intermediate to literacies experts.

This study proposes such processes of mentoring learning and learner growth can be facilitated by *visual languaging*. It is a visual strategy for constructing knowledge and deepening learning through 1) encouraging and enriching other ways of communication (through verbal or written modes); 2) developing cognitive levels by improving the appropriacy of learners' language use (e.g., familiarisation and adaptation of academic language and cognitive discourse functions) for languaging mediated through Learning Conversations.

Whilst framing and designing this study, its synergies with the pluriliteracies model emerged given both the study and the model focus on deeper learning and bring together the strands of content, language, mentoring, and learner agency into a coherent whole. That is the cohesion of conceptual, linguistic, pedagogical (e.g., languaging, cognitive discourse functions, Learning Conversations, visualisation), and affective elements (e.g., motivation, confidence) (Swain, 2006; Dalton-Puffer, 2013; Gee, 2018). These elements, therefore, form the theoretical strands underpinning the emergence of *visual languaging* and the subsequent research activities with participants to appraise its potential for deeper learning. This strategy draws attention to the essentiality of learning *visibility* to reinforce the alignment of PTDL with this study, which can be speculated through the following facets:

1) Aligning with dimensions of building knowledge and demonstrating understanding: • *Visual languaging* acts as a heuristic tool for learners to articulate the thematic content with cognitive discourse functions (CDFs) and trigger deeper discussions for learning.
2) Aligning with dimensions of mentoring and learner agency: • *Visual languaging* offers teachers and learners visual evidence to reflect teaching and learning and support mentoring learning (e.g., accessing learners' practice and internalisation of appropriate language functions when they *language* the content with visuals, thereby designing, adjusting, and updating specific tasks, teaching strategies for purposeful scaffolding); • *Visual languaging* provides flexibility for learners to visualise their thinking in creative ways in order to foster their agentic roles in learning.

Throughout this chapter, the researcher has brought together a wide range of theoretical elements which reflect the complexities of EMI whilst focusing on possible ways of investigating the affordances offered by adopting an ecological perspective. In particular, it prioritises visuals used by younger learners in China challenging and complementing the traditional ways of teaching in English language classrooms. It may offset the kind of cultural resistance or language ego towards speaking out, making mistakes, thinking, and elaborating independently with criticality in English. It is proposed that learners creating visuals may help their languaging with language functions and support teachers to guide and scaffold this process to accelerate learners' linguistic and conceptual learning. Supporting individual learners more explicitly and appropriately in constructing and demonstrating improved understanding and deeper learning through visual evidence may promote their personal growth in terms of taking active roles (confidence, beliefs of self-value) to direct their own English language learning. Through this lens, creating and languaging visuals can offer insights for deeper learning and inform further research and classroom practice in terms of the role of visuals and languaging for pluriliteracies development.

This study draws on insights from research exploring how learners might acquire a pluriliterate repertoire in a specific context focusing on –

- disciplinary-focused literacy skills (Shanahan & Shanahan, 2008, 2011),
- transferable literacies across subjects (Beacco et al., 2016),
- learner identities (i.e., languages and cultures),
- the differences in the language required in generating and communicating various subject knowledge (National Research Council, 2012),
- various modes of communication and semiotic systems in increasingly plurilingual societies.

Investigating how *visual languaging* may inspire more approaches to transform the potential offered by the PTDL model into classroom practices to equip learners with strategies for meaning-making and problem-solving is at the core. The strategies involve but are not limited to critical

thinking and appropriate language use, and purposeful selection or creation of texts or resources for constructing and communicating knowledge and thinking in and out of school. Given the elaborations on the purposes and potential of this study, the researcher has therefore chosen to link *visual languaging* with the pluriliteracies model for deepening learning (Coyle et al., 2018).

2.8 Research Questions

The researcher planned to integrate an online learning context where learners may need to develop certain digital literacies to operate and proceed with the visually permeated English language course designed for the development of learners' pluriliteracies. Such a hypothesis of facilitating individual learners to practice using multiple literacies needed to construct and communicate knowledge corresponds with the aim of the pluriliteracies approach. That is empowering 21st-century learners to develop a complex range of competencies (e.g., digital, visual literacies) across languages so that they are led toward deeper learning. This constructs the first facet of the research arguments. The second facet draws together multimodalities (e.g., visualisation, Learning Conversations) and contexts (e.g., online English language classrooms in China) for learning which have evolved rapidly in response to the advent of accessible digital technologies. Taking account of developments not only in online learning environments but also in the ways that multimodality can support the learning process in different ways, research is increasingly focusing on how multimodalities may enhance learning.

This study focuses on visualisation as one component of multimodal practices and its potential for deeper learning in online English language classrooms. It looks into ways in which visualising learning can be used as a scaffolding and heuristic tool that offers learners opportunities to articulate learning using specific CDFs and triggers more discussions as facilitated via Learning Conversations. From the PTDL perspective, visualising and languaging learning with accessible and appropriate use of cognitive discourse functions scaffolded by teachers via Learning Conversations, may support bridging between conceptual understanding and communication, thereby promoting deeper understanding. Therefore, an investigation into the dynamics of *visual languaging* for enhancing individual learners' conceptual and linguistic learning, appropriating their language use of cognitive discourse functions, and offering insights into teacher mentoring

and learner agency is essential for aligning the PTDL model with this study, from which the following questions are developed to address such quests:

- In what ways might visualisation serve as an intermediary learning tool (*visual languaging*) that bridges conceptual knowledge construction and language learning in English language classrooms?
- How can students develop their appropriate use of specific cognitive discourse functions through visually scaffolded languaging?
- What are the necessary conditions for online learning experiences which encourage interactive development of *visual languaging* for pluriliteracies growth in a digital learning space?
    a) To what extent can *visual languaging* support teachers in adapting mentoring online?
    b) How might *visual languaging* foster learner agency?

Chapter 3 Methodology

3.1 Introduction

This chapter opens by reviewing the ontological and epistemological orientations of quantitative and qualitative research to clarify the philosophical stance of this study, thereby directing the choices of methodology and methods for data collection and analysis. Subsequently, it clarifies the research context, sampling process, and methods for data collection and analysis. Then the chapter elaborates on the research timeline including the tentative design of the Pilot Study, detailed in the next chapter, aiming to provide instrumental guidance for the substantive Main Study (Malmqvist et al., 2019). Next, the chapter addresses ethical considerations by drawing on Tracy's (2010) eight quality markers in qualitative research to specify approaches taken to mitigate bias and enhance the trustworthiness of the data, analysis, and findings. Finally, an overview of the chapter will be succinctly presented. Therefore, the methodology chapter is organised into six chronological parts:

- Setting the philosophical stance (3.2),
- Outlining the instrumental case study (3.3),
- Clarifying the research context (3.4), sampling (3.5), and methods for data collection and analysis (3.6),
- Visualising the research timetable (3.7),
- Considering ethical issues (3.8),
- A summary of the chapter (3.9).

Given the fact that learners' personal voices and visual creations are valued as the key sources for building the researcher's perceptions and understanding of the potential of *visual languaging*, this study is in line with the qualitative philosophical stance. It views the world as socially constructed entities and knowledge as mutually built through interpersonal interactions (Denzin & Lincoln, 2005; 2017) afforded by the connectedness of the digital era. This philosophical thinking navigates the methodology and methods selected for addressing the research foci as emphasised in the research questions:

- In what ways might visualisation serve as an intermediary learning tool (*visual languaging*) that bridges conceptual knowledge construction and language learning in English language classrooms?
- How can students develop their appropriate use of specific cognitive discourse functions through visually scaffolded languaging?
- What are the necessary conditions for online learning experiences which encourage interactive development of *visual languaging* for pluriliteracies growth in a digital learning space?
    a) To what extent can *visual languaging* support teachers in adapting mentoring online?
    b) How might *visual languaging* foster learner agency?

The first research question explores how *visual languaging* links concept development and language by providing a visual form of languaging to support knowledge construction that may lead to deeper learning. The second question focuses on the potential of *visual languaging* to encourage learners to use cognitive discourse functions (CDFs) appropriately. That is their appropriate language use including academic language when articulating thinking using their visuals for completing cognitively demanding tasks. Such tasks were designed to challenge learners to practice their language use for defining, describing, or explaining abstract concepts related to the class content, thereby revealing and enhancing their understanding of conceptual knowledge as they use their own words or visuals to verbally externalise their thinking processes. This raised the importance of teachers' mentoring for learners to sustain their learning as emphasised in the third research question.

Hence, the research foci can be summarised as investigating:

i) the links of *visual languaging* with conceptual knowledge and language development
ii) the role of CDFs in *visual languaging*;
iii) the role of *visual languaging* in adapting mentoring and developing learner agency, which resonates with the four dimensions of the PTDL model (Figure 3 in Chapter 2).

More specifically, the first focus positions *visual languaging* within the cognitive domain (i.e., building knowledge and skills, demonstrating understanding); the second links *visual languaging* with the activity domain (doing, organising, explaining, arguing); the third one draws together the affective domain of both learners and teachers (i.e., learner commitment and achievement, mentoring learning and personal growth) with *visual languaging*. Regarding the visual tool proposed for learners to create and use for languaging, it will be interchangeably termed as visuals, visual creations, or visual artefacts in this paper. Now the philosophical underpinning of this chapter will be clarified.

3.2 Philosophical Stance

3.2.1 Ontology

Researchers need to position themselves within theoretical paradigms to reflect philosophical (ontological and epistemological) stances of different methodologies. For example, Tashakkori and Teddlie (1998) assert that the design of the study should be 'dictated' by research questions. Yin (2003) also suggests that empirical inquiries should conform to theoretical propositions. In a similar vein, Holden and Lynch (2004) note that methodological choices should be related to the philosophical position of the researcher and the analysed social science phenomenon. All their perspectives accentuate the paramount importance of making clear the philosophical underpinnings that inform research questions, methodologies, methods, and intentions in their research design. Therefore, it's fundamental to develop explicit ontological and epistemological positions before the selection of methodologies and methods that are appropriate to the research questions and foci.

A useful starting point is to briefly review and clarify the nuances of two predominant research worldviews – the quantitative and qualitative paradigms encompass ontological, epistemological, and methodological premises. Given that ontology focuses on the views or beliefs about the nature of reality and epistemology is the theory of knowledge that explores the nature of how knowledge is sought and studied (Denzin & Lincoln, 2005), philosophical considerations on reality and knowledge are inextricably linked with the methodology chosen for guiding the process of data collection and analysis of this study. Furthermore, methodology as a research strategy is

also determined by the researcher's perceptual orientation in responding to fit-for-purpose in terms of enlightening the research problems, and the type of knowledge that can be produced (Merriam, 1998; Creswell, 2013).

It is well documented that the quantitative positivist paradigm focuses on the nature of reality as fixed, measurable, and empirical facts existing external to personal ideas or thoughts (Marczyk et al., 2005; Neuman, 2007). The qualitative nature of inquiry portrays worlds as socially constructed realities constructed by individuals interacting with their social worlds that develop and change over time (Schwandt 1994; Maxwell, 2012; Merriam, 1998). This thinking implies that the realities can be multiple and subjectively constructed based on people's different perceptions and understandings of the world, which is regarded as relativist ontology (Denzin & Lincoln, 2005). From this perspective, realities are perceived as intersubjectively constructed through the meanings and understandings developed experientially, socially, and collaboratively (ibid.). This indicates that findings or knowledge can be generated by dialogically interacting with research respondents, from which conflicting interpretations can be negotiated and reinterpreted by researchers.

Moreover, considering the online context chosen for this study, it is worth addressing a theoretical framework that complements relativism as socially constructed – connectivism, which is defined as "the integration of principles explored by chaos, network, and complexity and self-organisation theories" (Siemens, 2005, p. 4). It implies learning may occur within the brain, social, and online networks, from which people share diverse opinions and access information sources among themselves and across the world in order to explore new ways of learning. Connectivism promotes the constant connectedness between people afforded by new technologies, which can promote collaborative discussions through social media or online platforms for problem-solving, decision-making, and meaning-making, thereby forming knowledge. It highlights the impact of technologies changing the way people communicate, learn, and make choices for continual learning.

Such self-determined learning syngergising collective thinking facilitated by the dynamic technologies in the digital era is also advocated in classroom learner-centred teaching. For example, Cormier (2015) and Bissola et al. (2017) suggest a non-linear, unstructured rhizomatic approach to learning that encourages learners to self-define their own learning path and goals rather than only receive pre-determined inputs from experts. In a similar vein, Hase and Kenyon (2000) echo this self-determined learning and promote its potential in cultivating learners to be the primary agent of their own learning, for instance, making their own learning decisions with reflective, critical thinking, and self-assessment (Blaschke & Hase, 2019).

In this sense, connectivism to some extent resonates with the intent of this study, which is combining visuals and languaging to heuristically support learners' creativity and belief in their own capabilities to manage and sustain continuous learning in networked environments. More specifically, as learners make meaning and communicate in the online classroom, they need to be digitally literate to operate in such an online learning environment by traversing networks to search, evaluate and adopt relevant information including online resources for doing learning tasks.

3.2.2 Epistemology

Derived from relativism and connectivism, knowledge can be learned and gained from human-constructed social processes or interactions (Mutch, 2005) across a network of connections that are highly dynamic, open, emergent, and self-managed (Chatti et al, 2010). The social world is subjective, and knowledge is constructed through interactions with other people and other resources (e.g., digital and technological tools). Thus epistemology draws together social constructivism (a social learning theory developed by Vygotsky (1978) advocating learning occurs through social interaction) and learning in a digital age. They both highlight the connectedness of learning afforded by other people and technologies that give learners opportunities to make choices for their own learning. In a similar vein, interpretivism embraces such knowledge building stance and focuses on how individuals make choices and the meaning of the world (Siemens, 2005), which from the angle of an academic researcher is to interpret participants' views "filtered through his or her own views" (Marriam, 1998, p. 22).

Given learners' experiences of creating and using visuals for languaging their conceptual understanding is valued as the essential source for investigating the potential of visuals, interpretivism can be understood from the learners' and the researcher's angles. For learners, such a dialogic-based learning process can help them to interpret the thematic content of the lessons. Whist for the researcher, it can support the interpretation of the visual and verbal data generated from data collection, thereby inductively building understanding to conclude findings for answering the research questions. This dual way of interpretation resonates with the nature of interpretivism to understand how the learners interpreted the content and how their visuals scaffolded their learning. Therefore, interpretivism in this study is manifested through two lenses. That is focusing on –

(1) how English younger learners interpret the content by making visuals for languaging learning with their own improvisations and creativity, thereby providing tangible guidance for adapting mentoring.

(2) how the researcher interprets the learners' visuals and languaging (using specific cognitive discourse functions) that reflect the extent of their content and language development, thereby gaining insights into the potential of *visual languaging* for English learning.

These two interpretivist lenses – to a certain extent – are linked with the cognitive and affective domains of the Pluriliteracies model from the angle of learners, the teacher, and the researcher. In other words, they lend a means to identifying learner affective factors that are embodied in their self-created visuals for complementing languaging, which interconnects the process of conceptualising and communicating knowledge (cognitive domain). This reciprocally enables effective mentoring in terms of designing teaching, providing feedback, and scaffolding (Renshaw, 2013), which from an academic research perspective, allows the researcher to gain a deeper understanding of learners' visual and verbal data for emerging meaningful findings.

Therefore, after reviewing the relevant philosophical orientations thus far, the researcher believes that learning occurs when individuals engage in socially interactive processes that are also impacted by digital networking and technology (e.g., web browsers, search engines, and

social platforms). These provide learners with opportunities to make choices of different resources for enhancing their learning. Such integrated thinking of philosophical stance is inspired by Denzin's (2012) 'methodological triangulation' to assure the validity of the information collected and capture the researcher's in-depth understanding of participants' understanding of the phenomenon of interest. Hence, the philosophical stance that directs the methodology and methods of this study integrates the ontology of relativism complemented by connectivism and the epistemologies of social constructivism and interpretivism.

3.3 Research Design – Case Studies

3.3.1 Review of Mainstream Design Approaches

Diverse design approaches applied for conducting qualitative research in different disciplines and fields, for example, education, management, social work, and anthropology are adapted to fit different contexts. Thus, mixed design approaches are often used by researchers to garner richer data for a better understanding of the phenomena of inquiry. Among various research strategies and procedures classified and described by researchers including Denzin and Lincoln (2017), Tesch (2013), and Creswell (2013), narrative research, phenomenology, ethnography, grounded theory, and case studies are more commonly used in qualitative studies. The overall purpose of these approaches to some extent is to understand how people make meaning of their lives and experiences (Merriam et al., 2016) and how knowledge is interpreted and constructed by human interactions in an inductive manner rather than deductively waiting to be discovered as in quantitative studies.

Therefore, it is worth unravelling the nuanced characteristics of the above mainstream qualitative design approaches, thereby indicating the appropriateness of using case studies for this study. Narrative research analyses the stories narrated by the participants to understand the revealed meaning of their experiences (Daiute, 2014). Phenomenology aims to describe the lived experiences of the individuals being studied to understand the underlying structure of the phenomenon (Van Manen, 2016). Ethnography seeks to understand the interaction of people with the culture of the society or the community in which they live (Wolcott, 2008). The grounded

theory approach focuses on building a substantive theory of the phenomenon of interest (Corbin & Strauss, 2014).

3.3.2 The Nature of Case Studies

Case studies, according to seminal works for example, by Yin (2003; 2009), Simons (2009), and Starman (2013), analyse and describe an individual case or cases with an in-depth exploration of a bounded system, such as a person, a particular group (e.g., teaching staff, a group of students with special needs, etc.), a context, or situation and time, a program or an event evolving in its real-life context. Seeing the participants from China learning English as an additional language in a primary school as a bounded system, interpreting this specific group's experience of learning through visuals in-depth resonates with the nature of case studies.

Moreover, according to Merriam (2016), the choice of a particular research type is tied to three components – the precise purpose of the study, the gap identified in setting up the research questions, and the overarching theoretical framework (i.e., relevant literature that frames the study), which permeate the entire process of qualitative research. While acknowledging the potential of the above methodological approaches that possess traction and insights for conducting different research, case studies appear to provide a more specific lens to answer the research inquiries as proposed in this study's research questions. This can be justified by the purposes, gaps, and theories of this study based on Marriam's (2016) three components:

- The purpose of this study is to construct a visual-based learning tool (i.e., *visual languaging*) for scaffolding learners to articulate their thinking or conceptual understanding and enhancing learning in English language classrooms.
- The gaps concern limited research in learner-created visuals for language and more importantly, in exploring the potential of *visual languaging* for enhancing learning from the pluriliteracies perspective.
- Theories that underpin the emergence of the visual languaging strategy synergise languaging (using specific cognitive discourse functions), multimodality (e.g., verbal and visual modes for learning – Learning Conversations, visualisation), and the pluriliteracies

model for deeper learning as unravelled in chapter two, which forms the theoretical framework of this study.

By describing the rationale of this study, the purpose of gaining in-depth insights into learners using visuals for learning English as an additional or second language resonates with the nature of case studies. That is, case studies enable researchers to build up a rich picture of participants' lived experiences using different kinds of data collection to gather their perspectives, perceptions, and/or ideas relating to the case of interest (Hamilton, 2011). In a similar vein, this study employs different data collection tools to collect individual learners' experiences and views on creating visuals for languaging their understanding in English languaging classrooms, thereby providing supplementary work to address the gaps as addressed above. The data collection tools will be discussed in detail in section 3.6.

Having clarified the links between case studies with the research purposes and gaps, the next section will explicitly demonstrate how the main theoretical underpinnings integrate with this design approach to further clarify the kind of case study the researcher decides to undertake.

3.3.3 The Instrumental Case Study

Based on the research questions – exploring the potential of *visual languaging* in conceptual language development focusing on developing learners' cognitive discourse functions and learner agency within the pluriliteracies learning ecologies, it suggests incorporating a pluriliteracies' view of learning with the qualitative case study design. The learning ecologies as discussed in chapter two emphasise the dynamic integration of four dimensions of the pluriliteracies model (see Figure 4 in Chapter two) promoting the co-construction of teacher-learner partnerships (Coyle et al, 2018). As Van Lier (2004) and Jackson (2016) postulate, learning ecologies comprise multi-faceted factors, such as learners themselves, and their ability to interact with their environment that "provides them with affordances, information, knowledge and other resources for learning, developing and achieving something that they value" (Jackson, 2016, p. 1). Such ability is regarded as developing "increasingly effective and successful ways"

(Van Lier, 2004, p. 93) towards a "spirit of inquiry and reflection, a philosophy of seeing and hearing for yourself, thinking for yourself, speaking with your voice and acting jointly within your community" (p. 99). Drawing on their renditions, the pluriliteracies learning ecologies encompass how learners move through *the knowledge pathways* and how teachers explore and adapt teaching strategies to guide learners to progress and succeed in *such trajectories* for deeper learning. Therefore, the way learners construct and communicate knowledge impacts the way learning and teaching evolve in the classroom.

Hence, pluriliteracies learning ecologies put learners at the core to encourage them to be responsible, confident, and motivated for their own learning. Such learner mindsets need to be guided, supported, and challenged through teacher mentoring for generating and sustaining learner commitment and achievement for deeper learning. (Coyle et al., 2018; Cinganotto & Cuccurullo, 2019). This learner-centredness of PTDL aligns with the nature of case studies as they both value individual learners' or participants' mindsets as the main source for teachers or researchers to analyse and make meaning for enhancing learning or addressing research inquiries within a specific context. In this study, designing the case study through the pluriliteracies learning model sought to encourage participants to engage and respond freely. The adoption of this model can be clarified in two components of the case study:

- The teaching and learning activities – integrating visuals and Learning Conversations to scaffold younger learners' language use for languaging understanding of the content introduced in the lessons (the specific design of the teaching content and learning tasks in each lesson will be outlined in 4.1 and 5.2.3).
- The research activities – negotiating and communicating with learners to gain an in-depth understanding of how *visual languaging* complements learning, mentoring, and learner agency.

From this perspective, this case study is shaped by a particular focus. That is using the pluriliteracies approach and a visual strategy to support learners who do not have linguistic capacities in the additional language to articulate their learning and gain insights into the

alignment of visuals with the PTDL model. This resonates with the notion of instrumental case studies that also address specific foci and offer instrumental solutions to a problem, issue, or dilemma rather than providing a broad inclusive picture within the bounded case (Stake, 1995). Therefore, after explicitly considering the nature of case studies as described by Stake (1995), Yin (2009), and Merriam (2016) and how it aligns with the purpose, gaps, and theoretical underpinnings of this study, the methodological choice of an instrumental case study is employed to explore the individual participants' English learning trajectories through visual creation and articulation, thereby expanding the linkage between visual arts and language education.

In line with the nature of a case study that considers preliminary stages of data analysis, a small Pilot Study was carried out to gain insight into the Main Study design. Such conjecture-driven design is characterised as an iterative design process (Cobb et al., 2003), featuring cycles of invention and revision. That is as conjectures are generated or refuted, alternative conjectures can be developed and subjected to tests. The implementation of a Pilot Study has the potential to increase the research quality (van Teijlingen & Hundley, 2001), for example, by testing, justifying, and identifying the necessity to adapt research methods or procedures in order to elicit appropriate responses and obtain rich data (Malmqvist et al., 2019; Gudmundsdottir & Brock-Utne, 2010; Kim, 2010). Therefore, this case study is comprised of a Pilot Study and the Main Study.

3.4 Research Context

Having determined the choice of methodology, the next step is to identify where (the data collection site) the case study was going to be conducted, who (the target group) would it be conducted with, and how (methods) it was undertaken.

This section specifies the research site for data collection. This case study was carried out with an English language school located in Wuhan city of China. The researcher used to work there as an English teacher. Therefore, the school was selected using convenience sampling since the researcher could also take on the role of the online teacher during this study – referred to as the teacher-researcher (T/R). Another reason concerns the teaching objectives and agenda in this

school in which the researcher was invited, observed, and learned how content and language integrated learning (CLIL) was applied to school subject learning (e.g., math, physics) with English as the medium of instruction in China. The students in this sample school begin specific learning of the English language on entry until they are considered competent according to the school examination levels to engage in cognitive and linguistic challenging CLIL subject learning. Though the focus of this study was situated on English language lessons, working in this school in Wuhan to some extent triggered the researcher's thinking of incorporating thematic English lessons instead of language form-oriented English lessons with visualisation and languaging.

Though the researcher has worked in this school before, the current students, their parents, and teachers were unknown to her. The researcher positioned herself in students' natural learning setting (i.e., the school-assigned teaching application that the students normally use for taking lessons online) to learn more about their values, worldviews, and viewpoints which according to Dewalt and Dewalt (2011), can result in the production of thick, rich, and valid data. After contacting and negotiating with the school district manager and two headteachers, approval was given to enable the researcher's access to the school's online teaching platform – DingTalk for conducting this study. DingTalk is an application-based computer program that can also be used on mobile phones. Next student volunteers were recruited for both the Pilot Study and the Main Study. The students can choose to use either the platform's desktop site on their computers or the app version via their mobile phones or iPads. Due to the restriction of the COVID-19 pandemic, the sample school had to switch from face-to-face teaching to online teaching, therefore the students are very familiar with the functions of the platform since they have been using it frequently. Some screenshots of students using DingTalk in this case study were attached in Appendix IV to present a general view of the platform's layout and functions.

For example, through this platform, students were able to share their visuals in the lessons, which allowed the teacher and students themselves to reflect and discuss their thinking expressed via Learning Conversations. Students also spontaneously typed their understanding of the content introduced in the case study English lessons through this platform. Other students preferred to write down their thoughts about the content on paper, then take photos and send them to the

platform where peers can access and view them. Therefore, this online platform to some extent provided a space for students to curate their visuals as created in each class, which triggered peer discussions about each other's visuals. Moreover, it facilitated self-reflection on their learning process and possibly made them realise what else they needed to do to enhance their conceptual understanding. As the students shared, articulated, and discussed their visuals, the researcher was able to develop a deeper and richer interpretation and analysis of the data to ensure its reliability and trustworthiness especially in presenting student learning processes and outcomes with visuals.

3.5 Purposeful Sampling

This case study was conducted with students from the previously specified school in China to collect empirical data for an in-depth investigation (Dewalt & Dewalt, 2011) of their experiences of learning with visuals in the online English classroom. Based on the research objectives, volunteer students were selected through the purposeful sampling approach or more precisely, homogeneous sampling. According to Campbell and his colleagues (2020), such a sampling method in this study refers to the researcher deliberately selecting participants according to two shared characteristics that are considered most useful for the research. These are:

(a) current primary school students,

(b) learning English as an additional, foreign, or second language.

Given the focus on learners aged between 8 to 10 years old studying in primary schools, they are also interchangeably referred to as students in this thesis. By considering and consulting students' availability and willingness to participate, 17 students in China consented to participate in this case study.

While communicating with their school teacher, it was noted that some of the volunteers were English language beginners, and some were at an intermediate level and have been learning English for approximately six months. The school teacher also shared with the researcher some

English lessons the participants had already experienced and their English learning schedule. The students usually have one English lesson a day in the sample school. Considering the information collected from the sample school after negotiating with the school teacher, the topics of the lessons designed concerned three aspects: 1) the topics that the students have not learned before or have not learned in depth 2) participants' interests 3) the researcher's art background. To reiterate, the specifics of topics and lesson plans for the Pilot Study and the Main Study are discussed in sections 4.1 and 5.2.3, respectively.

3.6 Methods

3.6.1 Data Collection

There are five methods used for data collection: teaching and learning methods (pedagogic focusing on visualisation, Learning Conversations). Research methods focusing on the visual-based participatory method inspired by Leavy (2018, 2020); participant interviews; and questionnaires. In addition, the researcher's reflective notes were used for creating English lesson plans for teaching the students online.

- The teaching and learning methods – visualisation, Learning Conversations

The teaching and learning methods aimed to support the younger learners in demonstrating their understanding of the content. This was triggered by specific learning tasks and complemented by learners creating and using their own visuals for languaging whilst being scaffolded via Learning Conversations. By considering the possibility that what the learners intended to depict through their visuals might not be fully or explicitly represented to others or themselves due to less-refined artistic skills, verbalising their thinking appeared necessary to capture *the missing visual parts*. As Frith and colleagues (2005) emphasise, the absence of what the participants intend to produce requires equivalent attention as what is actually drawn on the page. In this sense, Learning Conversations were chosen to provide learners with opportunities to talk about their thinking accompanied by their visuals. By identifying learners' thinking processes, the teacher-researcher can provide the scaffolding that learners need by using this dialogic tool.

Through visual-integrated Learning Conversations, learners' thinking can be visually and verbally defined supporting both themselves and the teacher-researcher to reflect on their learning and teaching processes, thereby facilitating learning and mentoring. Therefore, both visualisation and Learning Conversations are considered heuristic tools for learning, and by integrating these with interviews and the visual participatory method, participants' learning processes could be holistically and genuinely revealed. This combination of data collection tools may offer the teacher-researcher a deeper insight into the participants' interpretations of creating visuals for learning, whilst gaining an in-depth understanding of how *visual languaging* can support English learning and teaching, and thereby addressing the research foci of this study.

Having elucidated the rationale of employing visualisation and Learning Conversations, the next step is to clarify the choice of adopting the research methods – the visual participatory method, interview, questionnaire, and the researcher's reflective notes.

- The Visual Participatory Method

By handing over control to participants in image-making for languaging, the extent of their understanding of the content and language can be evidenced as it emerges rather than being told to researchers in an interview, survey, or focus group (Richards, 2011). Adopting this approach is not only inspired by the pluriliteracies model for demonstration learning with visualisation but also by Leavy's (2020) participatory visual research methods. She described them as a specific set of visual practices in academic research that involve "participants creating art that ultimately serves both as data and may also represent data" (ibid., p. 242), such as researching children's self-expression and community engagement through their art creations (Lee et al., 2020). Visual art forms can be paintings, drawings, photographs, sculpting, filming, and so on. Moreover, Leavy (2020) suggests the aesthetic quality of the resulting visual art can be less salient as participants cannot be expected to possess artistic ability or training. It was anticipated that some students in this project might be art amateurs, therefore, they were encouraged to produce data in any material visual form they prefer so long as their conceptual and language understanding is explicitly conveyed and articulated. The specific forms of visuals used by students in the Pilot Study and the Main Study will be elaborated on in Chapters 4 and 5.

- Semi-structured Interview

Similar to Learning Conversations, interviews are usually conducted through dialogues to ascertain the participants' perspectives on the focus of the research inquiry. Whilst there are three broad categories of interview methods (structured, semi-structured, and unstructured interviews), semi-structured interviews are organised with pre-determined open questions with the flexibility to alter the order and number of questions with informed questions emerging based on how the dialogues flow between the interviewers and the interviewees (DiCicco-Bloom & Crabtree, 2006).

Semi-structured interviews are comparatively more flexible "in which the person interviewed is more a participant in meaning-making than a conduit from which information is retrieved" (DiCicco-Bloom & Crabtree, 2006, p. 314). However, empirical data interpreted by interviews are debated as impressionistic, unreliable, and subjective compared to quantitative methods (Denzin & Lincoln, 2000). Therefore, conducting qualitative interviews requires careful attention to enhance objectivity and reliability, for example, meticulous planning and adequate preparation, intensive and immersive listening to the interview recordings for notetaking (Qu & Dumay, 2011). Moreover, decisions on what type of interview will be conducted, who and how many participants to interview, and how to analyse interview data need to be carefully considered (Doyle, 2004).

Taking into account these concerns, the thinking of conducting individual semi-structured interviews was elicited from the research foci that explore and value individual younger learners' visual experiences in English language learning. Furthermore, by being part of the learners' English learning process as a temporary teacher in the online lessons, Learning Conversations, and a researcher in the interviews, the importance of learners' interests, voices, and perspectives in trialing and adapting *visual languaging* for activating learner agency was noted. The affordances of semi-structured interviews integrating open-ended questions with follow-up questions that may be raised by the interviewees can trigger more engaged thinking and discussions, thereby generating more authentic answers for in-depth interpretation and analysis.

- Questionnaire

Questionnaires are highly structured with a list of set questions similar to structured interviews. and can be used to collect quantitative and/or qualitative data (Krosnick, 2018; Patten, 2014; Gillham, 2008). The researcher chose to combine it with the interview for two reasons:

1) concerning the mutually convenient time between the teacher-researcher and participants, some participants may not be able to attend the interview. In order to gain information from as many samples as possible, the questionnaire method as suggested by Gillham (2008) is an alternative option for respondents to complete at their convenience with less pressure for an immediate response;

2) compared to the interview, questionnaires are independently completed by respondents, which to some extent lack interviewer bias, thereby may enhance the overall data trustworthiness.

Nonetheless, the interview can supplement the questionnaire in ways of controlling over order and context of answering questions, motivating respondents, explaining their uncertainty or misunderstanding of the questions, and checking the seriousness or honesty of their answers (ibid.).

- The Researcher's Reflective Notes

Another method used in engaging with the problem of bias of 'researcher as teacher' and research transparency is by keeping reflective notes. It is a common practice in qualitative research to facilitate researchers' reflexivity (Ortlipp, 2008), whereby researchers not only make visible to the reader his or her choices, decisions, and actions undertaken during the research process (Mruck & Breuer, 2003) but also examine and clarify personal assumptions, subjectivities, and beliefs (Russell & Kelly, 2002). By drawing on their claims, the act of note-keeping incorporated into this case study process can be identified with three purposes:

1) refining the teacher-researcher's ideas and decisions for designing the lessons and learning tasks,

2) clarifying and enhancing her understanding and interpretations of the participants' data,

3) critically reflecting on her experiences of teaching the selected students with visuals during the process of data collection and analysis.

The specific notes that represent these purposes were attached in Appendices I and II.

In order to garner rich and authentic data, questionnaires, semi-structured interviews, and the researcher's reflective notes were proposed to be adopted in this case study. This combination may encourage teacher/researcher-learner/participant communication for developing a richer, deeper understanding of learners' feedback on visuals for learning and their overall experience with this online case study, subsequently impacting future relevant research design. Nonetheless, the data collection tools are subject to change, especially reflecting on the implications of the Pilot Study for designing and conducting the Main Study. In this sense, the use of the data collection tools for addressing each research question as anticipated in the Pilot Study (Table 3) differed from the Main Study (Tables 8 and 10). The specifics of the Pilot Study data analysis and insights will be detailed in the next chapter (Chapter 4) followed by the Main Study data and discussions of findings in Chapters 5 and 6.

3.6.2 Data Analysis

As indicated by the data collection tools, the data collected in the Pilot Study consists of video recordings and transcriptions of Learning Conversations, interviews, questionnaires, participants' self-created visuals, and the researcher's notes. The data collection and analysis for the Main Study will be outlined in Chapter 5 with insights from the Pilot Study. The Pilot Study data collection methods integrate three kinds of texts or modes, which are verbal (e.g., learners' languaging and utterances during the online study), written (e.g., transcriptions, research notes, students' written notes on their visuals), and visual (e.g., learners' visual artefacts). The combination of such data resources to some extent resonates with the linguistic and non-

linguistic resources of translanguaging (García & Li, 2014; Li, 2018) and multimodality (Kress, 2000) as addressed in chapter 2 for exploring the potential of teaching, learning, and researching with visuals.

The combination of verbal, written, and visual data may offer a holistic locus for analysing what the learners are thinking, visualising, and languaging. Indeed, participants' visuals and other verbal data transcriptions can provide tangible evidence for mentoring learning and corroborating the potential of *visual languaging* for teaching and learning. Therefore, the verbal data were transcribed and analysed based on the content of learners' utterances, especially their languaging and responses to the questions raised during Learning Conversations and interviews. The visual data were analysed based on the figurative content, for example, lines, shapes, and annotative texts that possibly be added by learners themselves. It is worth noting that the figurative elements cannot be analysed separately from the thematic content introduced in the lesson as the purpose of creating visuals is to support knowledge construction. Therefore, the content for analysis focuses on the process of learners representing their conceptual and language understanding through their verbal languaging and *visual languaging*. This suggests an analytical method that is different from simply analysing the figurative elements of the image itself (i.e., visual semiotic analysis) (Jewitt & Oyama, 2004). Instead, the method for analysing data needs to focus on the verbal, written, and visual content of the data.

Inspired by relevant research analysing children's visuals, for instance, drawings (e.g., Søndergaard & Reventlow, 2019; Merriman & Guerin, 2006), this case employs a content analysis approach. The researchers underline the psychological value of using children's drawings as data in child-centred research and refer to the application of content analysis to interpret image data (e.g., Silver, 2001; Franzosi, 2004) in addition to its typical use in the quantification of text (e.g., Berelson, 1954). Their analytical resources for analysing visual data emphasise not only a qualitative exploration of drawings but also the consideration of quantitative factors (e.g., children's gender, age) influencing the frequency of certain themes or categories.

However, this study exclusively adopts content analysis that integrates the visual and verbal, written resources: learners' articulation of their visual artefacts (possibly with some additional

written text or notes) and their responses during the Learning Conversations and interviews. In other words, what the learners visualise and utter (e.g., languaging) that are linked with the target language (English) and thematic content in the lessons, Learning Conversations, and interviews will be the core data for analysis. To be specific, the content analysis focuses on investigating –

- how students used English (whilst adopting some Mandarin for meaning-making and the follow of communication) for demonstrating conceptual understanding with support from their own visuals and the teacher-researcher via Learning Conversations.
- whether there was evidence of students enhanced conceptual understanding and more appropriate use of the target language (i.e., English) compared to their prior conceptual knowledge and English levels before participating in this case study.

According to Anderson and Arsenault (1998), the qualitative content analysis starts with selecting the texts (e.g., spoken, or written texts) for examination based on the research questions, then breaks down the texts into units of analysis that frame the focus of the study. In addition, Densombe (2014) echoes their description and sets out another two stages after the formation of units of analysis. Initially, it focuses on developing appropriate codes or categories (i.e., a label assigned to a piece of text) (Gläser & Laudel, 2013; Miles et al., 2020) to fit into organised themes or categories correlating with research questions. Second, it is necessary to select appropriate coding rules, such as counting the number of times a particular word or phrase appears (frequency) as in quantitative research or looking for the existence of a concept regardless of its times of emergence as common in qualitative analysis.

Taking into account their suggestions for conducting content analysis, the analytical steps were initiated from transcribing and interpreting all data sets to the emergence and grouping of codes or categories into themes that revolve around the research questions. This suggests that the process of analysing qualitative data is inductive and non-linear, from which revision and refinement including recoding, removing irrelevant data, or relabeling categories are often needed to generate trustworthy findings (Thomas, 2006). As Cohen and colleagues (2018) further indicate that code-labelling has to be exhaustive, mutually exclusive, and independent. Based on

their remarks, generating categories and themes in this study became more defined after systematically re-reading all data types to gain a thorough understanding of the main ideas embedded in the visual and verbal data. More precisely, the categories that naturally emerge from scrutiny and interpretation of the transcriptions and the content of students' visuals are subsequently grouped into themes. The specified categories, themes, and their links with the key theoretical underpinnings will be identified and discussed in chapters 4, 5, and 6 with learners' visual and written data in order to explicitly answer the research questions (Elo & Kyngäs, 2008).

3.7 Research Timetable

Given the important roles that pilot studies play as stated in section 3.3.2, this pluriliteracies-featured case study was designed in two stages – a Pilot Study and the Main Study. Due to limited research time and learner availability, six students were recruited for the Pilot Study participating in two one-hour lessons. The Pilot Study data collection was completed within a month with one lesson per week followed by a 15min individual semi-structured interview and a questionnaire after lesson 2 using the online platform – DingTalk (Table 2).

The Pilot Study			
Participants	Research activities	Duration	Platform
Group one – six students	Two lessons with all group one student	1 hour	DingTalk
	An interview with individual students of group one	15 minutes	
	A questionnaire (9 questions) with individual students of group one	Depending on individual students, it was expected to be completed and returned in three days.	

Table 2. Specifics of the Pilot Study plan

The first iteration of the case study for answering the research questions through the Pilot Study is represented in the following table, which was then open to being adapted for the Main Study according to the Pilot Study analysis and findings. The Main Study data collection methods, data sets (Table 8), and timeline (Table 9) will be further addressed in Chapter 5.

The Pilot Study		
Research questions	Methods	Data sets
	Interview	Interview transcripts

RQ1: In what ways might visualisation serve as an intermediary learning tool (visual languaging) that bridges conceptual knowledge construction and language learning in English language classrooms?	In-class Learning Conversations	In-class Learning Conversations transcripts
	Questionnaire	Questionnaire transcripts
	The researcher's reflective notes	English lessons
RQ2: How can students develop their appropriate use of specific cognitive discourse functions through visually scaffolded languaging?	Visual participatory method	Visual artefacts
	In-class Learning Conversations	In-class Learning Conversations transcripts
	The researcher's reflective notes	English lessons
RQ3: What are the necessary conditions for online learning experiences which encourage the interactive development of visual languaging for pluriliteracies growth in a digital learning space? a) To what extent can visual languaging support teachers in adapting mentoring online? b) How might visual languaging foster learner agency?	Interview	Interview transcripts
	Questionnaire	Questionnaire transcripts
	The researcher's reflective notes	English lessons
	Visual participatory method	Visual artefacts

Table 3. The original Pilot Study analytical framework

3.8 Ethical Considerations

This study was approved by the University of Edinburgh's Ethics Committee using strict guidelines (https://www.ed.ac.uk/health/research/ethics/committee). To ensure the reliability and authenticity of the study, all data collection activities were automatically video recorded via the teaching platform suggested by the sampling school. This involved the consent of students' parents and the sample school for educational and research development purposes in line with the ethics policy. All personal data (e.g., students' names, ages, ethnicity, verbal, and visual data) were secured in a password-protected computer owned by the researcher for analysis only and on completion of the research will be deleted. In sum, the procedural ethics practices encompass the negotiation of the consent form to ensure privacy and confidentiality (Sales & Folkman, 2000), and a parental informational sheet outlining the nature, benefits, and uses of their children's data.

3.8.1 Researcher as Teacher

Socially constructed and interpreted knowledge from the research angle indicates the subjectivity of qualitative analysis as it is unavoidable for researchers to remain impartial and independent of their inquiry. Therefore, in order to optimise impartiality, Malmqvist and colleagues (2019) advise qualitative researchers to be humble and reflective to "counteract threats to trustworthiness" (p. 3) by finding ways of encouraging participants to freely express their views through a variety of methods – for example, unobtrusive observations, in-depth interviews, focus group discussions for gaining deeper insight or understanding of the research problems in their unique contexts (Cohen et al, 2018). Major strategies for enhancing the credibility and reliability of this research are considered based on Tracy's (2010) 'Big-Tent' criteria as detailed in section 3.8.2.

As both the researcher and the teacher, keeping notes triggered new thinking for designing and teaching the English lessons and provided opportunities for reviewing and rethinking the interpretation of the data in more depth. During data collection and analysis, the teacher-researcher immersed herself in the context of a virtual learning space with English language learners living in China to teach and research their language learning through visualisation and languaging. The teacher-researcher sought to teach them visually facilitated English language lessons in an online classroom that would allow her to gain an insider's view of their experiences of creating and using visuals for the elaboration of conceptual knowledge as introduced and practised in lessons. By the end of the lessons, students' learning processes, especially the moments when they were using visuals for languaging their understanding during Learning Conversations and interviews were researched with supplementary notes.

Such moments were highlighted as they offered opportunities for reflection not only for learners to scrutinize their learning but also for the teacher-researcher to adapt her strategies for mentoring learning. For example, given the participants are primary school students from China, it was anticipated they might use Mandarin (their first language) in the process of English language learning. This raised the importance of the teacher-researcher's use of each language for offering students the opportunities to practice their English language use. This does not deny

the function of students' use of Mandarin as it can support the teacher-researcher to monitor their learning process by identifying possible problems in their conceptual understanding and English language use. Admittedly, both the teacher-researcher and the students are fluent Mandarin speakers, which requires the teacher-researcher to carefully use Mandarin especially when some students can fully understand and explain the content when taught in English. In case when students can not quite make meaning of the content, using Mandarin to explain abstract concepts can be more cognitively accessible and comprehensive for them to intake. More considerations for using Mandarin in the Pilot Study and the Main Study will be revisited with explicit data in Chapters 4 and 5.

These reflective processes were built on the premise that students' different levels of conceptual and linguistic improvement (e.g., appropriate language use of cognitive discourse functions for meaning-making) were revealed as they engaged in visualising and languaging their understanding of the content in English and/or Mandarin. Therefore, recording learners' visual creations, languaging using specific language functions, and utterances in the Learning Conversations and interviews was crucial for immersive observation, reliable transcription, and in-depth analysis.

Though this is a 'researcher as teacher' study, participants' own learning schedules in their schools were not affected. This study was also agreed upon by the sample school as a means to provide supplementary teaching sessions for enhancing students' English learning by drawing students' and teachers' attention to *visual languaging* for English learning and teaching. It was intended to use this small-scale case study as an experimental initiative providing insights for relevant empirical studies focusing on visual-based approaches to other language education. This study encourages wider groups of teaching practitioners, researchers, and learners to critique, adopt and adapt based on their own specific settings and learning goals. Detailed implications for future studies will be discussed in chapter 7. Next, the consideration of bias and the quality of data analysis will be addressed.

3.8.2 Bias and Trustworthiness

The issue of bias when analysing data was raised, for example, the subjectivity in perceiving, translating, and coding the data. This will be guided by following Tracy's (2010) 'Big-Tent' criteria for qualitative studies (Table 4), from which credibility (i.e., the trustworthiness of research findings) can be enhanced through practices including thick description (e.g., transcribing interview data), multivocality and member reflection. Based on her description, multivocality refers to voices sought from intense collaboration between the researcher and participants that also facilitate friendship building (ibid.). Indeed, participants built a more trusted relationship with the teacher-researcher and genuinely engaged in this online study. This was revealed from their active attendance and interaction in Learning Conversations and interviews, leading to more credible data (Miles & Huberman, 1994). Moreover, member reflection focuses on participants checking and recognising the validity of the researcher's findings (ibid.). These credibility-aimed practices emphasise the importance of participant voices and meticulous, concrete details of interpreting and confirming the data with them to maintain research credibility.

Derived from Tracy and Hinrichs' (2017) suggestions for mitigating the researcher's bias, researchers can confirm with participants whether the conceived views represent their meaning, ideas, or beliefs. They also need to review objective data sources including audio or video recordings to check for alternative implications from participants. The teacher-researcher confirmed with the students during the Learning Conversations and interviews to ensure that her interpretations of their visual articulation and responses to interview questions conform with their thinking. Moreover, the objective source of data – Learning Conversation and interview video recordings were rechecked and reviewed to ascertain her understanding of the data collected from the students. These approaches were applied both in the Pilot and the Main Studies.

As the data were organised into themes and categories using content analysis, therefore, coding reliability was also considered by adopting intercoder reliability (ICR) (also termed 'intercoder agreement') (Tinsley & Weiss, 2000). As a commonly adopted method by qualitative researchers

for ensuring qualitative research reliability, it measures the extent to which independent judges code the data by evaluating the characteristics of the given texts (e.g., messages, transcriptions, artefacts), comparing the similarity of their codes or categories, labelling with the researchers', and reach the same conclusion (ibid.). This approach was only applied in the Main Study given the Pilot Study was an informal trial. More specifically, the teacher-researcher invited another colleague researcher from the University of Edinburgh who was unfamiliar with this study or its coding process and decisions, to analyse and code the randomly chosen samples of the Main Study data independently. For the data collected in the Main Study, there were four interview transcriptions (two for each student group) and five Learning Conversation transcriptions (two for group two and three for group three) randomly selected for the coder to check and make decisions on codes or categories. The coder and the researcher's categories of these data show about 70% similarity after comparison.

Therefore, in addition to scrutinising the video recordings for research validity, the main feasible approaches to assuring the research credibility, reliability, and mitigating potential bias are member checking and intercoder checking by:

- confirming and communicating data interpretations with the participants, especially regarding their visuals and languaging in Learning Conversations and learner feedback in interviews.
- inviting a colleague researcher who was unfamiliar with this study or the coding decisions to analyse the transcriptions independently.

More detailed descriptions of how the criteria for research quality are considered and reflected meticulously in this study as shown in table 4 below.

Criteria for Quality (end goal)	Various Means, Practices and Methods Through Which to Achieve	Considerations for this study
Worthy Topic	The topic of the research is - relevant - timely - significant - interesting	This research is relevant to the pluriliteracies thinking for language education by integrating visualisations and Learning Conversations as scaffolds for

		languaging, thereby promoting learners' interest and motivation to sustain and deepen their learning.
Rich Rigour	The study uses sufficient, abundant, appropriate and complex - theoretical constructs - data and time in the field - sample(s) - context(s) - data collection and analysis processes	The nature of adopting and adapting different methods including visual, digital, and verbal tools (Learning Conversations, interviews) to generate and analyse multiple data and perspectives from purposively selected samples assures the rigour of the study.
Sincerity	The study is characterised by - self-reflexivity about subjective values, biases and inclinations of the researcher(s) - transparency about the methods and challenges	The researcher kept taking reflexive notes to ensure transparency and depth of thinking.
Credibility	The research is marked by - thick description, concrete detail, explication of tacit (nontextual) knowledge, and showing rather than telling - Triangulation or crystallisation - multivocality - member reflections - inter-coder reliability (when collaborating on data-analysis)	The qualitative data are rich and varied with detailed descriptions of the data collection and analysis process including using tables, diagrams, and figures to robustly answer the questions and adopting member checking, inter-coding to assure the credibility of the study.
Resonance	The research influences, affects, or moves particular readers or a variety of audiences through - aesthetic, evocative representation - naturalistic generalisations - transferable findings	This research not only targets students' visual learning experiences but also teachers' mentoring through visuals for language education, all of which are potentially transferable to the learning and teaching of other disciplines or subjects.
Significant contribution	The research provides a significant contribution - conceptually/theoretically - practically -methodologically	This study seeks to explore a new visual approach to learning additional languages, which aims to practically supplement traditional language pedagogies and theoretically enrich pluriliteracies teaching for deeper learning.
Ethical	The research considers - procedural ethics (such as human subjects) - situational and culturally specific ethics - relational ethics	This study follows strict ethical guidelines. All participants were notified of information about this research before voluntarily signing the consent form.

Meaningful coherence	The study - achieves what it purports to be about - uses methods and procedures that fit with its stated goals - meaningfully interconnects literature, research questions/foci, findings, and interpretations with each other	The research design and methods of data collection and analysis are 'fit for purpose' with regard to the research questions and aims that are generated from reviewing and discussing relevant literature.

Table 4. Considerations of Tracy's 'Big Tent' criteria for this study

3.8.3 Participant Consent

The nature of this study including the specific activities of participation and voluntary participants' rights was outlined in detail as an information sheet for parents to review. For example, participants were informed that all interview sessions and lessons would be pre-scheduled and video-recorded for recursive ongoing analysis. After negotiating and confirming the interview time with students, their parents, and teachers, the verbal data collected from Learning Conversations and interviews were fully transcribed and learners' visuals were saved as jpeg files on a password-protected laptop.

Students had the right to withdraw from the case study anytime they wished. Those who wished to volunteer signed a consent form by themselves as well as their parents or headteachers. Then they were invited to join the learning groups on the DingTalk platform voluntarily and chose their preferred digital device, such as a laptop, iPad, or iPhone to take the classes online. Three virtual learning groups (one for the Pilot and two for the Main) were set up on this digital application with both written and oral consent from the sample school and parents. As the participants were recruited voluntarily, it was noted that most of them were highly motivated and engaged in class, Learning Conversations, and interviews, which generated intuitive and authentic data. The specifics of the parental information sheet and consent form are attached in Appendix III.

3.8.4 Self-reflections

By keeping reflective notes, the teacher-researcher acknowledges her role as an English language teacher in this online case study and the importance of taking reflective notes during the process of data collection and analysis, especially the participants' utterances and visuals emerged in the lessons, Learning Conversations and interviews. Moreover, building a mutually respectful case

environment is crucial for participants to actively engage and freely express their thinking for the researcher to understand and develop deeper insights into the research inquiry. Therefore, all their views, perspectives, feedback, or ideas were valued and encouraged by questioning in a way that would facilitate open responses and trigger more teacher-learner or peer discussions in whole-class or individual-based Learning Conversations and interviews whilst taking care of the participant's feelings and emotions.

Moreover, building a positive relationship with the participants' parents and teachers is essential for granting the teacher-researcher's access to teach the students and setting up learning groups on the school's online teaching platform, from which the data were synchronically recorded. Parents and the teachers in the school also provided support throughout the case study, for example, they reminded the students to take the lessons by entering the online platform on time, encouraged them to engage in the learning activities during lessons (e.g., visual and language-related tasks, languaging in whole-class Learning Conversations) and participate in the individual-based Learning Conversations and final interviews. The rapport established between the teacher-researcher and the school community (e.g., students, parents, and the sample school teachers) as claimed by Siegel (2018) can enrich the data with empathy, reflexivity, and situatedness. In return, this study is also available for the students, their parents, and the sample school teachers to review and make suggestions upon their request.

3.9 Overview

This study is philosophically oriented from relativism, connectivism, social constructivism, and interpretivism, informing the choice of methodology and methods for data collection and analysis. By interweaving the pluriliteracies approach with this instrumental case study, classroom teaching and learning activities for thematic content learning in English language classrooms were specified. That is integrating visualisation with Learning Conversations to scaffold learners to articulate their thinking or conceptual understanding to peers and the teacher-researcher.

The case study consists of two constituent studies – a Pilot Study and the Main Study. The research tools for data collection including the participatory visual method, interviews, and questionnaires will be experimented with in the Pilot Study and adapted according to its findings and implications. As indicated previously, three different groups of younger learners were invited to participate in the teacher-researcher designed online lessons at separate times. One in the Pilot Study with the other two in the Main Study. The data were analysed through content analysis suggesting an inductive analytical process initiated by an understanding of the research objectives and preparation of the raw data (e.g., selection of texts for analysis) followed by an immersive reading, rereading, and reflection on their meanings to meticulously generate themes and categories (Anderson & Arsenault, 1998; Miles et al., 2020). Chapter four will focus on reporting and discussing the Pilot Study as set out in Table 3 section 3.7, considering the results and implications, thereby offering insights into any adaptations required regarding research methods, data sets, and English lessons for the Main Study as detailed in Chapter 5.

Chapter 4 The Pilot Study

It is acknowledged that conducting a Pilot Study is considered necessary to gain insights for designing the Main Study (Malmqvist et al., 2019). To reiterate, the purpose of the Pilot Study in this research is to understand the effectiveness of the particular research tools and data collection processes in order to provide insights for designing the Main Study for answering the research questions. Therefore, this chapter consists of five parts which are (1) the Pilot Study English lesson plans, (2) the Pilot Study data with emerging themes, (3) the analysis of the data (4) the implications of the Pilot Study findings, and (5) a chapter summary indicating any adaptations to the Main Study data collection methods, which will be detailed in Chapter 5.

4.1 The Pilot Study English Lesson Plans

The Pilot Study considers the students' current English levels ranging from entry to intermediate, especially in lesson design. Six students referred to as group one participated in two Pilot Study lessons, three of whom joined the individual-based interviews and two responded to the questionnaire. The lesson topic – colours and emotions was chosen as a new topic after communicating with the school teacher that potential links between colours and emotions had not been previously taught. Also, impacted by the researcher's art background, it is also within the researcher's interest to explore how younger learners respond to the meaning of colours in terms of emotions.

Lesson one began with very basic words and expressions of colours and emotions, then gradually shifted to complex concepts with nuanced emotions and their linking with colours. After lesson one, the students had one week to make visuals for introducing themselves and representing their understanding of how colours and emotions affect their lives. In lesson two, the students were guided to review the content of lesson one. Linguistic support was provided for them to articulate their learning with their visuals created after lesson one as an after-class task. They were encouraged to describe their visual-making process, and explain how their visuals relate to colours, emotions, and the links between these two concepts.

4.2 The Pilot Study Data

The data were mainly generated from students' visuals and languaging during whole-class Learning Conversations, and their utterances in the interviews, which were analysed using the following steps conforming to the procedures of content analysis. Through the following analytical process, three themes were grouped based on seven categories generated from the data (Diagram 6).

1) Reviewing the videos of the lessons and interviews, especially the teacher-learner conversations when the students were languaging their visuals that reveal their understanding of the content (e.g., links between colours and emotions),

2) Taking research notes (Appendix I) whilst transcribing and translating the students' responses to the interview and questionnaires questions (see Tables 5 and 6 in Appendix I),

3) Labelling students' utterances in Learning Conversations and interviews with categorises and themes to address the foci of the research questions (see Table 7 in Appendix I).

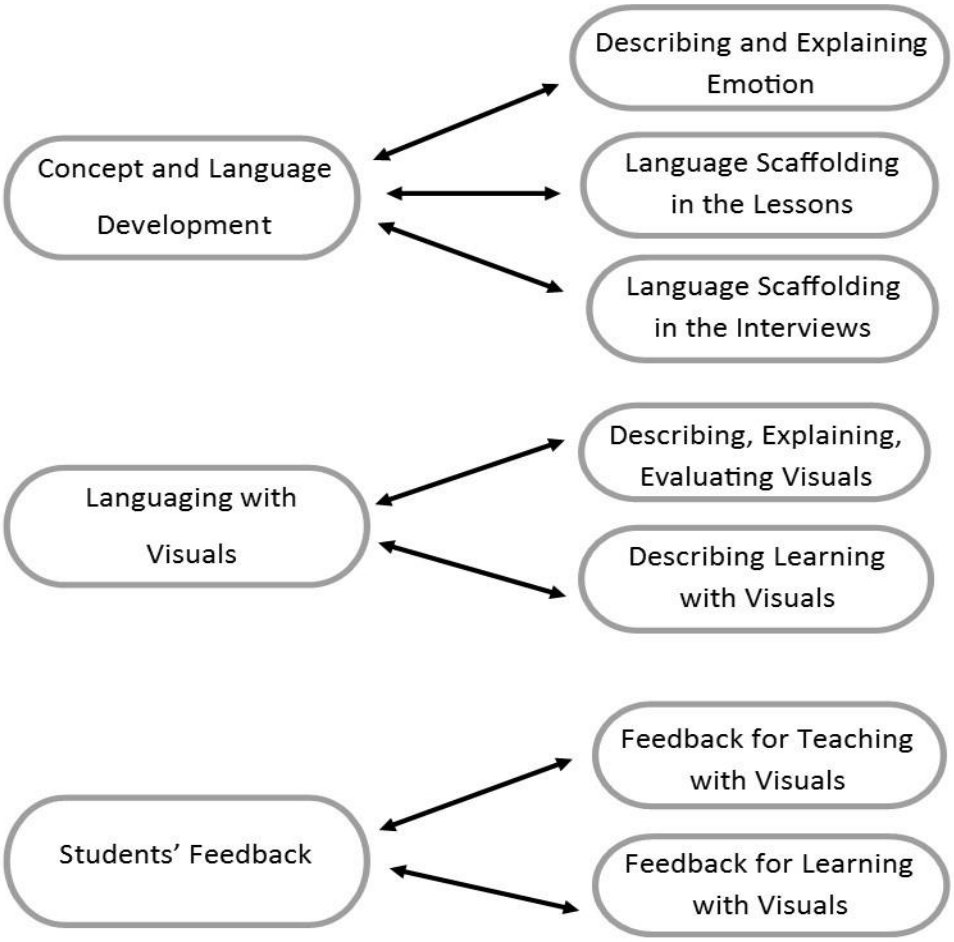


Diagram 6. The Pilot Study themes and categories

4.3 The Pilot Study Data Analysis

After defining the analytical steps, the following sections will elaborate on each theme and its corresponding categories and extracts of the participants' data that emerged from the lessons and interviews.

Theme 1:

4.3.1 Concept and Language Development

4.3.1.1 Describing and Explaining Emotions

During the first lesson, students were encouraged to introduce themselves in English by describing their hobbies, hometowns, and favourite colours, which led to the thematic content about colours and emotions. Some of them shared certain objects in the colours they like. They also managed to recognise different shades of colours (e.g., light, dark, warm, and cold colours) and described their relations with positive or negative emotions: *"Angry is red and yellow is happy"* (G1S1- Group one Student one).

Furthermore, they were provided with language tools to use cognitive discourse functions in their utterances in lessons, such as explaining their feelings by adopting the linguistic form – *'I…because….'*. As G1S3 mentioned: *"I was happy today because I can watch TV"*. G1S4 also shared: *"I feel happy today because I have a holiday tomorrow"*. It was unexpected that G1S2 used '*grey'* to represent his feeling before the teacher-researcher introduced the potential link between colours and emotions as he articulated: *"I feel grey today…because after this class I clean my room"*. By the end of class, a small task was introduced regarding using any forms of visuals they prefer to represent themselves and their perspectives of how colours and emotions affect their lives.

The second lesson began with a short revision in English of the content in lesson one by encouraging the students to describe their feelings regarding the past week as both lessons occurred every Sunday. All students showed an awareness of integrating colours with their emotions. As G1S2 said: *"I felt yellow because every day I am happy".* This colour was also mentioned by G1S3 in lesson 2 whole-class Learning Conversation with the teacher-researcher who used some prompting questions to support the student express his feelings with colours:

(Lesson 2 whole-class Learning Conversation)
G1S3: I felt happy because I watch TV.
T/R: What are your favourite TV programs?
G1S3: My favourite program is the news.
T/R: What colour would you use to describe your happiness?
G1S3: I can use yellow too.
T/R: Why?
G1S3: Because I am happy.

T/R: Do you think yellow is a happy colour?
G1S3: Yes, I think.

4.3.1.2 Language Scaffolding in the Lessons

Subsequently, all students managed to recall the colours on the colour palette (see Figure 5) except the target word *'beige'* as introduced in the first class. Instead, G1S3 metaphorically described it as '*ice cream*'. G1S2 echoed G1S3 by specifying the ice cream as *'vanilla'* flavoured, which resonated with his initial response *"that's cream"*. Furthermore, he independently spelled the target word though he was uncertain about its pronunciation. Based on their idea-exchanging discussion as in the following excerpt, the teacher-researcher was able to scaffold their learning according to their specific needs, which in this case is the phonetic difference between 'bridge' and 'beige' and enhance their understanding of this colour:

(Lesson 2 whole-class Learning Conversation)
T/R: What about the left bottom?
G1S2: That's cream.
T/R: Yes, is there another way to say it?
G1S2: Let me think something… bridge, b-e-i-g-e.
T/R: You are correct in spelling, but the pronunciation is beige. 'Bridge' has an 'R'.
G1S3: It like, just like ice cream.
G1S2: Vanilla.
T/R: Very similar, that's why we call it cream as well.

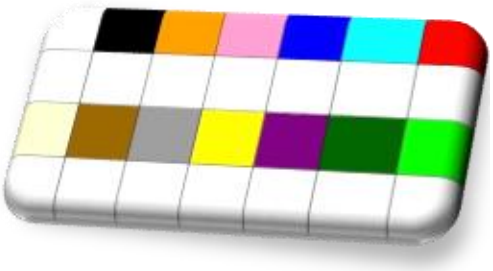


Figure 5. The colour palette

Such conversational scaffolded learning permeated the entire lesson that triggered more thinking and languaging using specific language functions. For example, the following teacher-learner conversation depicts two students languaging their understanding of the links between colours and emotions by describing possible meanings symbolised by colours with hints provided in Figure 6. The students were able to express their thoughts and collaboratively answer the teacher-researcher's questions by adopting the keywords (e.g., envy, wealth, mystery, attention) as well as some Mandarin to describe their understanding of the topic fully.

(Lesson 2 whole-class Learning Conversation)
G1S2: Black means evil, red I think romantic and love.

G1S3: White means good, blue is sad.
T/R: What about the person in green?
G1S3: He feel 嫉妒 (envy).
T/R: How to say it in English?
G1S2: I think that's e-n-v-y, Envy.
T/R: Yes, what about purple?
G1S2: Purple means like I think purple means wealth, mystery.
T/R: What about brown?
G1S3: Brown is…
G1S2: I think brown means strong.
T/R: And orange?
G1S2: I know how to spell a-t-t-e-n-t-i-o-n.
T/R: Attention.
T/R: The last one - pink?
G1S2: Kindness.

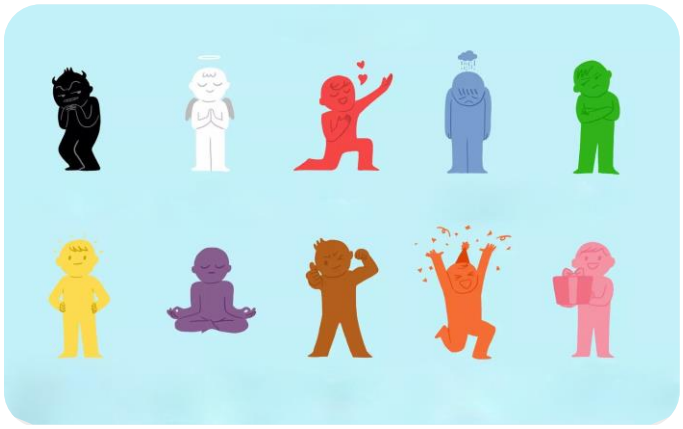


Figure 6. Emotions and colours
Retrieved from:
https://www.verywellmind.com/color-psychology-2795824

Learning Conversations as one of the mentoring strategies became increasingly important in guiding students to communicate using their own languages with increasing appropriacy instead of directly giving students accurate linguistic forms. Such conversations were constructed by both the teacher-researcher and students as a means of dialogic scaffolding specifically facilitated with content-related questions to encourage the students to build their utterances appropriately for languaging. As the teacher-researcher asked thought-provoking questions in lessons to encourage students to demonstrate and communicate understanding, their linguistic forms were supported with explicit guidance. For example, the mispronunciation of 'beige' as' bridge' was corrected through the visually elicited conversation.

4.3.1.3 Language Scaffolding in the Interviews

Furthermore, mentoring learning through conversations occurred not only in the lessons but also during the interviews where students received language support. For example, G1S1 described the representative meaning of '*black*' and used a combination of English and Mandarin which allowed the teacher-researcher to provide the specific lexical scaffolding:

(Interview with G1S1)
T/R: What is something new about emotions you learned?
G1S1: The black.

T/R: What emotion does black represent?
G1S1: Black is so…邪恶 (evil).
T/R: 邪恶 (evil) evil.

G1S2 described some new words he learned from the lessons, from which the teacher-researcher was able to provide him with the language support meeting his learning needs (e.g., the spelling and pronunciation of beige and envy):

(Interview with G1S2)
T/R: Have you learned anything new from the lessons?
G1S2: I learned a new color brige that also called cream and…different colour in different people's eyes mean different feelings.
T/R: Beige.
G1S2: I learned some new words that's like e…, kindness, wisdom.
T/R: Envy?
G1S2: Yes.

The above interview extracts were intended to encourage students to express their thinking of the content, such as how the concepts of colours (e.g., black) and emotions (e.g., feeling black) were integrated with their daily lives (e.g., wearing black clothes), thereby providing student feedback to support their language use and conceptual understanding and gaining research insights. In a similar vein, as the students articulated their conceptual understanding in the lessons, the teacher-researcher was able to provide and embed explicit feedback such as linguistic suggestions in Learning Conversations with the students as naturally as in daily talks.

The positioning of Learning Conversations in this study aligns with the concept of mentoring learning developed by Tillema and his colleagues (2015). It focuses on personalised process of learning by taking into account individual learners' differences, which from the lens of Priniski et al.'s (2018) relevance continuum is to increase learners' personal relevance (e.g., personal objects, memories, interests, goals) with the content. This requires teachers to plan the Learning Conversations with the learners in ways that help them discover and explore meaningful connections and usefulness to the content, thereby motivating their engagement with the content as part of their identities (Figure 11).

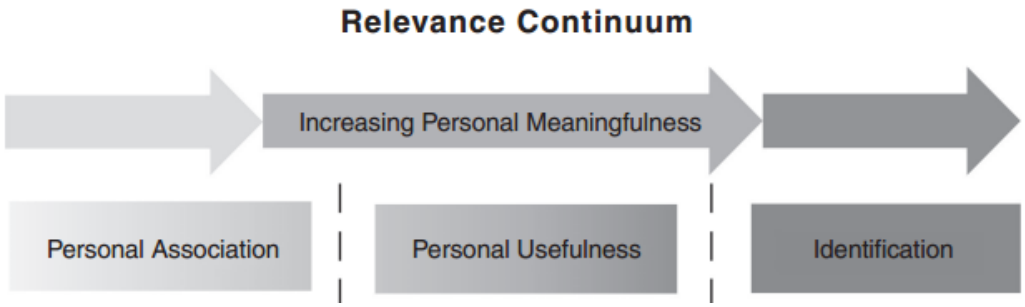


Figure 11. Relevance continuum (Priniski et al., 2018)

Learning Conversations scaffolded students' *visual languaging* and in return were triggered by visually facilitated languaging. This was evidenced as students used increasingly appropriate language forms to demonstrate and communicate their personal understanding of the content with visuals as a heuristic tool to support languaging. Based on the verbal data collected in the Pilot Study, students' languaging was encouraged by the teacher-researcher to maximise personal relevance with the content regarding colours, emotions, and their links to students' personal life. For example, G1S3 greeted the class in lesson two by describing his mood as *"I am doing black"* after the teacher-researcher asked him "how are you doing?", then the teacher-researcher hinted to him with proper expressions by rephrasing and responding: *"oh, you felt black, why did you feel so?"*, which encouraged him to explain as *"because today I wear the black clothes"*.

Theme 2:

4.3.2 Languaging with Visuals

4.3.2.1 Describing, Explaining, Evaluating Visuals

After reviewing the content of the first lesson, the next part of lesson two revolved around a visual task. That is at the end of lesson one, students were asked to introduce themselves with visuals that also depict how colours and emotions are linked to their lives and present their visuals in lesson two. Most students chose to take photos and were encouraged to articulate with their photos while being prompted with the teacher-researcher's questions in whole-class

Learning Conversations including 'what is in your photos?', 'why did you choose to take photos of such objects or things?', 'did anyone help you to complete this task?'.

Three students completed this task and sent their visuals to the teacher-researcher via DingTalk in different file formats (JPEG, PDF, PPT). They decided to use photos and online images to describe themselves and how colours relate to their lives. To be specific, they described the colours and objects in their photos as well as the process of doing the task with the support of their parents. For example, G1S3 saved the photos in a PPT file while G1S2 decided to make it into a PDF file with his parents' help, which to some extent practised their digital skills. The role of parental help was noted and will be discussed further in section 4.4.3.1. Students explained why they selected certain online images and took photos of artefacts including books and toys to represent their emotions, which revealed their preferences in playing, reading, and learning.

More importantly, it showed their conceptual understanding of colours and emotions as they were articulating how these two concepts were embedded in the photos of their favourite colours, books, and toys. This intentional action of employing external artefacts and investing them with meanings to guide their behaviours (e.g., photo-taking) to some extent resonates with Vygotsky's (1987) double stimulation mechanism. This mechanism consists of two stages of stimuli – the initial problem situation (e.g., the visual creation task) and the mediating conceptual tool (i.e., the artefacts chosen by the students for visual creation), which from Engeström's (2011) perspective can "enhance performance in learning, problem-solving and build novel concepts, agency and will" (p. 14).

Through such a visualising process, visuals as a heuristic tool seemed to trigger and support students' thinking and languaging during whole-class Learning Conversations. They managed to visualise and verbalise how the content – colours and emotions are interconnected in their everyday life. By integrating visuals with languaging, their conceptual and language understanding was enhanced as they practised using specific cognitive discourse functions. For instance, G1S3 described the photos of his favourite books in both light and dark colours on the book cover, which not only revealed his understanding of colours with emotions but also

encouraged G1S2 to join the Learning Conversation to further describe his knowledge of the book content he read.

(Lesson 2 whole-class Learning Conversation)
T/R: I've noticed you uploaded some pictures of different books, what kind of books are these?
G1S3: These are what I like to read adventure.
T/R: Which one do you like to read the most?
G1S3: I like to read blue colour.
T/R: There are two blue colours, which one, dark, light?
G1S3: The both.
G1S2: I read the two blue one, I think they are good they are some graphic novels, the light blue one tells us how to survive on the island and the blue one says what happens in the deep sea.

It was unexpected that both students read the same books and coincidentally collaborated in the process of describing the same object (i.e., G1S3's book with a light blue cover) although they took completely different photos (see Figures 7 and 8).

Figure 7. G1S3's favourite books

Figure 8. G1S2's favourite books

In addition, G1S2 selected some online images of games and his favourite colour in conjunction with photos taken by himself (Figures 9 and 10). He described in detail the steps of doing the task:

(G1S2's *visual languaging* in Lesson 2 whole-class Learning Conversation)
G1S2: First I put the stuff on that little sofa, then took the pictures of them, next I make it into a pdf and next I give it to you. Well, two of them is that I found on my iPad that first one is Plants vs Zombie and the second one is Minecraft cause I sure like those two games and then my favourite colour red and my favourite drink soda…And I like history, science stuff, and science fiction books. I like to explore the earth and the last picture you can see that, I like playing Lego.

Figure 9. G1S2's digital images

Figure 10. G1S2's photos

Then he explained by drawing the contrast between dark and light colours although he had limited linguistic capacities to express his thinking with appropriate language, which was scaffolded by the teacher-researcher in the following Learning Conversation.

> (Lesson 2 whole-class Learning Conversation)
> G1S2: I use this comfortable grey because you can see like when you taking pictures, it's all grey and like those the stuff I am taking picture with is something that have light colour like yellow, white, and those thing will make those stuff light coloured stuff more …, you can see them in very quick time, grey, dark colour, grey plus light color.
> T/R: You mean there is a contrast of colours, the grey colour can make other colours stand out more?
> G1S2: Yes.

By referring to G1S2's visuals and explanation, the teacher-researcher identified the photo (the one with a toy machine) he emphasised in the conversation and summarised his thinking by paraphrasing his utterances, which also made sense to the other students and triggered their evaluation of his visuals. As G1S3 succinctly evaluated: *"I think it's good because he tell us his*

hobby and he also like to read books". In return, G1S3's visual articulation also received G1S2's feedback as he evaluated: *"I think it's good, well because that when you see it, you really know he like reading adventure books and what are those, what adventure books",* which received an immediate response from G1S3: *"Any adventure books".*

Students' appropriate use of cognitive discourse functions (CDFs) mainly focused on describing, explaining, and evaluating their visuals for learning and communication in the class. They described how they planned and carried out the visuals, explained why they decided to take photos of certain colours or objects, and evaluated other peers' visuals from their perspectives with supportive reasoning. Student-led interactive languaging using these language functions brought together content, language, and literacy (Morton, 2020) in a dialogic way co-constructed by themselves and the teacher-researcher for conceptual knowledge building and demonstrating. Simply put, the teacher-learner conversations facilitated students' learning through their own visual and verbal representations of emotions and colours, from which CDFs were applied to practice their English language use (e.g., keywords). This also highlights the positioning of literacies in this study that involve using visual and digital tools for thematic English learning. For example, some students were able to use digital resources to convert digital file formats, and deliberately searched and selected online images for completing the visual task in the lessons.

4.3.2.2 Describing Learning with Visuals

As they were linguistically and cognitively supported through respectful and supportive Learning Conversations, some students became more confident and engaged to share their perspectives in the subsequent research activities. For example, during the interview, the students were responsive and creative when describing their previous learning experiences with visuals. For example, G1S1 described how he represented his thinking of solving mathematic questions with drawings. He responded mainly in Mandarin whilst G1S2 and G1S3 used English with a few Mandarin characters and phrases to explicitly elaborate on their thinking. All Mandarin utterances were translated into English as shown in Table 5 interview transcripts in Appendix I.

(Interview with G1S1)
T/R: How might visuals help you in the future to learn?

G1S1: 我会知道这些图片上面 (I can know what's in the visuals)…仔细去看它(by carefully looking at them), 搜索它上面我未知的知识(and researching the knowledge on the visuals that I don't know), 可能会在验证的同时知道更多的知识 (I may learn more whilst verifying the new knowledge).
T/R: 嗯 (Mm), 那你会不会在表达的时候，以后可能也会用一些图片的形式来表达呢 (Would you use visuals to express your thinking when you don't know how to put it into words in the future)?
G1S1: 会啊 (Yes), 很多时候都会 (often), 比如 (for example) today, I 学习一个三角形 (learned about) triangle, my father have a question, 我不知道给他怎么解答，然后我就会用图述的形式去给他解答，让他明白这个问题是怎么回事 (I didn't know how to verbally explain, so I used visuals to answer his question).

Two students sent their answers in English to a set of nine questionnaire questions (see Table 6 in Appendix I) to the teacher-researcher via DingTalk. Given their short and brief answers, the questionnaire appeared not as informative as the interview. Interviewing individual students through video calls appeared to actively engage them to share their opinions regarding the open-ended questions, which has implications for the Main Study to retain whilst rejecting the questionnaire method.

Theme 3:

4.3.3 Student Feedback

4.3.3.1 Feedback for Teaching with Visuals

Given the study also concerns how *visual languaging* impacts teaching and learner' mindset for learning, students' feedback regarding suggestions to the teacher-researcher and future learning plans using visuals were emphasised and collected from the interviews. They shared their perspectives on how teaching through visuals can be complemented by integrating with written (G1S1), verbal (G1S2), and digital resources (G1S3):

(Interview with G1S1)
T/R: What suggestions could you give me? 我最为一个老师, 你对老师有什么建议吗? (Do you have any suggestions for me as a teacher?)
G1S1: 我觉得不仅是图片，文字也非常…要写一些文字然后加强理解能力 (I think not just visuals, words are also very… should write some words to enhance understanding).
T/R: 文字和图片结合 (Combing words with visuals)?
G1S1: Yes, yes.

(Interview with G1S2)
T/R: What suggestions could you give me as a teacher using visuals to help you learn?

G1S2: My gestion is like that we have mouths to say and the… to think, so we can do saying, we can do writing, also write.

(Interview with G1S3)
T/R: Do you have any suggestions for me as a teacher to use visuals to help you learn?
G1S3: We can search pictures on internet.
T/R: You think teachers can give you some opportunities to search images on the internet?
G1S3: Yeah.

4.3.3.2 Feedback for Learning with Visuals

Regarding students' feedback on their own learning through visuals, some emphasised their interest in drawing for communication and learning (G1S1, G1S2) whilst G1S3 articulated his interest in learning science and technology with visuals.

(Interview with G1S1)
T/R: 这种情况有没有在语言学习当中遇到过 (Have you had such visualisation experience in language learning)?
G1S1: 会啊, 我会表达自己的意见 (Yes, I'll express my opinions).
T/R: How will you explain your opinion?
G1S1: I'll say 如果说不清楚的话 (if I can't say it clearly), I'll draw 画给他们看 (and show them), 让他们知道我自己的想法 (let them know my ideas). My father say 我表达能力不行 (I am not good at expressing myself), 我总是会用画图的形式 (I often use drawings instead), 因为我非常喜欢画画 (because I love drawing).

(Interview with G1S2)
T/R: How might visuals help you in future learning?
G1S2: I like to draw, and it may be help me to draw some pictures
T/R: How could drawing help with your learning?
G1S2: Well, I never give up my drawing, if my learning is not good, I cannot get much money, then I can draw pictures (to make a living).
T/R: How could drawing help with your
language learning?
G1S2: When sometimes I talking about my friends with some game pictures and some friends like my another English teacher in America, I'll show him my draw and we are talking about it and then we have upper English learn.

(Interview with G1S3)
T/R: How might visuals be used in the future to help you learn?
G1S3: I think I want to learn about science.
T/R: How could visuals help you to learn science in your opinion?
G1S3: Visuals can help us learn something like technology.

Individual-based interviews showed the potential for strengthening students' engagement and interest in using visuals for learning. As students were provided with such an emotionally safe

personalised space to communicate with the teacher-researcher as in daily conversations, they were relaxed to share their thinking on using visuals for learning in this case study as well as their past visual learning experience and provide feedback for teaching with visuals.

By reflecting on students' feedback, an understanding of how to enhance learning was developed. That is students need mentoring (through Learning Conversations) and accessible ways to express their thinking for communicating with others (through visualisations) especially when they lack the linguistic capacities to articulate in English. With these two supportive tools combined, students appeared more engaged to construct and demonstrate their understanding of the content and made suggestions for teaching with visuals, which accentuate the necessity to integrate the four dimensions of the PTDL model as addressed in chapter two. To reiterate, it concerns the affective factors of learners when supporting them in conceptualising and communicating knowledge for deeper learning, which in turn provides insights for mentoring learning and promotes learners' confidence, interest, or motivation to continuously direct and sustain their learning.

4.4 Pilot Study Implications for the Main Study

The Pilot Study combined Learning Conversations and *visual languaging* as scaffolds for students' online English language learning, which also offered implications for the Main Study including using L1 in visual-based English language classrooms, the importance of Learning Conversations or more specifically after-class Learning Conversations with individual students, and the specific form of learners' visualisation (i.e., drawing). These will now be elaborated on.

4.4.1 Concerns about Using L1

Though the main medium for learning is English, Mandarin was also used. The combination of students' L1, L2, visual and digital tools for learning resonate with the notion of translanguaging. As previously discussed in Chapter 2, translanguaging encompasses multilingual, multimodal, and multisensory resources for meaning and sense-making (Li, 2018). The translanguaging practices in the Pilot Study, therefore, include students using these resources to communicate in the lessons and interviews, especially at students' request or when the teacher-researcher sensed or

noticed a need for L1 for meaning-making and communication. By reviewing the video recordings, when students used Mandarin in the lessons, they had more control over their languaging when communicating with peers and the teacher-researcher. This also strengthened their engagement in different tasks, (i.e., identifying colours, emotions, and languaging with their visuals). Furthermore, their responses to the interview questions demonstrated the effectiveness of using Mandarin to express their thinking when they lacked the linguistic resources to do so in English. In a similar vein, as Dalton-Puffer and her colleagues (2021) found in their recent study of implementing CLIL in an Austrian technology secondary college, the combination of English and German enacted by all participating teachers and students can alleviate students' cognitive and linguistic difficulties, support respective content teaching and learning experience and increase students' confidence in using English for subject-specific purposes (Sandberg, 2019). This dual-language approach enabled clarifying complex concepts, which created more opportunities for learners to convey their perspectives.

Nonetheless, this study adds another lens of non-linguistic tools to complement students using English and Mandarin for learning in the online English classroom. As students made the selection and employment of languages, visual and digital tools (e.g., online images) in the lessons and interviews, the teacher-researcher was then able to scaffold their linguistic and conceptual understanding with more focus and precision during whole-class Learning Conversations. Moreover, students using both languages for communication in the interviews also provided rich data indicating the potential of visuals for learning. Therefore, Mandarin was judiciously used in the Main Study to facilitate understanding and communication.

Although using Mandarin facilitated understanding and classroom conversations, the extent of using it in the lessons may need to be carefully guided in order to leverage the learning of English as a second language (Yang et al., 2017). As an English teacher and learner, the teacher-researcher was concerned about students resorting to Mandarin whenever they encounter cognitively challenging tasks, which counteract the purpose of practising and developing their English language skills and knowledge. This raised the importance of strategic linguistic scaffolding for supporting students' articulation of self-created visuals in English, which can be in

various forms. For example, moving continuously between English and Mandarin to promote confidence and interaction, guiding the specific language use for different cognitive-related tasks. Such linguistic scaffolding also needs to take into account students' different kinds of language use in English, which can derive from their own school textbooks, the pre-designed teaching materials of this study, the internet, or the linguistic repertoire that they have already own including the language they invented. These language sources from the pluriliteracies lens of mentoring are inclusive and spontaneous that integrate multimodal resources to support learners in communicating and constructing English knowledge and language.

4.4.2 The Importance of Individual-based Learning Conversations

Languaging during whole-class Learning Conversations was intended to develop student conceptual knowledge with increasingly appropriate English linguistic forms. The purpose of the interviews was to gain a deeper understanding of students' knowledge construction and communication in English using visuals as a scaffold. Both were mediated by a conversational approach to learning and research. It was noted that students' emphasis in the lesson conversations was on learning whereas in interviews was on communication. In general, what students uttered for the purpose of communication is what they were thinking at that particular moment and much of that thinking or cognition was in advance of their English levels.

It is anticipated that the levels of learner conceptual understanding and appropriateness of English language use after taking the lessons may develop differently. Therefore, the development of their verbal languaging with visuals as a supplementary resource to convey meaning and understanding requires personalised scaffolding. That is the purpose of adopting after-class Learning Conversations with individual students in order to provide the kind of scaffolding that meets each student's learning needs. This was especially noted after reviewing the lesson video recordings, a couple of students were hesitant in speaking in English or became completely silent especially when other more linguistically capable students raised their hands to join the conversation. This raised a concern about the potential limit of conducting the study online as the teacher-researcher may not immediately notice every student's feelings and body language that indicate their learning needs and provide necessary support in time. It was

acknowledged that the online platform provided students with opportunities to develop their multiliteracies (e.g., search, select and share online sources for learning the content and making drawings) and afforded the convenience and efficiency of data collection during the pandemic. However, only holding the whole-class conversations online to some extent affected the opportunity for each student's speaking time to practice English and receive specific feedback and scaffolding fitting for personal learning needs, especially the 'shy' ones though such conversations showed signs of active engagement of most students.

Therefore, in order to better provide equal opportunities for all students to practice the target language and develop conceptual knowledge, personalised mentoring in a 'safe' environment (Fullan & Langworthy, 2014) that takes care of individual students' feelings and learning needs appeared essential. This environment was embodied as a 10 to 15 minutes conversation with each student in order to provide them time and opportunity for addressing their emerging learning questions or concerns and receive learning feedback or suggestions. It was then held after every two English lessons in the Main Study, therefore termed 'after-class Learning Conversations', which also complemented students' language use and content learning in whole-class Learning Conversations that triggered more peer conversations. Since this study explores individual learners' growth and progression by using *visual languaging,* Learning Conversations that occurred within the lessons with all students were emphasised and analysed on the moments when students were languaging with their visuals. The data collected from after-class Learning Conversations were more personal-driven and hence were fully transcribed and coded in addition to interviews and students' drawings.

4.4.3 Learners' Visual Output

4.4.3.1 Learners' Ownership

The potential of students' created visuals for scaffolding languaging and triggering Learning Conversations was noted and discussed, however, the ownership of visuals was overlooked which may influence the extent of visuals supporting students' learning. This concern was raised after reviewing the recordings when students were languaging during the lessons and communicating in the interviews as shown in the following excerpts. G1S2 completed the visual

task independently with his father's mobile phone whilst the other two students disclosed during the interviews that some of their photos were taken by their parents.

(Lesson 2 whole-class Learning Conversation)
G1S2: I got help that borrow iPhone from somebody.
T/R: From whom?
G1S2: My dad.

T/R: Anyone helped you?
G1S1: My mom.
T/R: Where did you take these pictures?
G1S1: My home. I find my home…toy, my toy is black and my book is black…the book talking about sky and talking about the sun, the earth, the moon, and ahh UFO.
(Interview with G1S1)
T/R: 我记得上堂课你有给老师看的的照片 (I remember last class you showed me your photos) photos, your mother helped you take them?
G1S1: Yes, my mother help me.

G1S3: First, I plan some picture, then I…we make a plan and like the first page will have two picture and the second page will have one picture. We put the pictures into the ppt and finally we write the heading.
T/R: You talked about we, did someone help you to do the homework?
G1S3: My mom help me.
T/R: She helped to take pictures of you?
G1S3: And helps to make the ppt and I'll put the pictures in the ppt.
(Interview with G1S3)
G1S3: Some pictures like my book and when I read is my mom take for me, and others is I take it in our... in my mom's phone.

Though parental support, for example, providing digital tools (e.g., iPhone) was helpful, it is necessary to ensure the visuals were intrinsically created by students themselves in order to reflect their genuine thinking processes instead of their parents as learners are the target sample for analysis. Simply put, learners' ownership of visuals especially regarding their decision-making on the content of their visuals is key to revealing their genuine extent of conceptual and language understanding.

Only by confirming this ownership can visuals act as authentic visible evidence of learners' thinking processes for reflecting on learning and adapting teaching. In other words, learners themselves can use their visuals to retrospectively review and reflect on their learning and the teacher-researcher can adapt teaching for more appropriate scaffolding. Given such potential

importance, designing visual tasks that explicitly require learners' ownership in visualisation was applied in the Main Study data collection. To be specific, creating visuals by learners themselves was reiterated and agreed upon at the commerce of the Main Study to ensure both groups two and three participants owned the process of visual creation for knowledge construction.

4.4.3.2 Drawing

An accessible unified form of visuals emerged from the interview data as all three students emphasised their interest in drawing for communication and learning. As G1S1 mentioned he often uses drawing to express himself – *"My father say 我表达能力不行 (I am not good at expressing myself), 我总是会用画图的形式(I often use drawings instead), 因为我非常喜欢画画 (because I love drawing)".* Similarly, G1S2 elaborated how he adopts drawing to communicate with others for English learning – *"I like to draw and… when sometimes I talking about my friends with some game pictures and some friends like my another English teacher in America, I'll show him my draw and we are talking about it and then we have upper English learn".* In addition, G1S3 linked the class topic colours with his hobby of drawing:

(Interview with G1S3)
G1S3: I know colours, we can use colours to draw pictures.
T/R: Do you like drawing?
G1S3: Yes.
T/R: What do you usually draw?
G1S3: I draw anythings.

Taking into account students' elaborations of their interest in drawing for learning, the importance of using drawing as a form of visual creation for the Main Study was also raised by reviewing relevant works of literature. According to Silver (2001) and Cicalò (2020), integrating drawing with cognition enables children to have the ability to use drawing as an alternative way to activate their thinking and seeing by creating inner images onto an external surface even before they can write and communicate with language. In a similar vein, Van Sommers (1984) maintains their position and further remarks that visualising thinking through drawings can clarify and evoke specific memory, which as Glaser (2008) indicates, can record and represent visually recorded perception. Derived from their perspectives, most children can draw to an extent that communicates their thoughts and ideas even though their drawings may be less recognisable.

Moreover, drawing implies the control of gestures and movement of hands or body that can affect and stimulate kinaesthetic intelligence (Wammes et al., 2016).

Based on their rendition of the potential of drawings especially the accessible nature of drawings for young learners to create and make meaning inspired the teacher-researcher to choose this visual form for the Main Study. As the Main Study proceeded with students making drawings, it appeared that this visual form to some extent allowed students to create with ease and encouraged them to own that process of creation for learning and communication. Reciprocally, drawing offered the teacher-researcher visible evidence to access and scaffold the students' thinking and learning in the online classroom. Considering the possibility that some students may be less competent or confident in artmaking, therefore, the aesthetic skills or quality of creating drawings were not considered for analysis.

4.5 Chapter Summary

To succinctly reiterate, three major changes to the research design of the Main Study were made in light of the Pilot Study.

- Conducting Learning Conversations with individual students after the lessons emerged as an important scaffold for addressing each student's learning needs (e.g., clarifying some complex concepts or linguistic forms) and constructing personal emotionally 'safe' spaces, especially for shy students.
- The Pilot Study participants showed a lack of interest in the questionnaire which resulted in less data compared to dialogue in the interviews.
- Drawings appear to have the potential to gain students' interest and offer them easy access to independently creating visuals compared to photos.

Therefore, the Main Study employed after-class Learning Conversations with individual students for personalised scaffolding and drawings as the visual form for learners to create and use for languaging and learning whilst the questionnaire was not considered. The next chapter will detail more on the Main Study design in terms of data collection tools, lesson plans, and research findings.

Chapter 5 The Main Study

PART 1. Introduction to the Main study

5.1 Chapter Introduction

This chapter consists of five parts. The first part transfers the implications of the Pilot Study to the Main Study by outlining the revised thinking of methods, data sets, their links with the research questions, and the lesson plans for data collection and analysis. The second to fourth parts present how themes and categories that emerged from the Main Study data using content analysis can address the potential of *visual languaging* in supporting students' conceptual and language understanding, language use with cognitive discourse functions (CDFs), and implications for mentoring and learner agency. The fifth part succinctly summarises the findings of the Main Study.

5.2 The Main Study Design

5.2.1 The Main Study Methods

As enlightened by the Pilot Study, the following table depicts the methods and data sets for addressing each research question, which was updated after analysing and discussing the Main Study data. The methods chosen for the Main Study are similar to the Pilot Study, however, the questionnaire tool was not employed as justified in the last chapter. The Main Study data collection tools are Learning Conversations, interviews, the visual participatory method (drawings), and the researcher's reflective notes. The following table illustrates the explicit link between the research questions, the Main Study methods, and the data sets, which will be more developed and refined with the discussion of the findings as shown in Part 5 Table 20.

The Main Study		
Research questions	Methods	Data sets
RQ1: In what ways might visualisation serve as an intermediary learning tool (visual languaging) that bridges conceptual knowledge construction and language learning in English language classrooms?	Learning Conversations	Learning Conversation Transcripts
	The researcher's reflective notes	English lessons
	Interviews	Interview transcripts

RQ2: How can students develop their appropriate use of specific cognitive discourse functions through visually scaffolded languaging?	Learning Conversations	Learning Conversation Transcripts
	The researcher's reflective notes	English lessons
	Visual participatory method	Visual artefacts (drawings)
	Interviews	Interview transcripts
RQ3: What are the necessary conditions for online learning experiences which encourage the interactive application of visual languaging for pluriliteracies development in a digital learning space?	Interviews	Interview transcripts

Table 8. Adaptation of Pilot Study to the Main study

5.2.2 The Main Study Data Collection Plan

Through the same platform as the Pilot Study, the Main Study recruited 11 student volunteers who were divided into the second group (five students) and the third group (six students). The students participated in five lessons on the topic of habitats and ecosystems, followed by two follow-up Learning Conversations that occurred after every two lessons. Subsequently, the individual semi-structured interviews were conducted after the fifth lesson. The after-class Learning Conversations acted as a locus for exchanging summative feedback between the participants and the researcher. The lessons lasted one hour, and the after-class Learning Conversations and interviews lasted around 15 minutes, respectively. The implications of after-class interaction with students will be subsequently discussed.

Data collection for the Main Study took place over two months with one lesson each Sunday, two biweekly Learning Conversations, and an interview. The following grid outlines the number of participants, research activities, duration, and platform planned for the Main Study.

The Main Study			
Participants	Research activities	Duration	Platform
The second group: five students;	Five Lessons (1 hour each):	Two months (One lesson each Sunday, two biweekly after-class Learning	DingTalk
	Two after-class Learning Conversations (15min each)		

The third group: six students	Interviews (15min)	Conversations, and an interview)	

Table 9. Specifics of the Main Study plan

Having presented the new set of methods and data collection plan, the Main Study lessons design will now be described in detail.

5.2.3 The Main Study Lesson Plans

By considering students' learning needs and interests reflected in the Pilot Study, attention to adopting a different topic for the Main Study focused on the content interests that motivate students. The aim was to start with content that students may have a basic understanding of but not yet fully mastered in terms of deeper conceptual understanding or linguistic skills to communicate with proficiency and appropriacy in order to generate richer data. Therefore, in developing learning episodes that not only consider students' learning needs and interests but also facilitate setting mutually agreed challenging goals that are understood and accessible, the teacher-researcher decided to discuss the topic and relevant tasks with the headteacher. She was more familiar with each student's current learning levels, teaching agenda, and progress in the school. There were greater opportunities to negotiate with the students about their expectations for participating in this project. It was anticipated that as the project was initiated, the communication between the teacher-researcher and the students would become more intensified.

Therefore, the Main Study adopts a developmental continuum building on the Pilot Study. That is gradually shifting from easy tasks (e.g., self-introduction, naming colours, and emotions) to cognitively demanding ones (e.g., linking colours and emotions in their daily lives). Such understanding of designing learning tasks was applied during the selection of the overarching topic (i.e., habitats and ecosystems) in the Main Study. This topic was chosen as the student's English teacher in the sample school has not taught both concepts as well as their interrelation or differences. Though some students had met the spelling and the Mandarin translation of the English word (e.g., habitat), they were not quite confident in describing its concept fully in English with appropriate language use. Also, the teacher-researcher informally communicated with the

participants before conducting the Main Study on DingTalk. Most students showed interest in this as a topic for English lessons. Therefore, after confirming the topic, each lesson's content was designed as follows with consideration of content and language development and the ethos of cultivating global citizens from the pluriliteracies lens.

5 Lessons learning objectives and tasks	Pluriliteracies development	
Lesson 1 – Nature of habitats T/R input to facilitate student talk about habitats and ecosystems drawing on prior knowledge *Visual languaging* (students draw habitats and articulate their drawings)	Students construct conceptual knowledge by visualising and communicating their understanding of habitats with T/R and peers in lesson 1 Learning Conversations (whole class conversations).	**Both content and language development through *visual languaging* habitats mediated through Learning Conversations. Using prior knowledge in new ways.**
Lesson 2 – Nature of ecosystems T/R input focusing on language needed for academically constructing the meaning of habitats and ecosystems. *Visual languaging* (students draw ecosystems and articulate their drawings)	T/R guides students to reconstruct and use language (meaning making) for describing and explaining habitats and ecosystems and to enhance their understanding by drawing and verbal languaging.	**Scaffolding students' language use of CDFs complemented by *visual languaging*. Encourage student spontaneity to actively engage in making their own meaning.**
Lesson 3 – Relationship between habitats and ecosystems T/R guides students to notice the differences and similarities between ecosystems and habitats through visual and verbal prompts in the lesson *Visual languaging* (students draw an ecosystem with multiple habitats and articulate their drawings)	Students use more nuanced descriptions/explanations of habitats and ecosystems using images on the lesson slides and verbal scaffolding through Learning Conversations. Through drawing/articulating their visuals scaffolded (T/R and peers) towards deeper understanding	**Peer and T/R scaffolding for meaning making (differentiating habitats and ecosystems) through *visual languaging* and Learning Conversations.**
Lessons 4 & 5 – Protecting habitats and ecosystems T/R reminds students of challenges to habitats through images on the slides; encourages students to brainstorm ways to protect the environment *Visual languaging* (students explore habitat challenges/problems they noticed in life and make suggestions, then articulate their drawings)	T/R encourages students to notice dangers to habitats and discuss the origins of problems, then share their opinions on how to mitigate such problems and protect the environment. Student reflection/analysis of their drawings focusing on dangers and possible solutions.	**Fostering learner agentic roles in reflecting, thinking and implementing ways to protect habitat and ecosystems. Encourage students to use prior knowledge and find new knowledge from own research inside/outside the classroom.**
After-class Learning Conversations T/R encourages individual student analysis of their learning, after lesson 2 and after lesson 4.	T/R review of thematic content and language use with individual students. Each student encouraged to elaborate more on their drawings and ask relevant conceptual or linguistic questions to facilitate their understanding.	**Teacher-learner co-constructing learning by offering more opportunities for individual learners to express their thinking and providing personalised scaffolding.**

Student/teacher interviews (After lesson 5)	T/R interviews individual students to collect their feedback for teaching online with visuals. Encourage students to reflect on their learning to trigger students' own future learning plans.	Use learner feedback to guide T/R mentoring learning. Learners spontaneously setting learning goals can facilitate their agency in learning.

Table 10. Lesson tasks for pluriliteracies development

- Lesson one focused on defining concepts of habitats and classifying different types of habitats, followed by a guided visual task to iterate these concepts.
- Lesson two started with student articulation of their visuals created in lesson one including describing their compositional processes and explaining the conceptual underpinnings. Then the lesson proceeded to the introduction of the concept of an ecosystem.
- Lesson three aimed to explore the relationships between habitats and ecosystems followed by students visualising their understanding of such content of their visuals at the end of the class.
- Lessons four and five combined the concepts introduced in the former three lessons and encouraged students to evaluate and explore feasible, effective ways to protect animal habitats in their daily lives, thereby raising their sense of responsibility in protecting the environment as global citizens.

Each lesson had at least one drawing task to facilitate student languaging of abstract concepts with specific language functions, which integrates the content with the target language. This process was supported by the teacher-researcher through Learning Conversations for student knowledge enhancement. Their evolving conceptual understanding was guided by learning tasks to encourage them to describe habitats, ecosystems and their interrelationship and protection corresponding to the pluriliteracies model for deeper learning (Table 10). The explicit design of the lesson tasks was annotated in the researcher's notes and represented as PowerPoint presentations available for scrutiny in Appendix II.

Although the two groups of students in the Main Study shared the same lesson content, their personal lived-through experiences and learning outcomes were different which were revealed

in the way they handled the drawing tasks. These differences will be discussed in Parts 2 to 4 which correspond to the pluriliteracies dynamic learning ecologies that value individual learners' differences. Moreover, the dynamic nature of this case study was also revealed by the adaptive methods and data sets implicated in the developments accrued during the Pilot Study. The following section will concisely outline the themes and categories that emerged from the Main Study data analysis for answering the research questions respectively.

5.3 The Main Study Data - Themes and Categories

Regarding research question one, three overarching themes were elicited from both participants' drawings, the researcher's transcriptions of interviews, and after-class Learning Conversations through interpreting video recordings. To be specific, these three themes are concept construction, concept enhancement, language learning derived from the drawings photographed and sent via DingTalk by the students themselves.

Though the intricate integration of conceptual and language learning is well documented (Lantolf, et al., 2018; Dalton-Puffer, 2016; Mohan, 2014), in this study, in order to scrutinise the nuanced potential of *visual languaging* in bridging both content and language development, these two elements were analysed with separate data themes for addressing research question one (see part 1 in chapter 5). This was also essential for understanding how their integration brought together by *visual languaging* can inform the second and third research questions.

Based on the same data resources, another set of two themes was generated around research question two, namely, visualisation and students' feedback on tasks. Subsequently, the themes – students' course evaluation, their future learning plans, and visual narrative with creativity apply to research question three from the learners' perspectives for learning with visuals.

Each theme and its corresponding categories are extracted from the researcher's interpretation of the verbal, visual, and written data aiming to explicitly answer the research questions. This is summarised and illustrated into three diagrams (7, 8, 9) to navigate the subsequent sections of presenting and discussing the research results in accordance with each research question. The intricacy of themes and categories with research questions will be critically discussed by interweaving data excerpts and relevant literature resources from section 5.4 onwards.

PART 2. Research Question 1

This part focuses on the themes and categories for addressing the first research question as shown in Diagram 7 as follows.

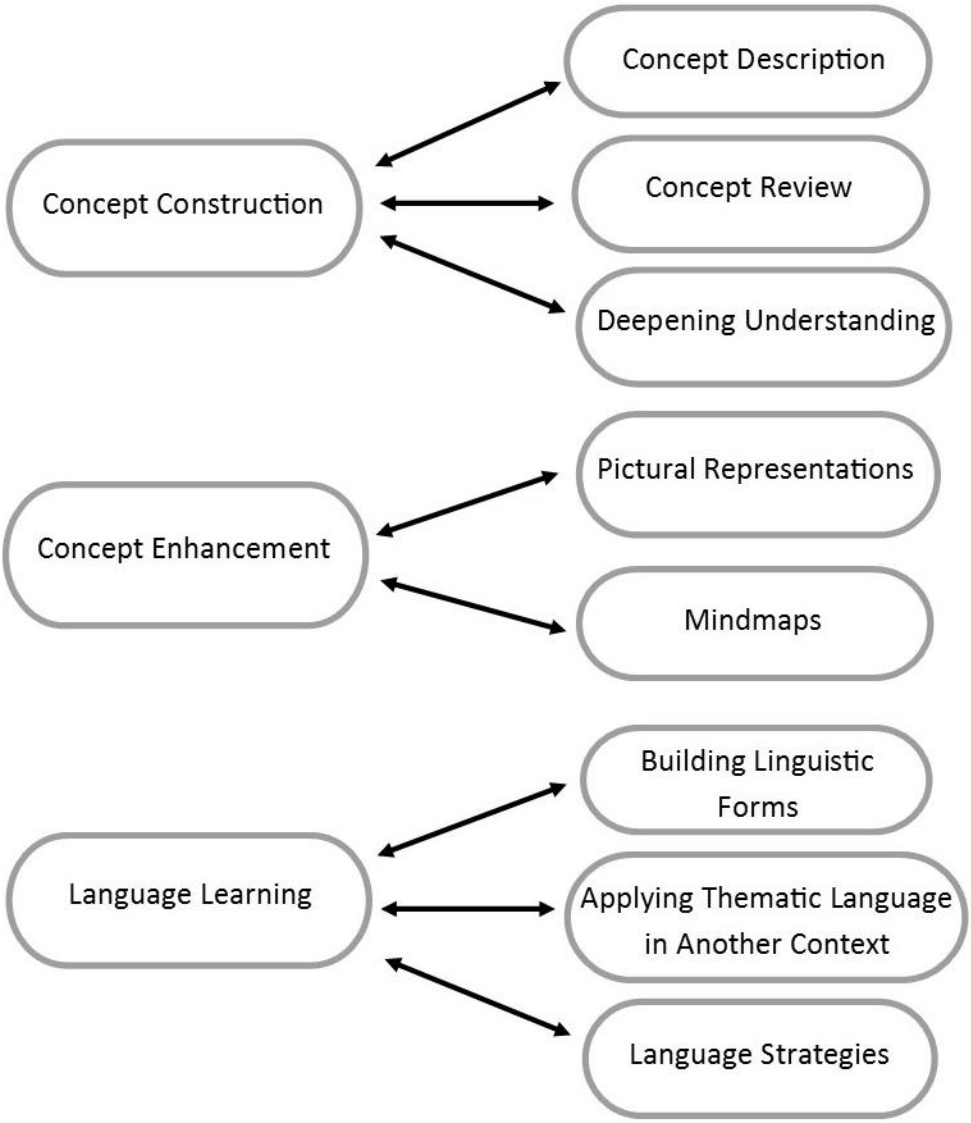


Diagram 7. RQ1 themes and categories

5.4 Concept Construction

This theme encompasses categories of concept description, concept review, and deepening understanding, which will be discussed with supporting data respectively.

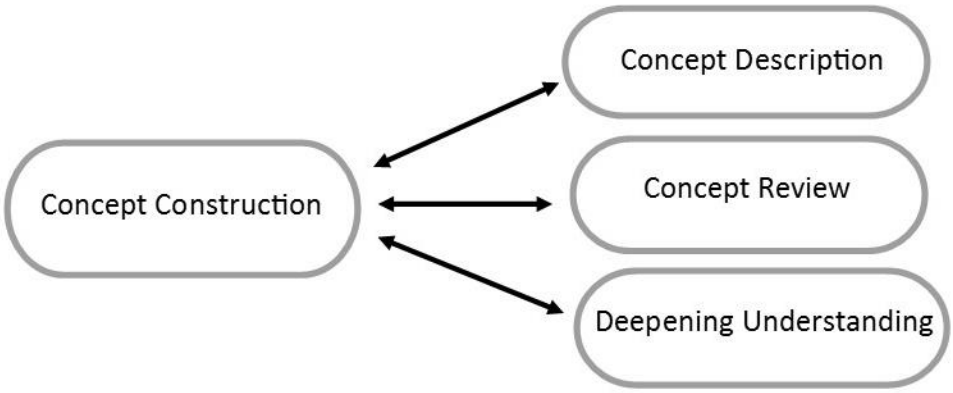


Diagram 7_1. RQ1 theme 1

5.4.1 Concept Description

This theme emerged from student interviews and Learning Conversations, especially when responding to the teacher-researcher's concept-checking questions – *'what have you learned from all the lessons and what can you remember after every pair of lessons?'*. Such questions were intended to elicit student reflections on their own learning as guided by Hattie and Timperley's (2007) feedback model. It concerns learner feedback by retrospectively asking themselves – *'how am I going?'.* The following extract demonstrated how three students described their conceptual understanding of habitats and ecosystems with dialogic guidance.

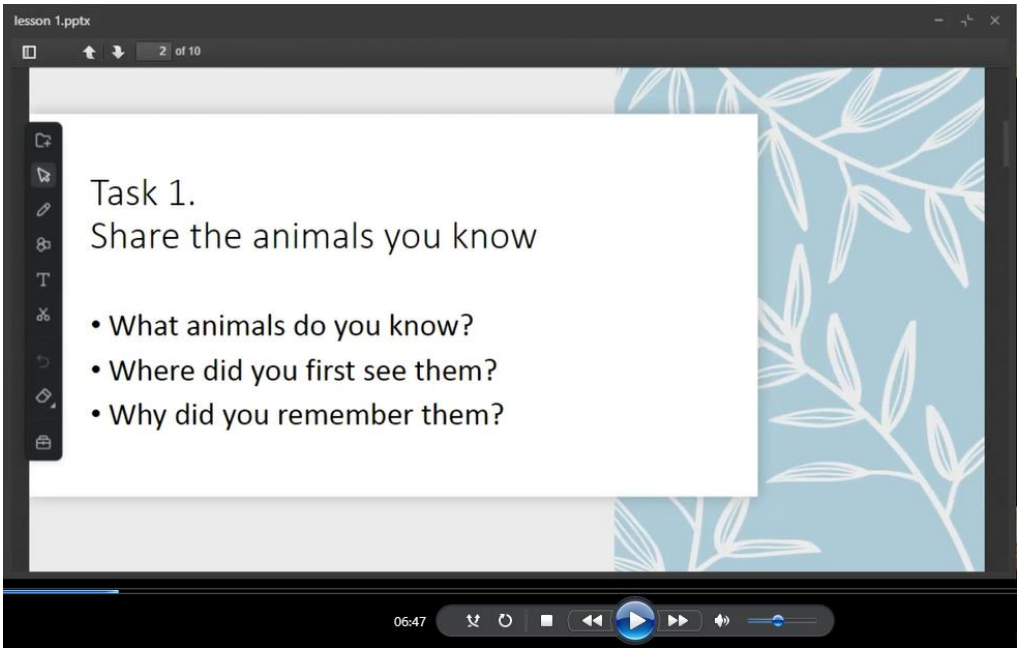
(Interview with G2S1)
T/R: How was your day?
G2S1: Today I am fine.
T/R: What did you do? Did you just come back from school?
G2S1: No, today I came back from school, and do my homework and ride my bicycle.
T/R: Okay, so you did some exercise. We are just going to have a short interview, just ask you a few questions, you can either answer in English or Chinese, both are alright.
G2S1: Ok.
T/R: So, my first question is what have you learned or remembered from all the lessons?
G2S1: G1S1: Mm, I remembered what is habitat, what is ecosystem. Habitat are are are the animal are the places that animal live. And ecosystem is some of the habitat and they have some have some have many habitat.

(Interview with G3S6)
T/R: What have you learned from our lessons?
G3S6: I think from the last lesson I learned about protect animals, and from the second class, I learned about 生态链 (ecological chain).

T/R: Ecosystem, food chain?
G3S6: Yes.

(After lesson 2 Learning Conversation with G2S5)
T/R: How about the lessons, do you have questions?
G3S5: Oh, oh, oh, I think I I I don't have any question.
T/R: Okay, then I have some questions for you, could you please tell me what are habitats and ecosystems?
G3S5: Uh, habitats is the place animal live.
T/R: And ecosystems?
G3S5: I forget it. I try to think. I think ecosystem is a place that have more habitats.
T/R: Yeah, and ecosystems would have diverse, many kinds of species.
G3S5: Oh.

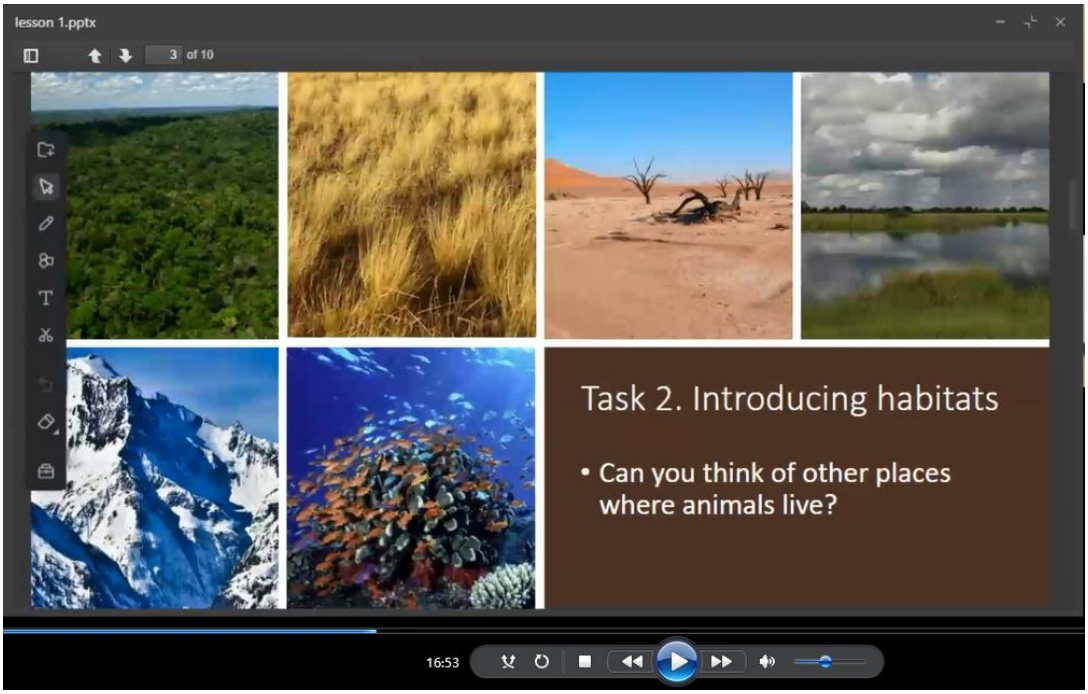
Student descriptions of the content are used to relay the facts or main points of their process of understanding or learning the concepts, which were constructed in the lessons with specific learning tasks. For example, lesson one task 1 led to the thematic topic of habitats by asking students about animals they knew and places they inhabit, which was mediated in the whole class Learning Conversation. The following tables demonstrate how students moved toward pluriliteracies development corresponding to table 10 in section 5.2.3 using selected lesson tasks with extracts of Learning Conversations and interviews further analysed with commentaries.



Lesson 1 slide – task 1

Lesson 1 whole class Learning Conversation	Commentary
T/R: Could you please tell us what animals you know? G2S5: I always can see some bugs and I can see them maybe in the gardens and maybe in the grassland. T/R: Why did you remember them? G2S5: Because they are small, they can fly or move very quick. T/R: Ah, so that drew your attention. And G2S1, you raised up your hand? G2S1: Yea. I see owls and a blue bird in the zoo, maybe the blue bird we can see on the tree. T/R: Why did you remember them? G2S1: Because I remember in S2 there is a article that is about owl and blue bird. T/R: So, it's from your class book? G2S1: It's in … (name of the school).	*Thematic language used by students:* *Bugs, gardens, grassland, owls, a blue bird, zoo, tree.* *G2S5, G2S1 provided simple description of habitats (location) of animals they already knew and explained why.*

Table 11. Lesson 1 Task 1 Learning Conversation extract



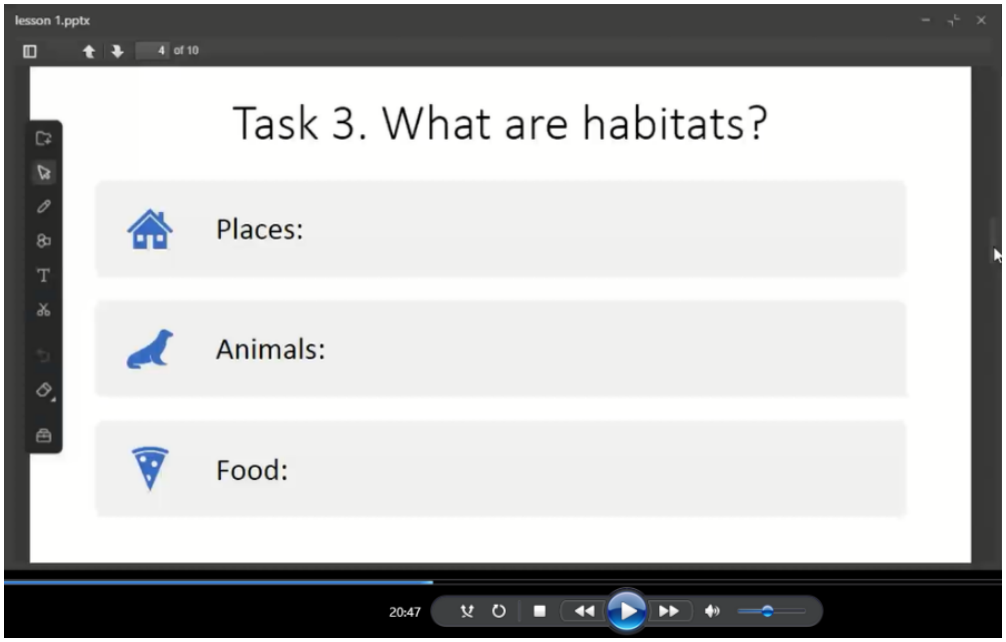
Lesson 1 slide – task 2

Lesson 1 whole class Learning Conversation	Commentary

T/R: Can you think of some place that your favourite animals live? G2S1: My favourite animal peacock lives in…I think it's live in fo forest. T/R: Ok, forest, so what are those places in the picture? G2S1: I think it's swamp. T/R: Which one is swamp? G2S1: The second. T/R: The one with a lot of grass? G2S1: Maybe it's grassland. T/R: So, which one is swamp? G2S1: The fourth. T/R: What about the first one? G2S1: The first one maybe is forest. T/R: You said your favourite animal peacock lives in forests? G2S1: Yes.	*T/R scaffolded G2S1 by enabling her to notice and talk about images of different habitats in task 2.* *Thematic language used by students:* *Peacock, forest, swamp, grassland, penguin, Arctic, jungle, dessert, mountain, ocean.*
T/R: Ok, and G2S5 I saw you raised up your hand? Would you like to talk about the animals you like? G2S5: Penguin live, the penguins live in the Arctics. T/R: Arctic…I saw you wrote something (on the DingTalk chat window). You said jungle, grassland, dessert, swamp, mountain, ocean. Thank you.	*Peer scaffolding encouraged G2S5 to use the chat function of the platform to write other habitats in English to complement what were not fully covered by G2S1.*

Table 12. Lesson 1 Task 2 Learning Conversation extract

This conversation revolved around different habitats by encouraging students to talk about places where their favourite animals live, thereby expanding to other habitats and engaging them to think about the concept of habitats as hinted on the following teaching slide.



Lesson 1 slide - task 3

Lesson 1 whole class Learning Conversation	Commentary
T/R: You all talked about some animals you like and where they live and this is what we can call a habitat, such as the place, we talked about jungle, forest, ocean, grassland, different places, and you also talked about different animals like penguins, dolphins, tigers, peacocks. Now can any of you tell me what a habitat is?	*T/R indirectly reviewed the discussion about students' favourite animals, different habitats to enable definitions of habitats including food in task 3.*
G2S1: I think habitat is the place that different kind of animals live. Like tiger in forest because it can hide and hunt other animals for food. G2S5: I think maybe like grassland, lions live in the grassland because there have food maybe cows or sheeps that lived here can provide food and cows and sheeps lived there because the grassland can provide(them) food.	*Examples of students' language use to describe and explain:* *I think…is…+ definition* *Because…+ reason* *Tiger, hide, hunt, grassland, lions, cows, sheep* *G2S1, G2S5 described habitats, explained why animals live in certain habitats.*
T/R: Sheep. Based on what you described and explained, a habitat is where animals live and find food to survive.	*T/R modelled a synthesis of students' definitions to confirm appropriate conceptual, language understanding.*

Table 13. Lesson 1 Task 3 Learning Conversation extract

This conversation guided students to consider key elements of a habitat, which triggered their thinking of constructing and expanding the meaning in their own words.

The data demonstrate how a deeper understanding of the content was triggered through tasks that gradually engaged students to talk more about habitats using their prior knowledge. For example, encouraging students to talk about what animals they know, where they live (Task 1), their favourite animals, and different places of habitats (Task 2) to draw students' attention and engagement in class conversation about the topic. As they developed descriptions of the content in their own language with language tools provided by the teacher-researcher (Task 3), the drawing task took place to further enhance their understanding as a way of output. This will be further addressed in section 5.5.

5.4.2 Concept Review

Students were also offered opportunities to have individual Learning Conversations with the teacher-researcher after lesson 2 and lesson 4 to express their thinking freely, receive personalised scaffolding, and reflect on their thematic English language learning in this case study.

After-class Learning Conversation with G2S1	Commentary
T/R: Can you tell me what you have learned from these two classes? G2S1: I learned from these two classes is what is habitat and what is e… T/R: E… G2S1: E…eco, um, ecosystems. T/R: Yes, ecosystems, anymore? Anything else you have learned? G2S1: I know ecosystems are the places that have deverse habitats. T/R: Diverse, diverse. G2S1: Diverse. T/R: Mm.	*T/R directly scaffolded G2S1 language form - pronunciation of 'diverse'.*
G2S1: And, and habitat is a a place that full of animal and plant species. T/R: Ecosystems 和 (and) habitats 的关系不仅是刚才说到的 (relations are not limited to what you just described that) ecosystems have diverse habitats, ecosystem 还有更多的 (also have) more animals and plants 因为它包含了各种不同类型的 (because it encompasses many different kinds of) habitats, 我们整体回答的时候就 (We can holistically describe it in this way), ecosystems are the places that have diverse habitats and more animals and plants 或者是(or) and more species than habitats. G2S1: Oh, okay.	*T/R directly explained the conceptual nuances of habitats & ecosystems and demonstrated how to construct the language of describing concepts.*

Table 14. Individual-based Learning Conversation with G2S1

Learning Conversations with individual students clarifies their conceptual understanding and scaffold their appropriate language use. Meanwhile, students were also encouraged to ask conceptual or linguistic questions relevant to the lessons. Some students who did not feel they had adequate cognitive or linguistic means to describe the concept thoroughly took the initiative to direct the conversation toward their personal emerging *learning concerns.* For example, G2S4 raised questions about new words (e.g., species) and concepts (e.g., ecosystems). She used some Mandarin to explicitly express herself and received the teacher-researcher's feedback. Similarly,

G3S2 demonstrated uncertainty in concepts as she elaborated on her understanding of habitats and ecosystems.

(After lesson 2 Learning Conversation with G2S4)
G2S4: What is speechit?
T/R: What is species 物种是任何 (species are any kinds of) animals and plants.
G2S4: 什么是生态系统? 用英语怎么解释 (What is ecosystem? How to define it in English?)
T/R: Ok, an ecosystem is a place with different habitats and has diverse organisms 或者是(or) diverse species.

(After lesson 2 Learning Conversation with G3S2)
G3S2: I am still don't know what is habitat and what is ecosystem. I think habitat is a little place and it live one kind of animals, and ecosystems is one place and have many kinds of animals.
T/R: Ok, for example, habitat let's see a tree is a habitat for squirrels, also for birds, maybe also for some plants like mushrooms, so a habitat is not just a place with one kind of animal, it's a place where specific animals live, versus an ecosystem has multiple habitats, so it will have diverse animals living there.
G2S2: Ok, I think like worm or some bug, bird will eat them, so what are they doing when they on life?
T/R: What do you mean?
G2S2: I mean what do they do some good things about humans?
T/R: Maybe worms can feed the birds and worms can help loose the earth.
G2S2: Okay, so they are not all bad.
T/R: No, they are not all bad, like earthworm, some people would put earthworm in their field to make the soil loose for growing plants.
G2S2: Ok.

Based on their purposeful questioning during the Learning Conversations, the teacher-researcher was able to provide content and language scaffolding to meet individual learning needs. In this sense, Learning Conversations can act as a locus for formative feedback where the teacher-researcher promptly supported the students with personalised guidance as the interactive conversations proceeded. This potential link between Learning Conversations and formative feedback theoretically resonates with the positions of Black and Wiliam (2009) and Shute (2008) as reviewed in section 2.3.1 of Chapter 2. They advocate scaffolding learners with specific support through a spoken form that provides teachers with evidence for explicit formative feedback.

Similar to Learning Conversations, semi-structured interviews also focused on checking students' conceptual and language development by asking them to review the content whilst scaffolding them to reinforce their learning. For example, G2S1 constructed an increasingly deeper understanding of the concepts during the whole class Learning Conversation as discussed in

section 5.4.1. During supplementary the after-class Learning Conversation and interview, she was provided with more explicit explanations about the relationship between different habitats and ecosystems and ways to protect them alongside opportunities to reuse and practice English used in the lessons.

Interview with G2S1	Commentary
T/R: Can you talk about the relationships between habitats and ecosystems or their differences? G2S1: Um, habitats is a small place that animal can live, but ecosystem is a place, it's a big place that so many animals can live, like birds, it is an ecosystem.	*T/R prompted G2S1 to review and describe the relationships between habitats and ecosystems.*
T/R: Anything else you have learned? G2S1: And I learned…six habitats in our earth, there are grassland, uh, glacier, ar, umm, I think it's seven, grassland, glacier, Arctic, forest, swamp, and umm and ocean, and this is umm...	*G2S1 recalled different habitats by using* *I learned…there are…with keywords - diverse, species, habitats, ecosystems, grassland, glacier, Arctic, forest, swamp, ocean.*
T/R: Yea, there is the Arctic, there's the Antarctic. Antarctic means the south pole continent, and Arctic means the north pole continent. G2S1: Oh, ok…I learned how to protect the ecosystem and what is the eco-friendly transportation.	*T/R directly explained the conceptual nuances of the Arctic & Antarctic.*

Table 15. Interview extracts with G2S1

Interviews were conducted in a supportive dialogic way to provide opportunities for both the teacher-researcher and students to summatively review, reflect, and evaluate holistically the learning and teaching process with visuals. Moreover, interviews were used to collect student feedback on their learning experiences including suggestions for online teaching and learning with visuals. This offered insights into the potential of *visual languaging* for mentoring and learners' agentic roles for learning. This will be detailed in Part 4.

5.4.3 Deepening Understanding

Student conceptual- and linguistic-oriented questions as presented in the above Learning Conversation and interview extracts were not only supported by the teacher-researcher but were also triggered by their intrinsic learning interests and curiosity about the topic. This stimulated

them to raise other questions emerging from the topic to support a deeper understanding of the content from different angles. For example, G2S3 questioned the average length of animals' lives.

(After lesson 4 Learning Conversation with G2S3)
G2S3: 动物的平均寿命是多少啊? (What is the average lifespan of animals?)
T/R: 动物的评价寿命, 这要看动物, 各种不同的动物, 它的寿命都不一样, 比如说蚊子, 它可能一季就死了, one summer, 像猫或者狗, 它可能会活到十几年 (It depends on the animals. For example, most mosquitos usually die after a summer, like cats and dogs can live more than 10 years).

Students were also triggered to think and discuss the content to deepen their conceptual understanding, such as how to protect the environment in after-class Learning Conversations.

(After lesson 4 Learning Conversation with G3S2)
T/R: What are some types of garbage or trash we discussed today?
G3S2: Oil and some plastic, and some air, maybe?
T/R: Air is not a type of pf trash.
G3S2: Oh, oh, yes trash and maybe some glass and some so many metal, uh, yes, maybe.
T/R: Maybe paper?
G3S2: Oh, yes, paper, and some also we like stone, oh, no, no, no, no, no. Maybe we eat something that we eat, like fish boon.
T/R: Fish bone, fish bone.
G3S2: Mm!
T/R: We don't eat fish bone, so we will throw them away.
G3S2: And some old clothes.
T/R: Oh, yea, used clothes. Can used clothes be recycled?
G3S2: Yes, we also have some bin that is about old clothes, we can put old clothes in that bin and some people will took it away to help that people that no clothes.
T/R: Yes, to help people who need clothes to wear, people who maybe are too poor to buy new clothes. And what are some transportation modes we discussed today?
G3S2: Mm, maybe transportation, um, that…
T/R: I remember you talked about underground train; do you remember?
G3S2: Oh, yes, and bus, and taxi, and we ride bike and we can maybe go some place on foot.
T/R: So those are some ways we can do to protect the environment, to reduce air pollution.
G3S2: Mm.
T/R: So, in your daily life, how do you protect our environment, the habitat, or the ecosystem?
G3S2: On life, I just put trash in the correct trash bin, and I also go to school or go home by bike, and sometime, I will plant some trees in some place, yes, that place is need me to plant tree.
T/R: Oh, yes, just as you said places with a lot of sand, they need trees.
G3S2: Yes!

(After lesson 4 Learning Conversation with G3S6)
T/R: In your daily life, how do you protect the habitats or ecosystems?
G3S6: Um, uh, well, when I am, like um when there's like a bottle, water bottles, like plastic bottles, water bottles, and we will take it to our school and there's a bag, they put all of the plastic bottles that

we don't want to a bag and on Friday, there will be the people and they will get it together and take it I don't know take it to somewhere and they will, yes like recycle them.

In this sense, Learning Conversations facilitated not only discussions of concepts introduced in the lessons but also extended to other relevant conceptual knowledge that interested the students, which to some extent encouraged their engagement in this study. This was evidenced by students actively describing their thematic content and language learning developed from the online lessons compared to what they knew before this study and their prior visual experiences (section 5.8.3). Regarding language development, group three students enhanced their lexical use (e.g., G3S3, G3S5) for content learning, and their conceptual misinterpretation of habitats was clarified (e.g., G3S2, G3S6), which substantiated the process of deepening learning. This was also revealed via their language use for describing the content in the interviews by comparing it to their prior understanding.

(Interview with G3S3)
T/R: Do you know anything about habitats, ecosystems or their protection before our classes?
G3S3: I don't know anything about habitats in my science class., I hear it in my English class.
T/R: How about ecosystems, have you heard of them before?
G3S3: I never heard this English word before, but I know the Chinese meaning of this before.

(Interview with G3S5)
T/R: Do you know anything about habitats and ecosystems before?
G3S5: Before I think the habitats is like the food wheel, food chain, like the animals and plants have a place…and before I don't know ecosystem this words.
T/R: Ah, ok, so you learned something new about ecosystems and you also learned what is a habitat, it's not just a food chain.
G3S5: Yea.

(Interview with G3S2)
T/R: What did you know about habitats, ecosystems, or their protection before?
G3S2: Before, at before, I think habitat is just a place, and no animal, just a place, like forest and wetland, it's just a place have no animal. And now I know about it, habitat is a place and have least animal in it.
T/R: Have least?
G3S2: Um, no, just that animal is small than ecosystem.

(Interview with G3S6)
T/R: Do you know anything about habitats, ecosystems, and their protection before our class?
G3S6: Maybe a little, but not very well, maybe I only know a little like how to protect the animals, we can take out, when we go to the park, we can take out our trash, and the ecosystem I think it's like a food chain, like the bird eat the bug and the bug eat the grass. Only a little bit, not very well.
T/R: Did our class help you in your own school?

G3S6: Like the ecosystem, our school maybe sometimes 提到了一丁点 (mentioned a little bit), 然后这个课就是加深了那个印象 (then this class deepened my impression).

This finding also applies to group two students who highlighted the differences between what they learned regarding the thematic content and what they knew before participating in this case study during the interviews:

(Interview with G2S3)
T/R: What have you learned or remembered from all the lessons?
G2S3: And I learn many 一些我没，一些我之前不怎么那个的不清楚然后不怎么知道的一些保护动物和 (some I didn't, some I didn't quite know about animals' protection and) help the habitat.
T: Ok, so what do you think has helped you learn?
S3: PPT.
T: Oh, the ppt.
S3: Mm…或者是更多的拓展 (or more content extension).

(Interview with G2S4)
T/R: What have you learned or remembered from our lessons?
G2S4: 保护环境我学到了用步行或者骑自行车，还有不砍树，不乱丢垃圾 (I learned some ways of protecting the environment, such as walking, riding a bike, don't cut down trees, don't throw trash anywhere).

While the students articulated their ideas and understanding of the content to the teacher-researcher, it was noticed that they combined Mandarin with English in their utterances for the flow of communication. Although Mandarin was accepted during the conversations, the teacher-researcher provided specific linguistic support to meet individuals' needs for meaning-making using the target language – English. This is triggered by the drawing tasks as follows and will be further discussed in section 5.6.

5.5 Concept Enhancement

This theme comprises pictural representations and mindmaps. It was generated from the visuals including images adopted by the teacher-researcher for designing the online lessons but also drawings created by the students in doing the *visual languaging* tasks related to conceptual understanding.

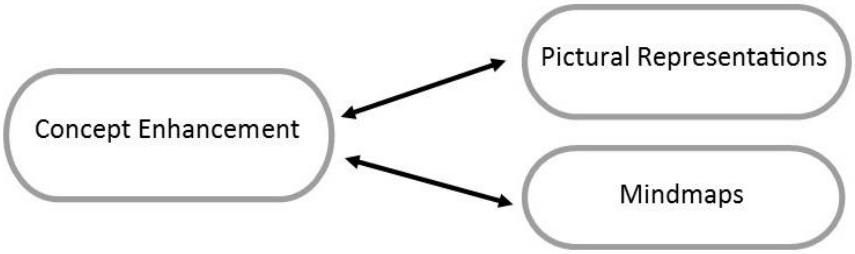


Diagram 7_2. RQ1 theme 2

These two types of visuals played different roles in this case study:

- The images (pictures) in the teaching presentations were designed for facilitating understanding of the content and stimulating students' creativity in making their own drawings.
- Students' drawings were encouraged to *language* and deepen their conceptual and language learning.

Collected through the participatory visual method, students' drawings were regarded as the key artefact for analysis. Both types of visuals were discussed in the Learning Conversations and interviews with both groups of students, from which two categories appeared addressing the different ways students chose to visualise their interpretations of concepts. Some students decided to use *pictural representations* and others preferred *mindmaps* to support their languaging, using specific language functions (e.g., describing different habitats, explaining the differences between habitats and ecosystems and ways to protect them).

5.5.1 Pictural Representations

Drawing task 1 in lesson 1 was first introduced by the teacher-researcher to enhance students' conceptual understanding by depicting the habitats of their favourite animals. Moreover, this task was intended to familiarise students with the drawing practices and for the teacher-researcher to estimate their prior knowledge of the content. As the students were completely new to the teacher-researcher, therefore, it was anticipated that gaining a deeper understanding of their current language and cognitive level is important for adapting subsequent teaching practices or content possibly with changes in terms of conceptual or linguistic complexity.

Lesson 1 slide –drawing task 1

Lesson 1 whole class Learning Conversations	Commentary
T/R: Now you can prepare a pen and a piece of paper and draw your favourite animals in their habitats. (After 5 to 10 minutes)	*T/R directly introduced the drawing task to enhance students' conceptual understanding.*
G2S1: I finished. T/R: Yes, can you describe your drawing? G2S1: I draw a peacock in the forest. Because the peacock its tail is beautiful, it's a..a male. It will dance and…uh attract the female peacock. (Figure 12)	*This extract demonstrates individual learner interpretation of survival beyond food that includes the sustainability of species.* *This led to her second drawing (Figure 15) which also included her spontaneous labelling of the peacocks with their young, (which had not been explicitly taught by T/R).*
G2S5: I draw two penguin is catching fish in the South Pole, when the winter is coming, they can get together and warm themselves, and I draw a penguin and an egg, it means they can take care their eggs ad babies in the Arctic, uh, in the South Pole. (Figure 13)	*Visual languaging by G2S1 became transformed into peer scaffolding as G2S5 then indicated the survival of penguins and their eggs in extreme conditions.*
T/R: Why did you draw three little drawings on one piece of paper? G2S5: Because I want to show that the South Pole can provide food for the penguin, and they live together because when the winter coming they can warm themselves.	*G2S5 engaged in meaning-making through visual languaging.*

Table 16. Lesson 1 Task 4 Learning Conversation extracts

Figure 12. G2S1's first drawing

It was noted that G2S1 integrated drawing with written text (e.g., words and phrases for labelling or annotating the visual content) to demonstrate and communicate conceptual understanding. Aligning with the potential of multimodality theory (Kress, 2009), the visual and written modes for languaging G2S1's thinking were signified by her unique drawing style with explanatory annotations. Similar visual and verbal integration was also employed by G2S5 to reveal his understanding of habitats as highlighted through the *visual languaging* of his first drawing (Figure 13).

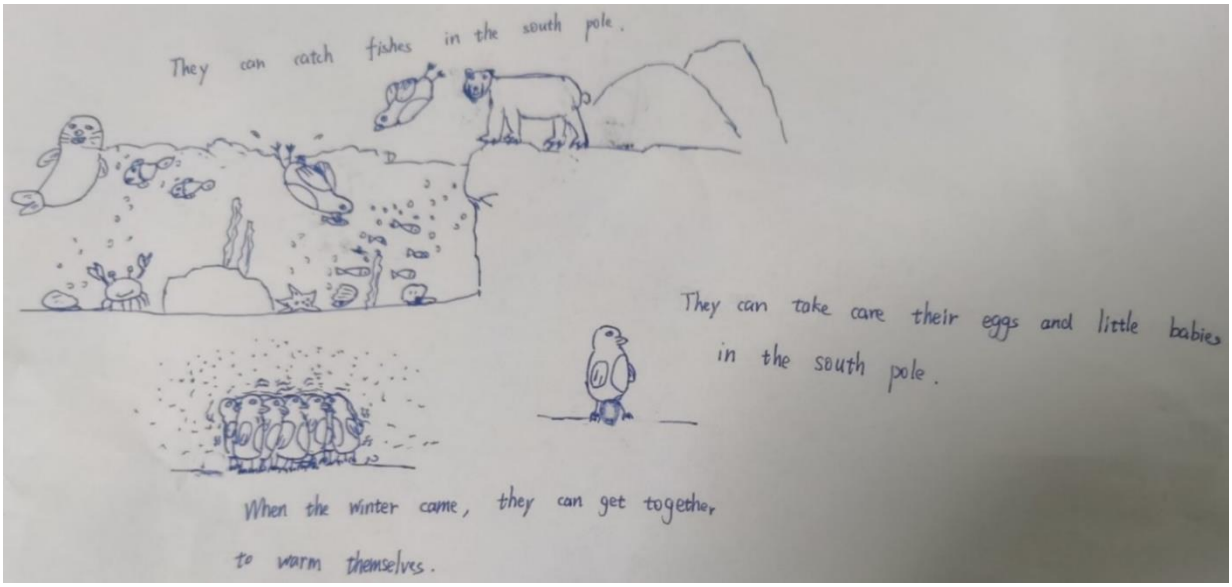


Figure 13. G2S5's first drawing

These drawings suggest that *visual languaging* creates opportunities for students to demonstrate their understanding and trigger new thinking shared in Learning Conversations. This not only enabled the teacher-researcher to monitor students' learning progression but also for students themselves to reflect on and deepen their own learning. This is the embodiment of *'visual languaging'*. In this sense, students constructed conceptual understanding by describing and explaining their thinking complemented by their drawings.

Both students managed to visually represent their thinking of what a habitat is even though their artistic ways of representing this concept were different. It was made clear that the quality of students' drawings was not the focus of data analysis. However, there was a tendency that, due to this being an unfamiliar way of representing learning, some students considered the level of their artistic skills as a barrier to creating drawings. This concern was raised when G3S1 finished his drawing and explained why he chose to draw a hog rather than his favourite animal – lion (Figure 14). He explained that drawing a lion properly was challenging and therefore, he drew a hog instead. Later in the interview, he indicated a lack of confidence in drawing and the limited help that drawings can offer to support his learning:

(Interview with G3S1):
T/R: What did your drawing help you to learn?
G3S1: "My first drawing draw a pig, and 画的还是有那么一点点丑 (my drawing is still a little bit ugly).
T/R: 我们这个课程也不是考验你画的好不好看，所以你不用担心 (Don't worry, we won't test whether you are good at drawing or not in this course).
G3S1: Ok.
T/R: 那你觉得你画的画在学习方面对你有什么帮助吗 (Do you think your drawings can help you learn)?
G3S1: I think don't have. 感觉画画对我学习没什么帮助 (I feel drawing doesn't help much with my study), 因为我总是画不到我想达到的效果 (*because my drawings always don't meet my expectations*).
T/R: 你可以通过写的形式 (You can try to write), maybe write next to your drawing.
G3S1: Write some words on the image and my drawing, I think yeah it's great.

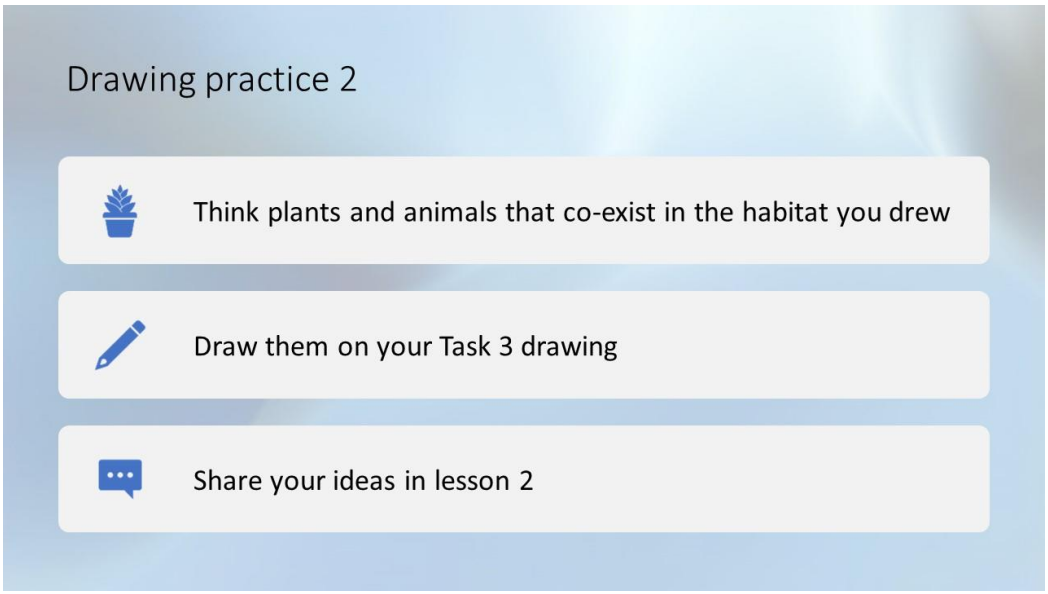
Figure 14. G3S1's first drawing

The student felt frustrated that he couldn't draw in a style to visualise his thinking. His explanation raised concern about other alternative ways supplementary to visualisation. Therefore, considering learner affect, the teacher-researcher reassured the student that combining pictural representations with written texts such as annotations could supplement the representation of his learning. This negotiation was based on mutual respect and shared goals for enhancing learning. Both parties had the goal of realising the process of languaging thinking with visuals. In order to achieve the goal and sustain learning, scaffolding learners to develop a mindset of facing and overcoming challenges with strategies is necessary for them to demonstrate and communicate conceptual understanding. For the case with G3S1, taking into account his worries and suggesting an alternative approach to picturising through respectful conversations highlighted the importance of scaffolding for facilitating languaging with visuals. This finding aligns with the interconnected dimensions of mentoring and learner growth in the PTDL model (Coyle, et al., 2018).

Consequently, G3S1 used speech bubbles to supplement his drawing in subsequent drawing tasks (e.g., task 5 about protecting habitats and ecosystems). This is illustrated in Figure 25 in section 5.7.2. In this sense, the captions, annotations, or in a broader sense, the written text were acting as a complementing tool for visualising and languaging students' understanding of the content.

Many other students intuitively used this tool in their drawings for articulating and communicating their perspectives on protecting habitats and ecosystems in section 5.7.2.

To further enhance students' conceptual understanding of habitats, a complementary drawing task (see slide below) encouraged students to extend their drawings with co-existing animals and plants in the habitats that they depicted in their first drawings.



Lesson 1 slide – drawing task 2

As shown in figure 15, G2S1 refined her first drawing (Figure 12) by adding the food element (worms and peacocks) with colours in different tones, indicating creativity and cognitive processing of the concept of habitats. Similar improvised application of colours representing individual learner creativity when visualising their conceptual understanding was also noticed and analysed from the angle of students' sensory expressions. This will be detailed in section 5.11.

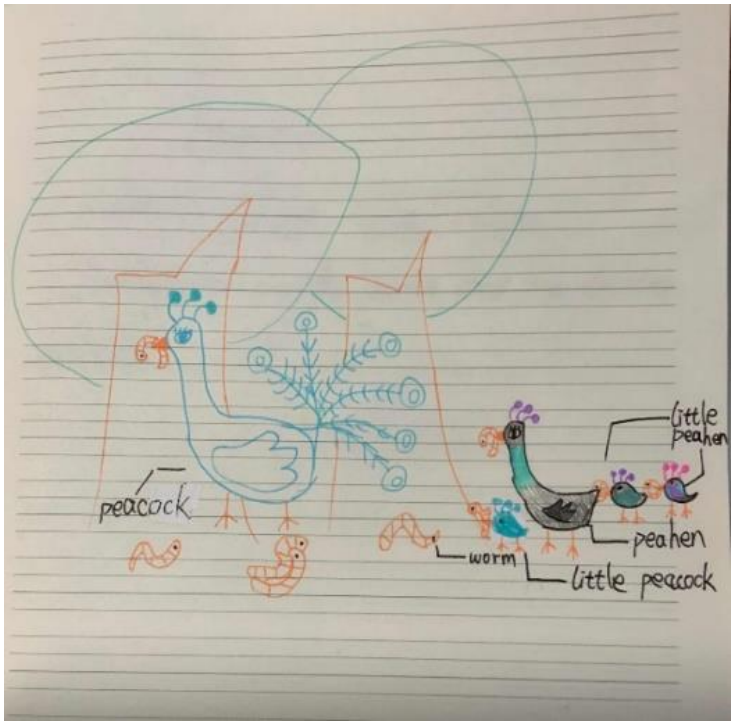


Figure 15. G2S1's second drawing

This second drawing task aimed to deepen students' understanding, such as by clarifying their misinterpretations as captured in the interviews in section 5.4.3 that habitats have diverse species. Similar conceptual misinterpretation was also identified in lesson 2 drawing task 3. As shown in the following slide, this task was about depicting the relationship between habitats and ecosystems.

Lesson 2 slide – drawing task 3

In G3S2's (Figure 16) and G3S4's drawings (Figure 17), habitats and ecosystems were differentiated by drawing habitats (e.g., forests, mountains, sandhills) without any animals whilst ecosystems were depicted with animals. This differentiation was also made clear as they described their drawings in lesson two Learning Conversations, which reflected their conceptual misunderstanding.

(Lesson 2 whole-class Learning Conversation with group 3 students):
G3S2: I think habitat is just a place that animals can live, and ecosystem that are lot of animal live here, maybe the bug eat plant and bird eat bug like this.
G3S4: I think habitats is just a place, it's like mountains, forest and desert and I think ecosystems is a place and there is many animals, the difference of my drawing is in habitats, this mountain, there's no animals and this is just a place that animal can live, and ecosystems there is a place and there is many animals, animals are in there and in habitats, I don't draw some animals in there.
T/R: I can see a camel.
G3S4: Because I think it's like a mountain, so I drew a camel and I crossed it.

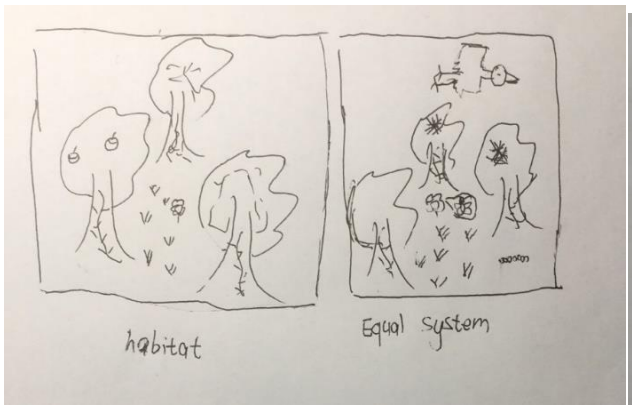


Figure 16. G3S2's third drawing

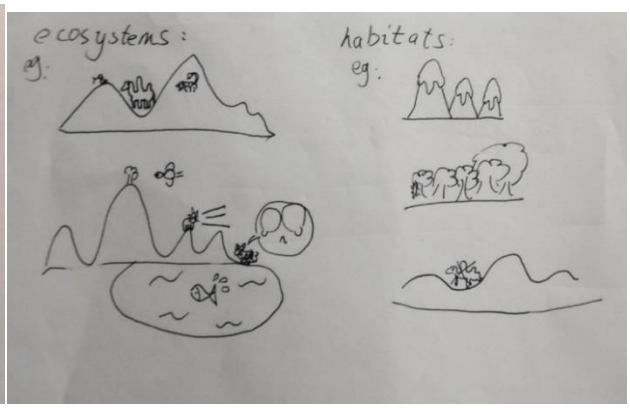


Figure 17. G3S4's third drawing

In contrast to G3S4's articulation of her drawing, other students visualised both habitats and ecosystems with animals. As shown in the following drawings, G3S5 depicted a small habitat with seaweed and some fish in contrast to the vast ocean ecosystem with various sea creatures (Figure 18), G3S6 drew a beaver den and multiple similar beaver dens as one ecosystem (Figure 19). They both visualised how an ecosystem consists of multiple habitats with various or the same species.

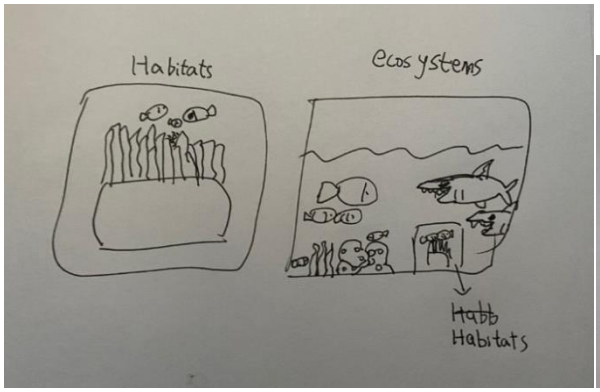


Figure 18. G3S5's third drawing

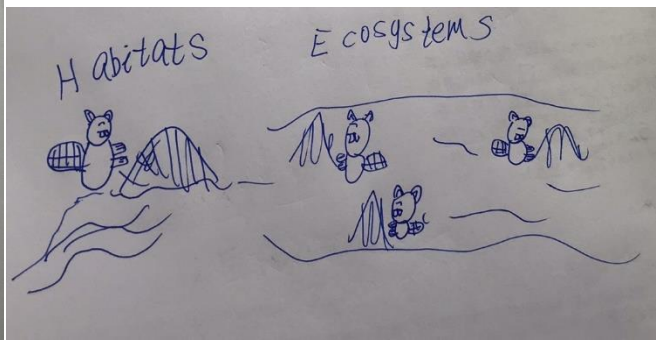


Figure 19. G3S6's third drawing

To support their positioning, G3S1 further described his conceptual understanding during the whole-class conversation: *"I think the habitat also have animal but ecosystem have more animal more than habitat",* which challenged G3S4's elaboration of habitats and ecosystems. Such divergent thinking triggered peer discussion complementing teacher-student Learning Conversations where both parties jointly constructed knowledge and clarified misinterpretations. By drawing together all students' thinking of the thematic content, the teacher-researcher then

discussed with the whole class to explicitly address whether habitats have animals or not and received desired learning outcomes. This finding was collected from the interviews as students described what they have learned in the lessons (section 5.4.3).

As students interacted in the class Learning Conversations through visualisation and languaging, (e.g., describing conceptual understanding with their drawings and discussing each other's drawings and thinking), the teacher-researcher was able to identify individual students' needs and provide specific scaffolding to enhance learning. Meanwhile, the students were encouraged to make meaning and construct knowledge by discussing and scrutinising the content through dialogic peer scaffolding. The latter will be further addressed in section 5.9.3.

In other words, both students and the teacher-researcher mutually collaborated in the Learning Conversations especially when there were different opinions, voices, or interpretations of the content derived from students' drawings and languaging. Thus, students' convergent or divergent thinking acted as the foundation for mentoring learning as they offered in-class Learning Conversations with specific purposes or goals shared by both the teacher-researcher and students, which in this case was to clarify the concepts and nuances of habitats and ecosystems. Such shared learning goals not only engaged students in further discussions but also, from a more ecological perspective reflected in the pluriliteracies model, nurtured teacher-learner resilient partnerships based on learners' needs (Coyle et al., 2018; Nikula et al., 2016). This was also substantiated in questions spontaneously raised by students for addressing their learning concerns (sections 5.4.2 and 5.6.3) and the advice or feedback from the teacher-researcher for enhancing their learning. In return, students offered advice for teaching online with visuals (section 5.9.4). This partnership to some extent also facilitated the building of trust and respect in the teacher-learner relationship.

5.5.2 Mindmaps

It is worth mentioning that students' drawings differed even though the underpinning conceptual understanding was the same. For example, in addition to pictural representations, G2S2 created a map (Figure 20) to demonstrate his thinking of the earth as an ecosystem encompassing

multiple habitats including the Arctic, Antarctic, forest, and river as well as other abiotic factors (e.g., air, rain, and wind).

Figure 20. G2S2's third drawing

Moreover, the following visuals created by G2S1 and G2S3 distinctively structured how they perceived ecosystems and habitats, which stood out from other students' drawings that were commonly delineated with flows of lines, shapes, and colours. Instead, they used mindmaps (Figures 21, 22) to succinctly visualise the relationship between habitats and ecosystems.

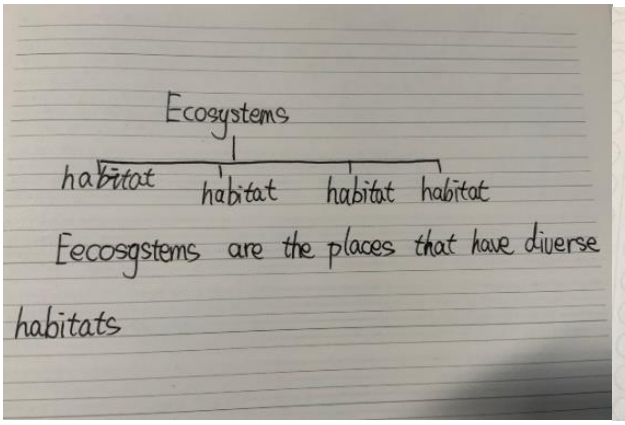


Figure 21. G2S1's third drawing

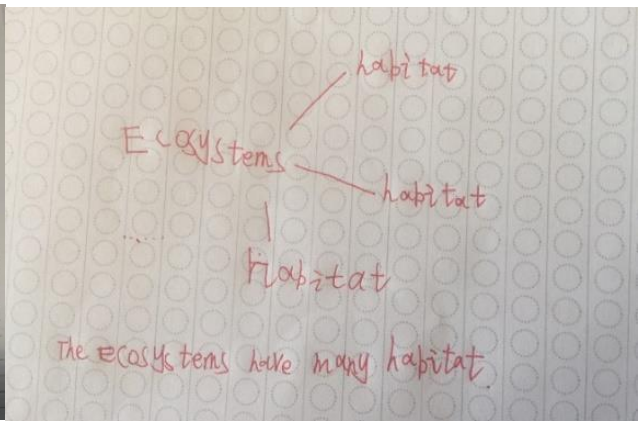


Figure 22. G2S3's third drawing

Whilst the students were taking the online classes separately in different locations (e.g., either at home or somewhere outside), it might seem that their drawings for each learning task were less likely to be affected by each other. However, the extent of similarity between G2S1 and G2S3's drawings drew the teacher-researcher's attention to the impact of the online learning platform (i.e., DingTalk). It enabled all students simultaneously participating in the lessons to send instant messages and share each other's drawings for languaging and peer discussions. After reviewing the lesson 2 video, G2S1 finished her drawing before G2S3, then took and uploaded a photo of her drawing (Figure 21) to the online learning group. It was anticipated that G2S3 may have seen it and adopted the same style for his drawing (Figure 22). This interestingly raised the necessity of their languaging in order to distinguish and identify how their thinking was embedded in their drawings that shared a high similarity. The following extract shows how they explained during lesson 2 whole class Learning Conversation and received peer feedback whilst the teacher-researcher mediated the conversation with prompting questions:

(Lesson 2 whole-class Learning Conversations with group 2 students):
T/R: G2S1 你画的怎么样了? (How is it going with your drawing?)
G2S1: I send a picture to our chat group.
T/R: Oh, ok, G2S5, 你应该可以看到 G2S1 画的 (you should be able to see G2S5's drawing), 你可以 (can you) add your comments?
G2S5: Mm…I think he can draw a picture that can shows what's the difference between them. Because pictures can show what do you thinking.
T/R: Pictures can show what your thinking are like. G2S1, can you talk about your drawing? Why did you just write those words?
G2S1: I used the mindmap because I don't know how to draw a picture of a very big ecosystem, so I write words.
T/R: I saw you drew some lines, 它也是一种视觉表达的形式哦 (it's also a type of visualisation). G2S2, 你可以评价一下 (can you evaluate) G2S3's drawing?
G2S2: I think it's very easy, I think he can add some pictures to show what is ecosystem, what is habitat.
T/R: 我觉得他画的 (I think his drawing) It's a bit similar to G2S1's.
G2S2: Yes.
T/R: G2S2, can you talk about it?
G2S3: 因为我觉得这样画画可以更简便一些, 不会多花一些时间 (Because I think it can be easier to draw like this and it won't take much time).
T/R: So, you want to save time, you think it's quicker, simpler.

Based on their explanations of the reasons why they chose mindmaps, G2S1 (from group 2) had a similar concern as G3S1 (from group 3) who drew a hog instead of a lion. They both thought

that depicting a specific concept or an animal was challenging. From a different perspective, G2S3 was concerned with the limited time and considered the convenience of using a mind map rather than a pictural representation. Therefore, they decided to simplify visualising the links between habitats and ecosystems with written notes highlighting their understanding that an ecosystem has multiple habitats. This understanding retrospectively reconciled with students who used pictural representations as previously discussed in section 5.5.1.

Even though students had different visualisation skills or styles, their conceptual understanding embedded in their drawings was key for the teacher-researcher to support them to make meaning. In addition, as their collective understanding of linking drawings and learning developed, students' drawings facilitated students themselves to articulate their understanding as well as for their peers to scaffold each other's learning by providing formative feedback during whole class Learning Conversations. As G2S5 constructively evaluated and suggested on G2S1's mindmap (Figure 21): *"I think she can make draw a image that can shows what's the difference between them, I think she can make her work better because image can shows what do you thinking."* This dialogic peer scaffolding was facilitated by drawings, which practised students' use of language functions (e.g., describing, explaining, and evaluating) for communicating in Learning Conversations.

Whilst students discussing drawings might seem a very initial stage in learning, however, it is fundamental because by discussing the nature of the drawings, this in effect centres around the concepts and languaging the concepts in alternative ways. The students don't necessarily realise they are learning. This is the key point of using and discussing drawings, which is also at the very core of the *visual languaging* approach.

Another potential of visuals was revealed from their autonomous choice of using different visualising styles. Students who preferred to use mindmaps explained why simplifying the process of visualising content was better. They claimed certain content, for instance drawing a lion or an ecosystem was complicated and time-consuming, so they found compatible alternatives (e.g., the hog, the mindmaps) to complete the learning task, which also

demonstrated their conceptual understanding or provided a purpose for meaningful conversations. Their resilient ways of coping with unexpected challenges that emerged from doing tasks engaged them in practising problem-solving skills for future learning. This potential of visuals resonates with the focus of the third research question - learner agency, which will be revisited in section Part 4.

Therefore, the findings identify three potentially beneficial pedagogic uses of visuals – with some provisos (e.g., languaging with visuals through Learning Conversations) to corroborate the hypothesis about the use of visuals for-

- languaging thinking and understanding of conceptual content
- facilitating mentoring including teacher and peer scaffolding for both conceptual and language development.
- developing learner agency (further detailed in Part 4)

5.6 Language Learning

This third theme emerged from learners building linguistic forms, applying thematic language to other contexts, and developing language strategies.

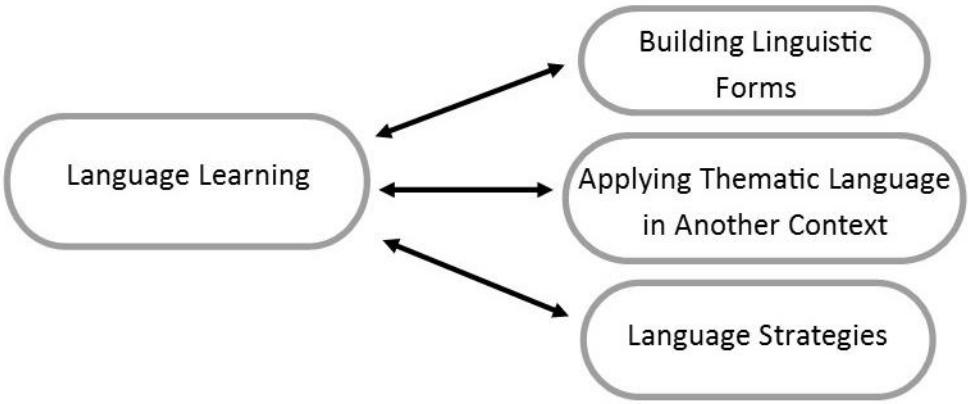
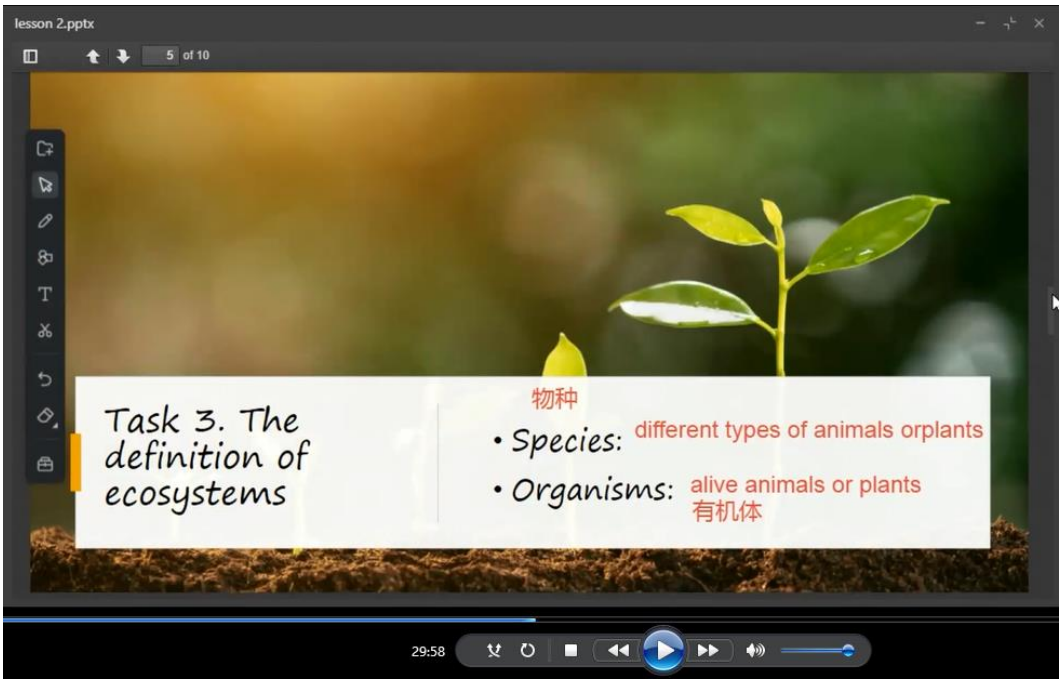


Diagram 7_3. RQ1 theme 3

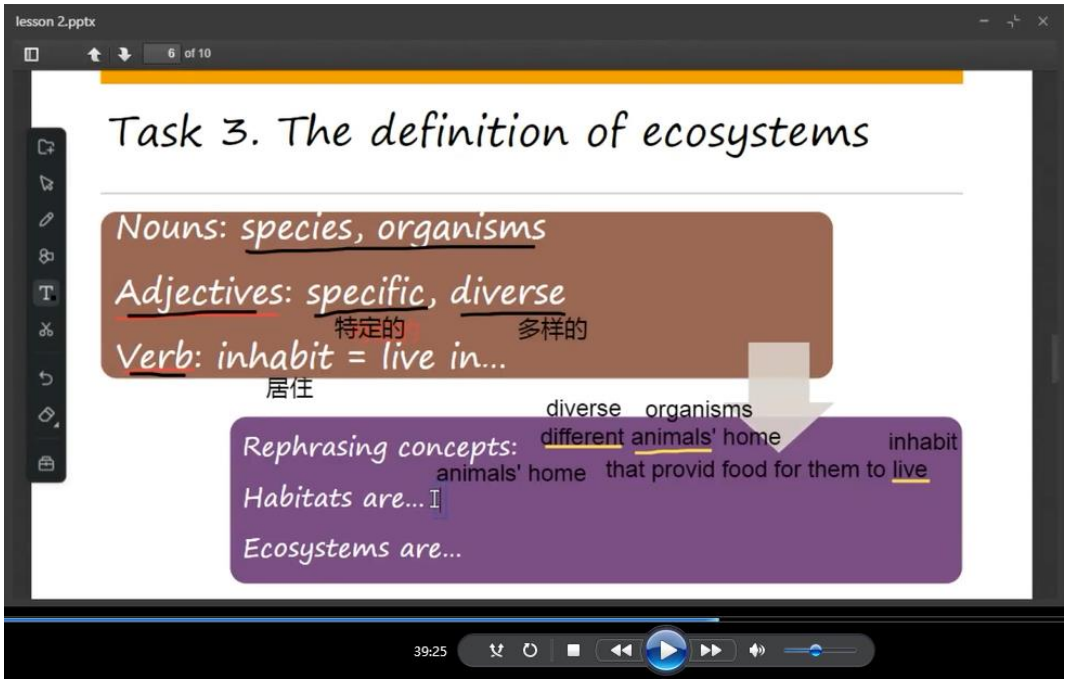
5.6.1 Building Linguistic Forms

It was anticipated that the students would require language support given that in the regular classes of their own schools, they are more used to answering questions from their teachers than

articulating their learning in their own words. This draws attention to the necessity of language teaching and scaffolding. To be specific, the students need to be taught the language that would support them to communicate their learning. For example, in order to support students in using language needed for increasingly academic-relevant discourse by constructing the meaning of habitats and ecosystems. The following task was introduced to engage students to appropriate their academic discourse.



Lesson 2 slide -task 3 (1)



Lesson 2 slide – task 3 (2)

Lesson 2 whole class Learning Conversation	Commentary
T/R: The animals and plants in your drawing can be called 'species'. They are all alive, so we can call them 'organisms.' 中文是'有机体' (In Mandarin, it's called 'Youjiti'). And you all talked about different types of animals and plants in your drawings. 这种不同类型的动植物可以称作(those different kinds of animals or plants can be termed as) 'species' 中文是'物种' (in Mandarin, it's 'Wuzhong').	*T/R directly taught thematic language by explaining their meaning, describing their language forms in Mandarin whilst writing down notes on slides 5&6.*
T/R: Now let's try to use these two concepts to describe what is a habitat and an ecosystem. 大家之前提到(As you mentioned that) habitats are different animals' homes that provide food for them to live, 我们能不能用上面的词来改动一下 (can we use the language above to rephrase it)?	*T/R started with students' own conceptual descriptions to encourage them to use alternative terms to reconstruct concepts.*
G1S2: I think different can change to diverse. Animals can change to orgni… T/R: Organisms. G1S2: Yes. And 'live' can change to inhabit.	*Peer scaffolding emerged as G1S2 initiated the process of changing language elements (different-diverse, animals-organisms, live-inhabit) for describing habitats.*
T/R: Let's put them in one sentence. G1S1: I think habitat is part of an ecosystem. Habitats are the place that full of animal and plant species.	

Ecosystems are the place that organisms inhabit and have deverse habitats.	*This triggered G1S1 to interweave them into completed sentences describing the relationships of habitats and ecosystems in an academic way involving using species, diverse, organisms, inhabit.*

Table 17. Lesson 2 Task 3 Learning Conversation extract

After confirming students' conceptual understanding through Learning Conversation, lesson 2 aimed to deepen this understanding by introducing the academic language needed for descriptions. This conversation reveals how students were guided to use English language resources provided in the teaching slides to construct their definitions of concepts with academic appropriacy. By guiding students with alternatives to the colloquial language used in lesson 1 (Tables 11-13), they started to focus on using cognitive discourse functions (CDFs) (further discussed in Part 3) to rephrase and express their understanding of the concepts more appropriately when using English. More data on students using specific CDFs for languaging their drawings and conceptual understanding will be discussed in sections 5.7.1 and 5.7.2.

Moreover, after-class Learning Conversations with individual students offered opportunities for personalised language scaffolding. For example, G2S2 was encouraged to use or say the keywords (e.g., inhabit, ecofriendly) introduced in the class to describe his conceptual learning.

(After lessons 2 and 4 Learning Conversations with G2S2)
T/R: Could you please tell me what you have learned from our classes?
G2S2: Today I learned ecosystems and habitat…and some words.
T/R: Words, for example?
G2S2: Like inhabit…uh, ecofriendly.
T/R: 这个 eco 代表什么呀? (What does eco stand for?)
G2S2: Ecosystems 的缩写. (It's the abbreviation of ecosystems.)

In addition, individual conversations enabled the teacher-researcher to provide feedback to address students' learning concerns. For example, explaining the meaning of certain words to G2S5, translating Mandarin characters into English for G3S1, and clarifying G3S4's pronunciation to enhance their conceptual understanding.

(After lesson 4 Learning Conversation with G2S5)
T/R: Hello, 我们上的 4 节课有什么问题吗 (Do you have any questions about the four classes we had)?
G2S5: 这节课有一些单词还是有点不懂 (There are some words in this class I don't quite understand.)

T/R: 哪些单词你告诉老师? (What words? You can tell me.)
G2S5: Transportation.
T/R: 它表示交通工具 (It means different tools for traveling). 还有哪些单词呀 (Any other words)?
G2S5: Protecting and what?
T/R: Environment 环境 en-vi-ron-ment.
G2S5: Environment.
T/R: 保护环境 (protect environment) protect environment.

(After lesson 4 Learning Conversation with G3S1)
T/R: About today's class, what are some trash types we discussed today?
G3S1: People throw the, throw the, mm… I don't remember 香烟 (cigarette), 烟头 (cigarette buds).
T/R: Cigarette, cigarette buds.
G3S1: Throw the cigarette in the forest they can make the forest fire.
T/R: So, these are some problems caused by people.
G3S1: Yea.
T/R: And what are some different types of trash we talked about today?
G3S1: Like the paper, glass, and 塑料 (plastic).
T/R: Plastic.
G3S1: Plastic and I remember have another one.
T/R: Yea, how about some food we don't eat, such as fish bone?
G3S1: Yes, food, food, fish bone like food.
T/R: Yeah, these are kitchen waste, I sent it to you, can you see it?
G3S1: Um, yeah, kitchen waste.
T/R: What are some transportation modes we discussed?
G3S1: Transportation?
T/R: Transportations 交通工具 (transportations/vehicles).
G3S1: Ride a bike and on the foot to walk and I think take some… because now there have some car can use the 电(electricity) How to say?
T/R: Electric powered car.
G3S1: Electric powers, um, I think we also can ride this kind of the car.
T/R: Mm! 电力发动的交通工具也可以叫 (Vehicles powered by electricity can also be called) electric vehicle.
G3S1: Electric vehicle.

(After lesson 2 Learning Conversation with G3S4)
T/R: Do you have any questions for me?
G3S4: How to read this word, it's o-r-g-a-n-i-s-m-s?
T/R: aw·guh·ni·zmz, organisms.
G3S4: Organisms.
T/R: Do you have any other questions?
G3S4: No.
T/R: Ok, then I have some questions for you. Can you tell me what are organisms?
G3S4: Uh, let me think, organisms is a life thing and it can be fire.
T/R: It can be fire?
G3S4: I think the organisms can, the fire can fire them.
T/R: You mean the fire can burn the organisms?

G3S4: It's like some plants can be fire and they are organisms.
T/R: Some plants can be burnt by fire, so the plants are organisms?
G3S4: Yeah.

Further, the individualised conversations enabled the teacher-researcher to observe and anticipate what the students intended to say, for instance reconfirming keywords with students (e.g., G3S1, G3S3), thereby scaffolding their speaking in English with appropriate linguistic use (e.g., spelling for G3S2 and listening for G3S3). Excerpts from the following Learning Conversations demonstrate how individual students were linguistically scaffolded.

(After lesson 2 Learning Conversation with G3S1)
T/R: Can you tell me what is habitat?
G3S1: The habitat is mm…I think are the species inha…
T/R: Go ahead, habitats are the species?
G3S1: Inhab…
T/R: Inhabit, do you mean this word?
G3S1: Inhabit, yes.
T/R: And how about ecosystems?
G3S1: I think ecosystem is making the…um…I don't know how to said.
T/R: Say it in English?
G3S1: Yea.
T/R: Do you know how to say it in Chinese?
G3S1: Yea, mm, 就是有非常多的动物在这个地方 (there are many animals here), 这个有非常多的 (it has many) many habitats, 形成了一个平衡 (that form a balance).
T/R: 什么平衡? (What balance)?
G3S1: 生态系统平衡 (Ecosystem balance).
T/R: Oh, ok, so in your opinion, you can say ecosystems have multiple 多个的(multiple) many habitats
G3S1: Multiple habitats.
T/R: Yeah and have more or diverse animals or 像我们今天学到 (like what we learned today) diverse species or organisms inhabit.
G3S1: Yes.
T/R: Okay, and what are species and organisms?
G3S1: I think species is the animal um, is the animals, species means the animals and there mm, can I say it in the Chinese?
T/R: Yeah.
G3S1: 物种 (species).
T/R: Yea, can you explain what is species in English?
G3S1: The species is the animals, and it means… I think it's the kind of animals.
T/R: Mm, how about plants?
G3S1: The plant also can, also can… I think species is the kind of the…
T/R: Do you think plants can also be a kind of species?
G3S1: Also, can.
T/R: So, can you sum up?
G3S1: I think the species is the kind of animals and plant.

T/R: Species means the kind of animals and plants, ok, and how about organisms?
G3S1: Organism means every every um the things have have the life, there can called mm organism.
T/R: Ok, organisms are any living things.
G3S1: Yes.

In this Learning Conversation, G3S6 was provided with necessary language resources (e.g., lexis and phrases) to elaborate more on the content regarding ways to protect the environment.

(After lesson 2 Learning Conversation with G3S6)
T/R: What are some garbage types we discussed today?
G3S6: Um, I think there's recycle like there are trash that can recycle. And something about the kitchen, um…
T/R: Uh, kitchen waste.
G3S6: Yes, and something like the things are bad to the nature, like the plastic and other human waste, like electric bins.
T/R: Electric things, such as?
G3S6: Such as like our phone that we don't want anymore, and like Pied, and also our, like the light.
T/R: The lights, did you say pied? What did you say before the lights?
G3S6: A Pied, I Pied.
T/R: Oh, iPad, okay. So, we call these - electronics 电子设备 (electronics).
G3S6: Okay, electronics.
T/R: And what are transposition types we talked about today?
G3S6: Umm, can you say that again, please?
T/R: Yeah, what are some transportation types, transportation modes?
G3S6: Oh, transportation types, I think like riding a bike, and walking on foot, go by a skateboard, we can also use the… I don't how to say it in English, I think that is, but I am not so sure, that the electric little bike.
T/R: Do you mean electric bike, 电动车 (electric bike)?
G3S6: Yes.
T/R: Okay, electric bike.
G3S6: Yes, I think that's it.

(After lesson 2 Learning Conversation with G3S3)
T/R: Can you remember some other new words we learned today?
G3S3: First, it's ecosystem. And what's that? Species?
T/R: Yea, as you just described their meanings.
G3S3: And org-zam-ni-zation?
T/R: Organisms.
G3S3: Organisms.
T/R: Pay attention the pronunciation, or-ga-nisms. Any other new words?
G3S3: I can't remember any other, sorry.
T/R: How about 'inhabit'?
G3S3: Alright, I remember it.
T/R: Oh, what does it mean?
G3S3: Is this similar to habitat?
T/R: It looks similar, it's a verb, it means live in someplace. How about this one: diverse?
G2S3: Deverse.

T/R: Di-verse.
G3S3: Let me think, wait a minute, diverse, I knew, it's just like there are so many, right?
T/R: Right.
T/R: How about 'specific'?
G3S3: The Pacific Ocean? Is that?
T/R: Not Pacific.
G3S3: Oh, this one, this one I knew it, it's just like this specials, someone say it's him, he or she must to do it, just like this.
T/R: He or she must do it? Specific means a certain type of something.
G3S3: A certain type of something, yes, I just mean this.
T/R: Can you describe it again, 'specific'?
G3S3: It's a certain tain type of something.
T/R: Yea, certain type 特定的一种类型 (certain types).
G3S3: Yes, I knew it in Chinese, I just don't knew how to describe in English.

Aligning with the above Learning Conversations with individual students, linguistic support or scaffolding through the process of encouraging students to express their thinking, anticipating what they intend to say, and providing feedback for their learning was also necessary for the interviews. During the interviews, students raised questions about their emerging learning concerns. For example, both G2S5 and G3S2 needed linguistic support about the same keyword (organism).

(Interview with G2S5)
T/R: What have you learned or remembered from all the lessons?
G2S5: I learn, I learn some, I learn what is biotic what is abiotic.
T/R: Anymore?
G2S5: And, and, and I know what is a habitat.
T/R: That's all?
G2S5: And what is an organ… how to say this word?
T/R: Organisms.
G2S5: Organism.
T/R: Organism 是原型 (is the original form), 加了(add) s 是它的复数形态 (is its plural form).

(Interview with G3S2)
T/R: What have you learned or remembered from our lessons?
G3S2: First, I think I know what is habitat, what is ecosystem, and I also learned about lots of habitat, I also learned about food chain and I also…I learned about some some words like species, orga… organ… organise.
T/R: Organisms.
G3S2: Organisms, I also learned about ecosystem and habitat definition. And I learned about like today how can save our 环境污染 (Environment pollution).
T/R: Environment pollution.
G3S2: Environment pollution.

T/R: Do you mean how can we stop or prevent pollution?
G3S2: Yes, just save this problem, but I think we can't save, but we can make this problem to be better.
T/R: Do you mean solve s-o-l-v-e 解决 (solve) this problem?
G3S2: Yes, solve.

Students also had questions about using Mandarin during the interviews. Both G3S2 and G3S3 were concerned about the choice of language for communication purposes, which triggered more discussions about improving English speaking (G3S2) and the linguistic differences between Mandarin and English (G3S3).

(Interview with G3S2)
G3S2: Mm…I think my English have big problem, that my…can I speak Chinese?
T/R: Yes, sure.
G3S2: 就是我觉得我的语言不太流畅，而且我的词汇量可能不太大，就是说我不知道我该如何把那个词用英文表达出来 (I think my speaking is not very fluent and my vocabulary is not enough that I don't know how to express a Chinese word in English).
T/R: That's ok, you need more practice in speaking.

(Interview with G3S3)
T/R: Did our class help you learn some other things?
G3S3: I think only the ecosystem and the food chain.
T/R: Helped you…?
G3S3: In science class.
T/R: How did it help in your science class?
G3S3: It's just there has something I don't know and I can't write it, but after the learning, I knew how to write it.
T/R: Write what?
G3S3: Some…can I say in Chinese?
T/R: Of course.
G3S3: 题目 (exam, textbook, or practice book questions).
T/R: Some questions.
G3S3: I can just say it in questions? I believe it's (questions mean) just 疑问 (queries), not 题目 (exam, textbook, or practice book questions).
T/R: 题目也可以用 ('题目' can also be translated as) questions, 不仅是你问的问题 (it's not just the questions you ask), 也可以是试卷或书本上的题目 (but also the questions on test papers or textbooks).
G3S3: Alright.

Either in Learning Conversations or interviews, students all received instant replies from the teacher-researcher intending to support them recall the content introduced in the lessons and solve their learning problems (e.g., language concerns - spelling and pronunciation). While

students described what new knowledge they have learned from this online course, it was noted that they showed an increasing ability to independently *language* their concept learning. A few needed linguistic scaffolding from the teacher-researcher. As shown in the following interview extracts, G2S2 described the diversity of habitats using the keywords (e.g., diverse, wetland) and habitat problems (oil leak) with little external support. G3S5 also, to some extent, showed competency in describing his learning using the target language (e.g., habitat, ecosystem, biotic) relating to the thematic content.

(Interview with G2S2)
T/R: 你说到了 (You mentioned) spelling 拼写新的单词 (spelling new words), 这些新单词你指的是哪些 (what are those new words)?
G2S2: I know the new words.
T/R: 比如哪些呢 (for example)?
G2S2: Diverse, um, wetland, uh, o, organisms, and uh, oil leak.
T/R: Oil leak, ok.

(Interview with G3S5)
T/R: Can talk about what have you learned from the first three classes?
G3S5: Uh, let me think, I think the ecosystem and habitats.
T/R: Mm!
G3S5: And let me… and the biotic, right?
T/R: Yeah, anymore?
G3S5: And how to how to say it, bioctic.
T/R: Yea, biotic.

These data suggest both Learning Conversations and interviews provided more opportunities for students to build their language use for languaging learning. Students were scaffolded with appropriate linguistic forms to develop their use of language functions (e.g., describing and explaining). According to McConachie (2010), increasing language appropriacy can prepare learners to acquire not only basic literacy (reading, writing, and speaking) but also move in the direction of disciplinary literacy (e.g., reasoning, investigating). As he posits, disciplinary literacy involves using "reading, reasoning, investigating, speaking and writing required to learn and form complex content knowledge appropriate to a particular discipline" (ibid., p. 16). This also aligns with Shanahan and Shanahan's (2008) model of literacy development (Figure 1) by moving from basic literacy to intermediate literacy towards disciplinary literacy (i.e., skills specialised to construct and communicate different subjects). Based on their renditions of literacy

development, nurturing students to build increasingly appropriate cognitive discourse functions is essential for their future disciplinary development beyond this case study.

Given this study is more language-oriented (English as L2) focusing on communicating and constructing English thematic knowledge, the English language is regarded as a discipline taught through using multimodal texts including verbal, visual, and digital. These modes were embodied in the way the students used their L1 (Mandarin) and L2 to verbally articulate their learning triggered by their drawings via the digital platform (i.e., DingTalk). The enhancement of this discipline learning was not only evidenced by their appropriacy of linguistic forms in this online context but also in their own school settings, which will now be explicitly addressed as follows.

5.6.2 Applying Thematic Language in Another Context

When students were building their deeper understanding of linguistic forms while being scaffolded by the teacher-researcher, their ability to transfer such knowledge to another context was revealed especially when they were questioned in the interviews, for example, whether this course helped them study more generally in their own schools. The interview extract below demonstrates G2S1 explaining how she employed what was learned in the lessons for her own school projects.

(Interview with G2S1)
T/R: What do you think has helped you learn?
G2S1: Um, it helped me um about, our … (name of the school), it has a PBL (project-based learning) lesson, it is about protect animal. And this lesson help um um do the project… when in … (name of the school) class, the teacher just say some of the ecosystem and habitat, we learned in our class I can understand better… We learned what is habitat and ecosystem in … (name of the school), that's one, and now we learned how to protect the animals and their habitats I think it is deeply.
T/R: It is… what did you say? Did you say deeply?
G2S1: Yea.
T/R: Oh, you mean you learned how to protect habitats and ecosystems deeper.
G2S1: Yea.

Students also used keywords (e.g., biotic and abiotic) learned from this project in their school classes (G2S5). It was worth noting that group 3 students indicated a prominent application of the target language practised and gained from this course to their school's learning tasks – English essay writing (G3S2), reading comprehension (G3S5), and a science test (G3S3).

(Interview with G2S5):
T/R: What do you think has helped you learn?
G2S5: A lot.
T/R: For example?
G2S5: Can uh help me during the school class.
T/R: What helped you during the class?
G2S5: Uh, biotic and abiotic.

(Interview with G3S2):
T/R: Did you use what you learned in our class in some other schools or classes?
G3S2: Yes.
T/R: Can you give me an example?
G3S2: Yes, I will also use some new word new thing in my school class and that will help me to learn about some things in school, like 这学期我们有单元叫 (a learning unit of this semester is called) Arctic.
T/R: Ah, did you learn something from our class and use that in the class about Arctic?
G3S2: Yes, I just do my 作文 (essay), I use in my 作文 (essay).

(Interview with G3S5):
T/R: Did you use some of what you learned here in your school?
G3S5: I think it let me learn many new words and what's meaning
T/R: Did you use those words in your school?
G3S5: Yeah, yes.
T/R: Can you give me one example? What did you use in your school's English class?
G3S5: My English class have some…like the article, it is about habitats, it is about the forest and some words and I know, but some like difficult words, I doesn't understand, but I know this article is all about the habitats, so I used the habitats to put it in the article, I can know the all article meaning.

(Interview with G3S3):
T/R: Did our class help you with your own English study in your school?
G3S3: Help a little bit with my science.
T/R: How?
G3S3: I just have my science finish test about 6 day ago, in that test, there have some questions we don't learn in the class that the science teacher teach us, but we learn it in your class, so I knew how to write it.
T/R: Like what questions?
G3S3: Some food chain and some habitats.

Students spontaneously applying what they have learned to other learning circumstances demonstrated increasing conceptual understanding and processing in the lessons that enabled them to engage in knowledge transfer, which also highlighted the potential of this study for deeper learning. As Pellegrino and Hilton (2012), Coyle and Meyer (2021) suggest, deeper learning requires learners to internalise knowledge and automatically transfer the knowledge to other learning contexts. To realise such a process of knowledge internalisation and automatisation for deeper learning, learners need to be mentored to facilitate their growth

mindset in directing and sustaining their own learning (Coyle & Meyer, 2017). Moreover, as Ormrod (2011) suggests, for learning to be successful, learners must enrich their repertoire by storing new knowledge and skills in their long-term memory and purposefully selecting and transferring the information and strategies needed from the repertoire for future learning challenges.

Drawing together their perspectives, Christodoulou (2017) suggests successful knowledge transfer requires both "rich and detailed structures of knowledge" (p. 34) from learners' long-term memory and mentoring for learners to solve problems independently. This aligns with the integration of the four-dimensional PTDL model (Coyle & Meyer, 2017) that ultimately aims to increase learners' confidence, motivation, and beliefs of self-value for in-depth lifelong learning. With this growth mindset, learners are more likely to engage themselves in new knowledge construction and collaboration with the teachers for achieving their learning goals, which reciprocally allows teachers to adapt and develop new teaching and mentoring strategies to meet learners' needs as they progress through the pluriliteracies knowledge pathways. This understanding also directed the teacher-researcher's teaching belief and practice in this case study. That is using dialogic and visual heuristic ways of scaffolding to mutually construct learning with learners as they create and use visuals to externalise their understanding.

5.6.3 Language Strategies

The questions raised by students in the interviews and Learning Conversations as discussed thus far were both conceptual- and linguistic-based. As they become more engaged in communicating with the teacher-researcher, they also asked additional questions that were linked with their individual English language learning concerns after the lessons. This self-level-directed reflection to some extent resonates with Hattie and Timperley's (2007) feedback model that delineates how students respectively feedback on their learning by asking themselves questions (e.g., 'how am I going?', 'where to next?'). Through a similar vein, the students were encouraged to reflect on their learning in this case study by asking themselves such questions (i.e., private speech). Based on their awareness and attempt to make improvements in their English learning, data revealed how they evaluated their own learning outcomes from the lessons and raised relevant

questions to address learning difficulties. This provided the teacher-researcher with opportunities to offer feedback specific to students' learning needs.

The following extracts outline students' questions that emerged from their self-evaluations of learning in the online lessons and their own school English classes. It appeared that students were more concerned with their linguistic forms and strategies for using English. During the after-class Learning conversations, some of them raised problems in spelling (G2S2) and vocabulary (G3S5) whilst others drew more attention to grammar (G3S3) and speaking fluency (as raised by G3S2 in section 5.6.1).

(After lesson 4 Learning Conversation with G2S2)
T/R: Do you have any questions about all those four classes we have had? 比如我们今天说的一些新词 (such as the new words we talked about today)
G2S2: Uh, yes, I have. uh, 我记得住它们的意思，记不住它们的拼写 (I can remember their meanings, but not spelling.) 就是那个就是出行方式有利于这个森林环保的那个单词记不住 (I can't remember the word about modes of travel that is good for forest environment protection.)
T/R: 出行方式哦对那个确实很长是的 (modes of travelling, yeah, that's a bit long) trans-por-ta-tion, transportation.

(After lesson 2 Learning Conversation with G3S5)
T/R: Do you have any questions for me? It can be about our lessons; it can be about your English study.
G3S5: Can I speak Chinese?
T/R: Sure.
G3S5: We how 在我们写首字母填空的时候是怎么搞呢? (How do we do the exercise of filling in the missing initial letters?) 有的时候不知道怎么样填, (sometimes I don't know how) 就是感觉总是填不出来 (I just feel like I can't fill it out.)
T/R: 你可以按音节的方式填. (You can try the method of syllables to fill in the blanks.)
G3S5: 就是比如说 (Just like), 比如说… (for example…)
T/R: 比如我们今天学的 organisms, 把它拆分开，拆分音节的方式. (For example, the word 'organisms' we learned today can be split by syllables.)
G3S5: 就一节一节的写. (Just write one by one.)
T/R: 对, (Yes,) 一节一节的写, (just write one syllable by one syllable,) 这个 'or'就是一个音节, ('or' is a syllable) ga 是一个, ('ga' is one), 'nism'是一个. ('nism' is another one.) 你可以音节的方式来记单词. (You can memorise words by their syllables.) 这样你的发音不会错，另外在做拼写的时候也不会漏掉某一个字母. (Through this way, you may not mispronounce or misspell words.)
G3S5: Oh, 知道了, (understood,) 谢谢老师. (Thanks, teacher.)

(After lesson 2 Learning Conversation with G3S3)
T/R: Do you have any other questions for me?
G3S3: Yes, so can I ask some question that is not about the class, but it's about English learn?
T/R: Yes, of course.

> G3S3: The first question is in my another English class, the teacher tell me to have 16 tenses, so what's the 16 tenses?
> T/R: I can summarise for you, there are simple present, simple past, simple future, simple past future and current continuous tense, past tense, future tense, past future tense, and past future perfect tense. I'll send them to you all, that would be better.

As students' learning foci were articulated through self-evaluation or reflection, their desire and drive to overcome linguistic barriers (e.g., lexis, syntax, speaking fluency) in their English learning were revealed and enhanced. This process of realising their existing learning problems, seeking the teacher-researcher's feedback and suggestions to solve problems and improve learning, to some extent represents their growth mindset in learning. This mindset from the lens of the PTDL affective domain can be interpreted as learners' enhanced motivation, confidence, and agency in directing and sustaining their own learning and problem-solving skills (Coyle & Meyer, 2017).

In this sense, the above students' questions manifested their drive and trust in themselves to develop their current language strategies for achieving their learning goals. Moreover, as they were asking for the teacher-researcher's feedback, their trust in the teacher-researcher for supporting their learning was implicated. Indeed, over two months, they gradually built a respectful and trustworthy relationship with the researcher as their teacher and became increasingly more open when expressing their thinking, views, and ideas on the online platform (i.e., DingTalk). Therefore, the teacher-researcher positioned herself as their supportive learning 'buddy' and voluntarily offered ongoing feedback on their school English learning even after they completed the participation in this case study.

> RQ1: In what ways might visualisation serve as an intermediary learning tool (*visual languaging*) that bridges conceptual knowledge construction and language learning in English language classrooms?

The data suggest ways in which conceptual development and language progression can be bridged by *visuals* created by learners to scaffold their languaging when they lacked the linguistic capacities to articulate their thinking in English lessons.

The potential of how *visual languaging* linked concept and language was discussed from the angle of concept enhancement and will be further elaborated on from student use of specific cognitive discourse functions as below.

PART 3. Research Question 2

As indicated by the data and discussion so far, *visual languaging* needs to integrate with cognitive discourse functions and mentoring facilitated by Learning Conversations to optimise its potential in bridging and enhancing students' concept construction and language progression. Through specific visual practices – creating and articulating with visuals, these two crucial components – cognitive discourse functions and mentoring, as respectively emphasised in research questions two and three, can be explicitly answered (see sections 6.3 and 6.4). Next, the data regarding the nuanced connections between *visual languaging* and cognitive discourse functions will be discussed based on the themes and categories summarised in diagram 8, which offers implications for the second research question.

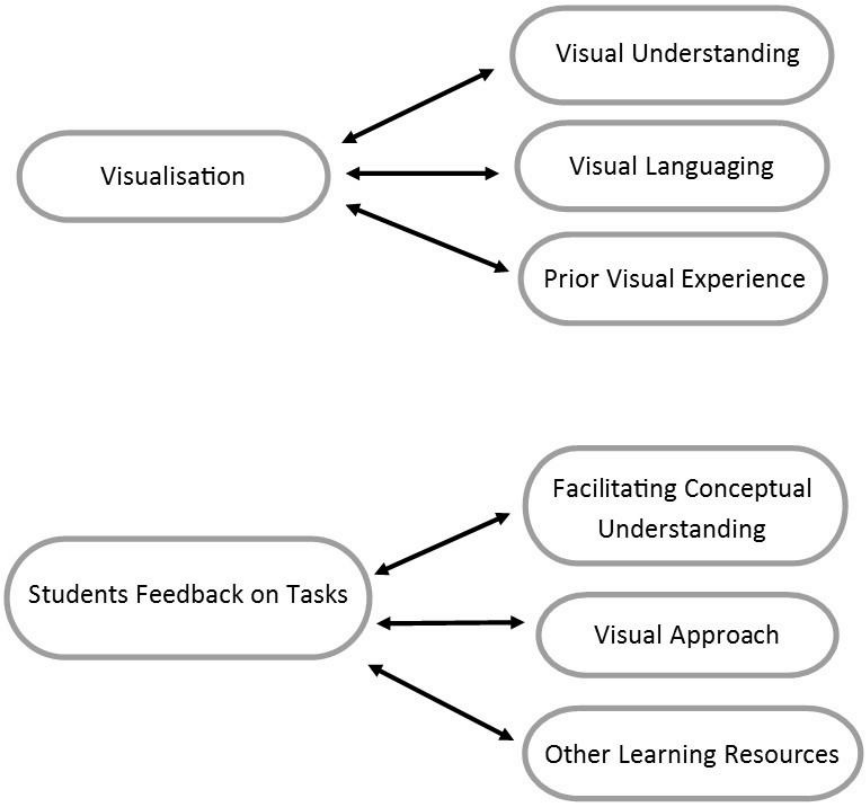


Diagram 8. RQ2 themes and categories

5.7 Visualisation

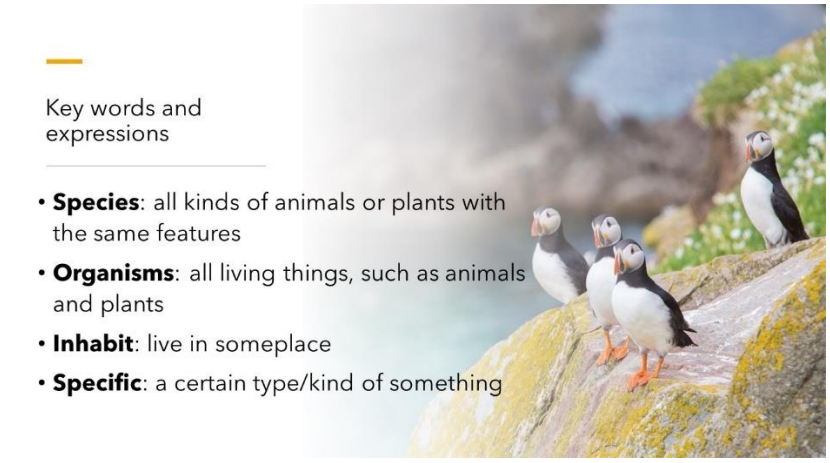
The second research question builds on and deepens the focus of the first question. It explores learners' use of language functions in representing their thinking alongside visuals as a complementary tool in assisting the process of communication.

> RQ2: How can students develop their appropriate use of specific cognitive discourse functions through visually scaffolded languaging?

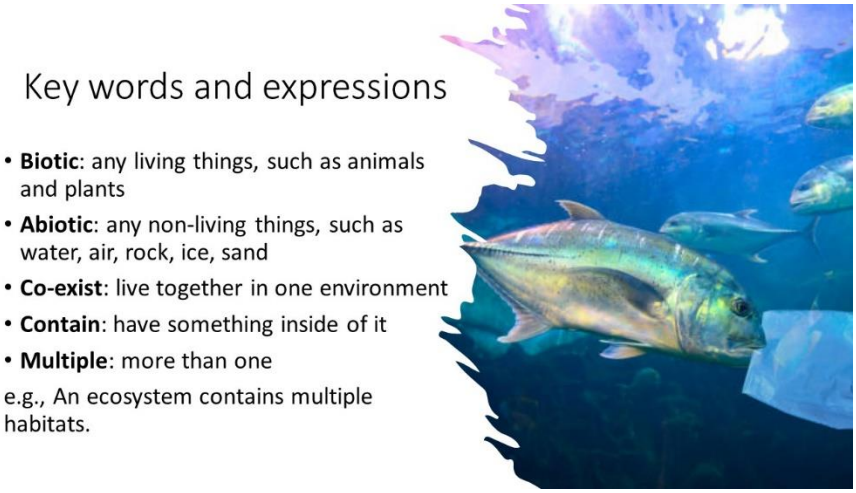
The research set out to understand how focusing on combining two forms of languaging – verbal and visual – may develop greater developing the appropriacy of learners' language use in different visual-based tasks that require them to articulate their drawings after interpreting the content in the lessons.

Students learned the academic language (e.g., keywords and phrases) needed to describe their understanding of the content during whole-class conversations with the assistance of the images and keynotes in the teaching presentations. As shown in the following slides, every lesson's target language was summarised for review in order to reinforce their content and language learning. These slides were intended to provide students with the language needed for articulating their conceptual understanding to the teacher-researcher and peers. A full version of all the lessons' slides is available in Appendix II.

Lesson 1 slide - lesson 1 target language



Lesson 2 slide – lesson 2 target language



Lesson 3 slide – lesson 3 target language

Lesson 4 slide – lesson 4 target language

The visuals in this study consist of students' drawings and images selected for teaching for supporting conceptual understanding. The following theme further analyses the intricacy of cognitive discourse functions with these two forms of visuals with data from students' Learning Conversations and interviews. These focused on how students perceived the visual-related tasks, how they created or used visuals for learning, and what their prior visual learning experiences were in order to gain a deeper understanding of the potential of *visual languaging* in appropriating cognitive discourse functions. Hence, this theme draws together three categories (Diagram 8_1):

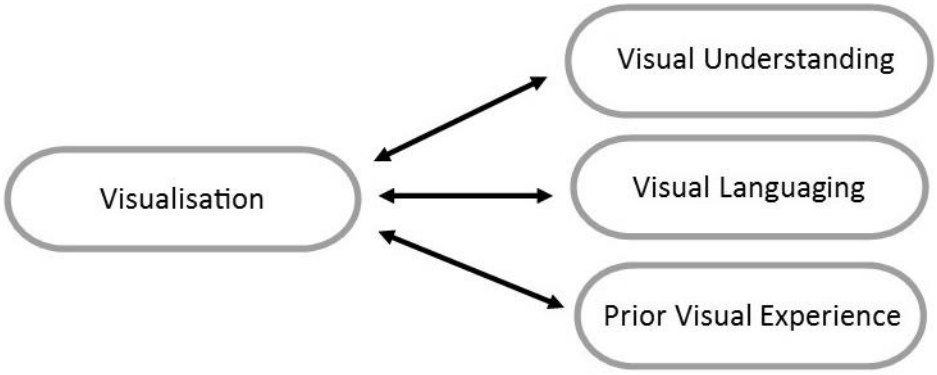


Diagram 8_1. RQ2 theme 4

- Visual understanding (5.7.1) – derived from how students understood the content via the images used for teaching.

- *Visual languaging* (5.7.2) with students' drawings.
- Prior visual experiences (5.7.3) – describing how students created visuals for learning in their own school. (This resonates with the previous finding of applying thematic language in another context (5.6.2)).

5.7.1 Visual Understanding

The images in the lessons were intended to demonstrate and facilitate understanding of the content and motivate students to draw. Interview and Learning Conversation questions collected data regarding student feedback on images for teaching and drawings they created for languaging. Student drawings will be discussed in the next section (5.7.2). As shown in the following extracts, students evaluated the images used in the lessons from the angles of concept and language comprehension (G2S1, G3S1, G3S2), interest and engagement in classroom learning (G3S5), and problem-solving (G3S6).

Concept and language comprehension:
(Interview with G2S1):
T/R: How do you think about the images, pictures we used in the lessons?
G2S1: I think picture in our lesson is um, it is, it is, some of it's the photos and some of it's just like picture, I think it reflect the problems.
T/R: What problems?
G2S1: Uh, like lesson 5, there is some image about the problems, about animals their habitat is, some of the people, they are destroying their habitat, and animal will didn't have place to live, so they will be extinct.

(Interview with G3S1)
T/R: How do you think about the pictures we used in the lessons?
G3S1: Images in the lessons is beautiful and can tell us some many things of the classes.
T/R: Many things of the classes, for example?
G3S1: Like habitats images, I see in the image that forest, desert, snow mountains, I know they are habitats, the habitats is the animals live.

(Interview with G3S2)
T/R: How do you think about the visuals we used in the class?
G3S2: Uh, visual?
T/R: Visuals could be images, pictures we used in the class.
G3S2: I think that images good for my learning, sometimes I don't what is this word means and I will look at images, and that images is also example, so that images good for me.
T/R: So, the pictures help to understand the meaning of the words?
G3S2: Yes.
T/R: Did it help you in any other parts of learning?

G3S2: I think it also help me to learn this class better.

Interest or engagement in classroom learning:
(Interview with G3S5)
T/R: How do you think about the pictures in the class?
G3S5: It made the class be more interesting, I think have the images and some words, it let me like to listen and learn this ppt.

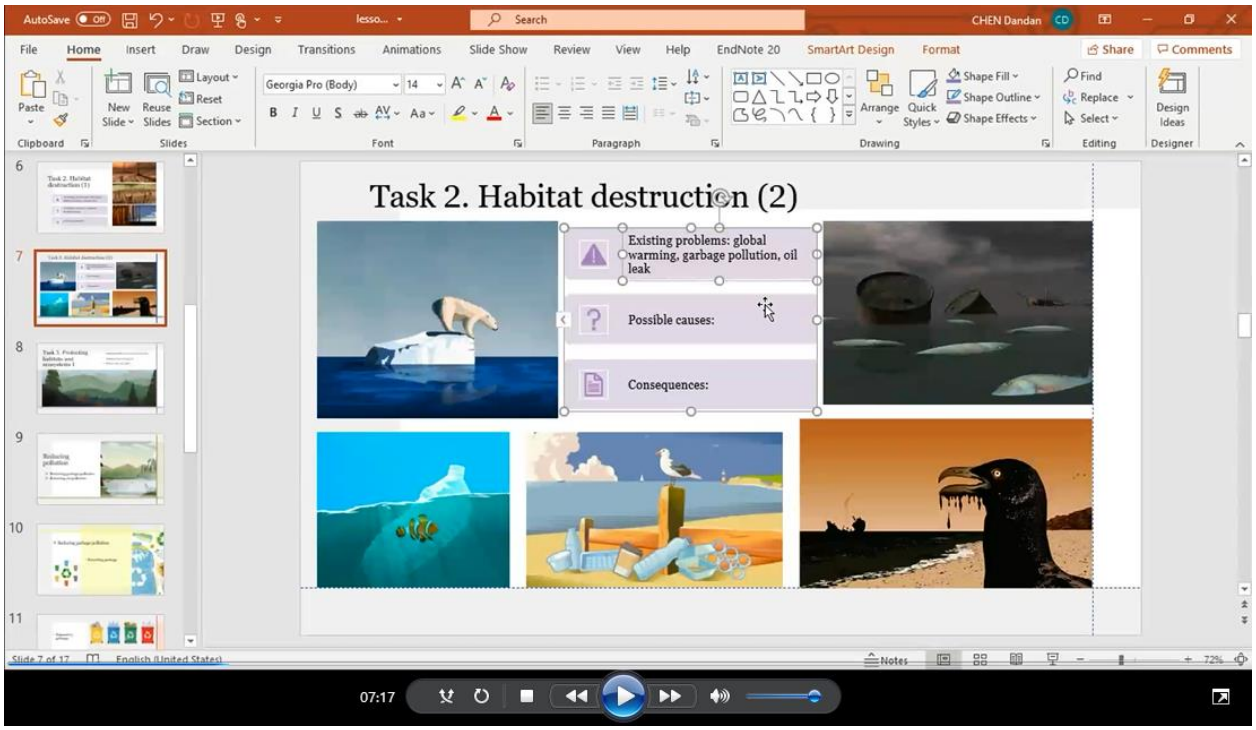
Problem-solving:
(Interview with G3S6)
T/R: How do you think about the images, pictures we used in the class?
G3S6: I think it's fun.
T/R: Why do you think it's fun?
G3S6: Because I think there's some questions and there will some pictures for us, when we look at the pictures and there's questions, we can think more like 就能帮助我们思考那个问题 (help us to think about the question).
T/R: Ah, help you to think about the questions.
G3S6: Yes.

Based on their languaging of the images used for teaching, the potential of this type of visual was revealed when students were 1) describing conceptual understanding from observing the images (e.g., different habitats and habitat problems), 2) explaining how they made meaning of the new words through the images (G3S2), 3) evaluating how the images engaged them in the class (G3S5) and supported them to think about questions for learning (G3S6).

The images in the lessons were also used after class with students during individualised Learning Conversations. For example, G2S3 was absent in lesson 4, therefore his conversation focused on reviewing the content of that lesson. The student was guided to review the content and express his thinking about the images for conceptual learning. As outlined in the following excerpt, the student discussed possible ways to protect the environment, classified garbage types, and identified different habitats to review and reinforce lesson 4 content that he missed. This after-class conversation co-constructed by the teacher-researcher and the student formed a learning partnership aiming to support the student's language use of cognitive discourse functions and enhance his conceptual understanding of habitats and ecosystems.

(After lesson 4 Learning Conversation with G2S3):
Discussing possible ways to protect ecosystems:

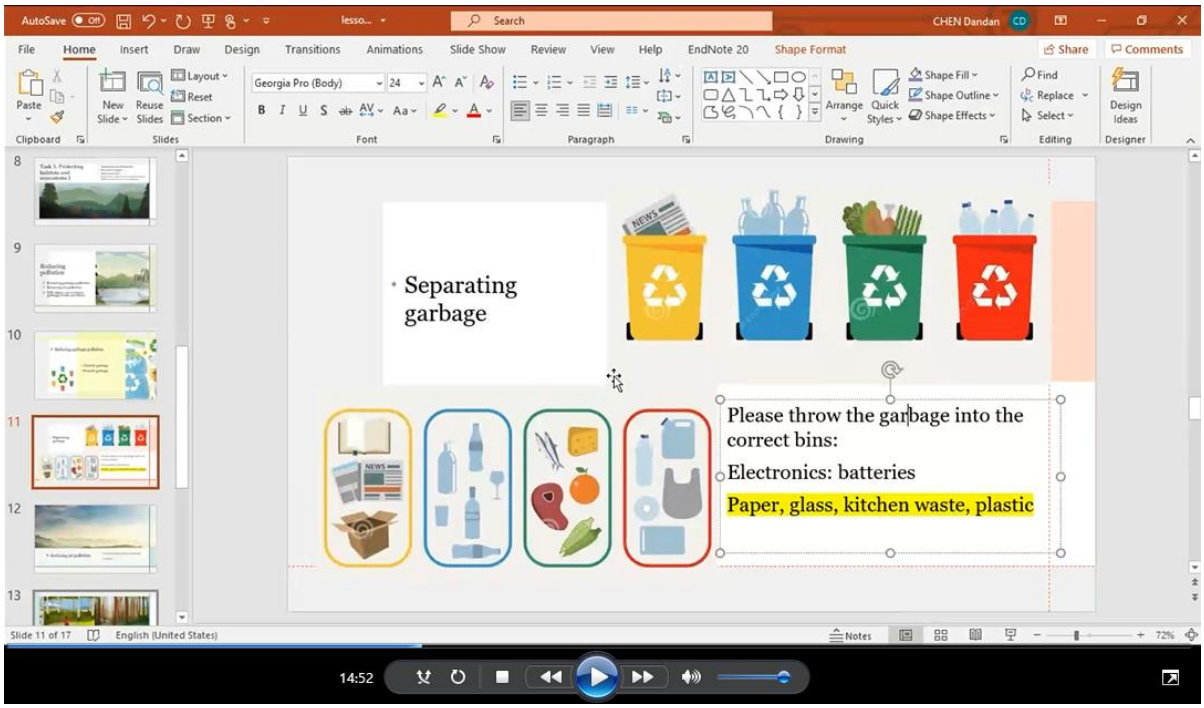
T/R: 这些图所出现的问题会有什么影响? (What are the consequences caused by the problems as shown in these pictures?) consequences?
T/R: Mm, yea, maybe become extinct, that's why we need to protect habitats and ecosystems. So, what you can do to protect it?
G2S3: We can give the ecosystem money to help these animal.
G2S3: Say to anyone don't use don't 将垃圾放到海里面 (throw garbage into the ocean) 或者是沙滩上 (or on the beach), 因为潮来了也可能将那些垃圾给卷走 (because the tide may also sweep away the garbage into the ocean).
T/R: Mm, 对(yes) so, we should tell us not to throw garbage anywhere.



After lesson 4 Learning Conversation with G2S3 screenshot_1

Classifying garbage types:
T/R: 那我们图片当中你可以看到有哪些垃圾呀? (What garbage types can you see in the pictures?)
G2S3: Ok, book, newspaper and…
T/R: 它们都是纸类的对不对 (they are all paper, right)?
S3: Yea.
T/R: 都是纸类的叫 (all paper types can be called) paper.
G2S3: Paper.
T/R: 旁边的第二个 (what about the next to it)?
G2S3: 嗯(Um) I don't know.
T/R: 这是玻璃瓶 (they are glass bottles), glass 玻璃类的 (glass).
G2S3: Oh glass...and then it's food.
T/R: 对这个都是我们不需要的食物 (Yes, they are the food we don't need), 厨余垃圾 (kitchen waste).
G2S3: Yes…kitchen waste.

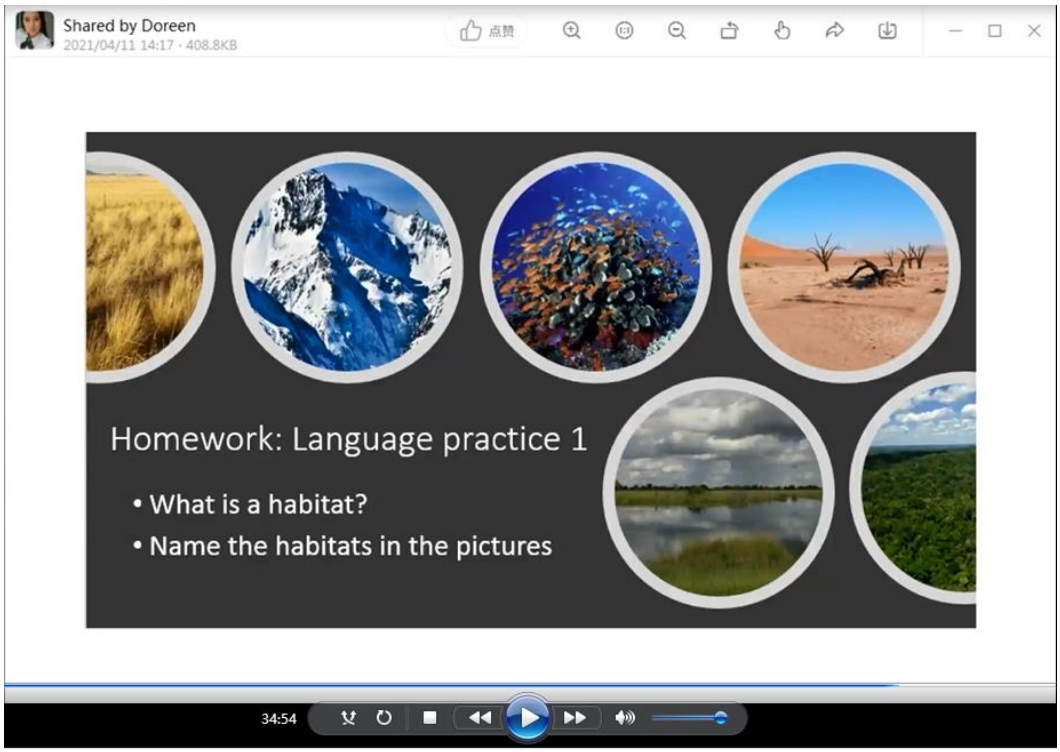
T/R: 对，最后一个呢 (Yes, what about the last one)?
G2S3: Mm…塑料 (plastic)
T/R: 对塑料 (Yes, plastic) plastic,
G2S3: I don't know how to say in English.
T/R: Plastic, 老师写了 (I wrote it down).
G2S3: Plastic.
T/R: 所以这四种垃圾要放在上面哪几个桶 (so which bins above should we throw these four types of garbage into)? 像第一个黄色桶放了(For example, the first yellow bin has) newspaper, 所以纸应该是倒在这里的 (so the paper should be thrown here).
G2S3: Yes. And number two is glass, number three is food, number four is plastic.



After lesson 4 Learning Conversation with G2S3 screenshot_2

Reviewing different habitats:
T/R: 看这个图有几个 habitat (See how many habitats there are in the picture).
S3: Let me see. One, two, three, four, five.
T/R: What are they?
G2S3: I know number two, number two is ice, ice, ice…
T/R: 这是个雪山 (this is a snow mountain), 不是冰山哦 (not an iceberg), 冰山(Bingshan) 是(is) iceberg, 雪山 (Xueshan) 是(is) snow mountain.
G2S3: Oh, snow mountain. Number three is uh…o…o…
T/R: Ocean.
G2S3: Ocean, number four is desert.
T/R: 对 (Yes)!
G2S3: Number five I don't know. Number six is mountain.
T/R: Number five is 湿地 wetland.

G2S3: Wetland.



After lesson 4 Learning Conversation with G2S3 screenshot_3

Data suggest that interviews and/or Learning Conversations offered means for students to reflect on their learning with visual prompts and for the teacher-researcher to scaffold students when they were expressing their thinking. According to Fullan and Langworthy (2014), Learning Conversations that are co-constructed by the learner-teacher are built on mutual respect and learning goals. By taking into account learner interests, preferences, or learning needs when designing, scaffolding, or adapting mentoring strategies, both parties' teaching and learning goals can be achieved. Therefore, each Learning Conversation in this study was based on individual student emerging learning concerns identified from their utterances in response to the teacher-researcher's concept or language checking questions. Even though most students positively commented on the effect of images embedded in the teaching material, one student's preference for using the written text for learning compared to the images was noted, which also triggered both written and visual resources. This is evidenced in the next section which explores the potential of students' drawings and languaging as a combined heuristic tool for learning.

(Interview with G3S3)
T/R: How do you think about the pictures we used in class?
G3S3: I can use it to know about the meaning of the word sometime, I don't think the using of the picture is not very big.
T/R: What did you use a lot when you learned in class?
G3S3: The text.

5.7.2 Visual Languaging

This category was derived from the data of students' elaborating understanding with drawings created by themselves and peers in the interviews and Learning Conversations. Both groups of students described their drawings especially when they could not sufficiently communicate with the new content in English. Meanwhile, they also expressed their interpretations of other students' drawings and offered feedback. For example, G2S3 described what he perceived from group two students' drawings: "*我看见了他们画的一些人类不好的现象，我也看见了他们画的一些 habitat" (I saw them drew some bad phenomena caused by humans, I also saw then drew some habitats)*.

Through the combination of visualisation and languaging, students externalisd their thinking process. Meanwhile, the teacher-researcher scaffolded students based on their verbal languaging with their drawings including what they intended to visually represent. To be specific, the process of visualisation involved students using visual and written tools to complement their articulation of conceptual understanding. By listening to their languaging and observing their drawings, the teacher-researcher was able to precisely identify the absent part of student drawings that links to their conceptual learning (Frith et al., 2005). This absence refers to the inconsistencies between what students intend to visualise and what they actually depicted on the page. For example, in G2S5's drawing (Figure 23) for the third learning task (i.e., visualising the relationship between habitats and ecosystems), the student described what actually drew and what she intended to draw in lesson 2 whole-class Learning Conversation: "*I think this park will be more beautiful… 有鸟会筑巢在 tree 上面" (some birds will nest on the tree)*.

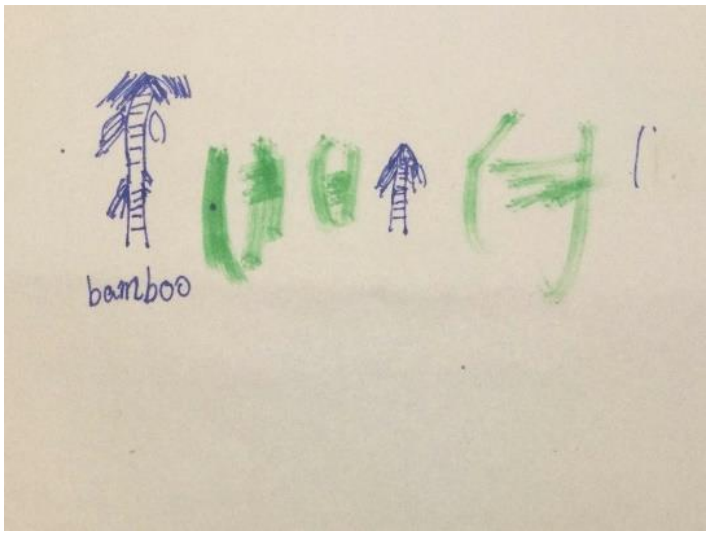
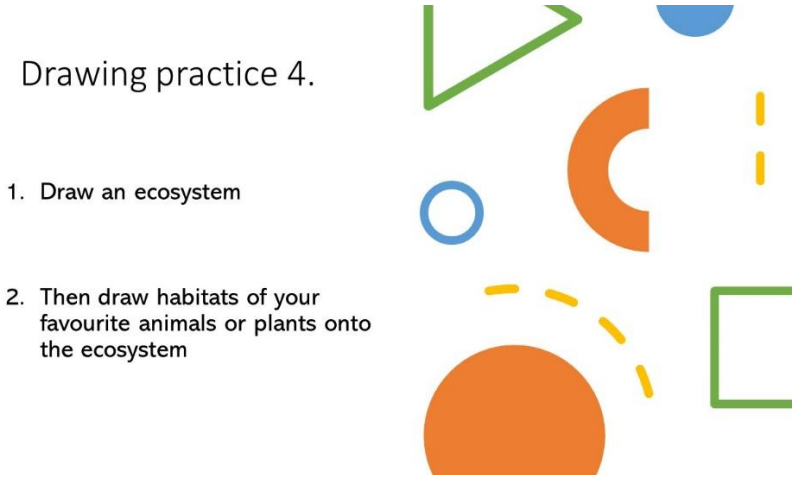


Figure 23. G2S5's third drawing

After comparing the visual content of her drawing notated with the word *"bamboo"* with her verbal languaging, the teacher-researcher was then able to interpret the student's conceptual understanding that the park was depicted as an ecosystem, within which the bamboos and trees were the habitats for birds to inhabit. Though certain visual elements (e.g., birds, park) were not fully represented in her drawing, her verbal languaging during in-class Learning Conversations encouraged elaboration and demonstrated her understanding of habitats and ecosystems more fully.

Another group 2 student's languaging with drawings and written text also described what he (G2S3) intended to represent in the fourth learning task.



Lesson 3 slide - drawing task 4

(After lesson 4 Learning Conversation with G2S3)
T/R: What are in your drawing?
G2S3: 就是一个生态环境系统里面有很多濒临灭绝的动物. (It is an ecosystem with many endangered animals.)
T/R: 有哪些濒临灭绝的动物啊? (What endangered animals?)
G2S3: 有些我没画出来 (some I didn't draw), 有 (which are) monkey, bird, 鹿 (deer), panda, dolphin, whale.
G2S3: Deer… and have the turtle.
T/R: Turtle 在哪里呀 (Where's the turtle)? 我没有看到耶 (I don't see it).
G2S3: Turtle is in the water.
T/R: Oh, in the water, 那你可以下一次把 (then next time you can draw the) turtle 画在水里 (in the water).
G2S3: Ok no problem.
T/R: 那么这里面哪些是 (In your drawing, which ones are) biotic, 哪些是 (what are abiotic?
G2S3: The…water, 竹子 (bamboo).
T/R: Bamboo 竹子(bamboo).
G2S3: And 竹子(bamboo), 其他的都是有生命的 (the rest are biotic), 鱼也是有生命的 (the fish is biotic).
T/R: Bamboo 没有生命吗 (is abiotic)?
G2S3: 竹子没有生命 (bamboo is abiotic), 哦(oh)! 竹子有 (bamboo is biotic)!竹子有 (Bamboo is biotic)!

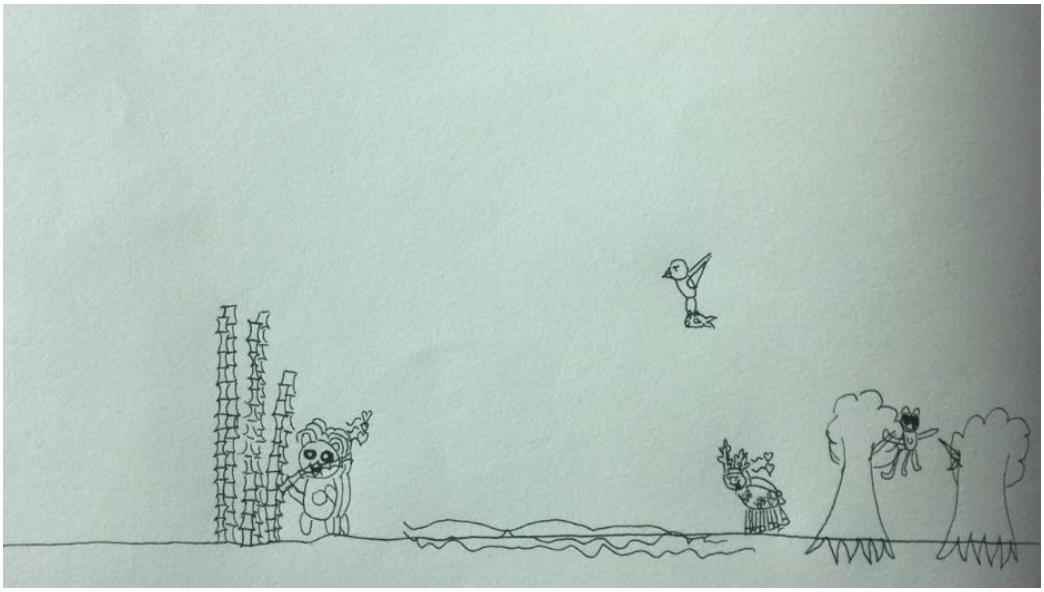
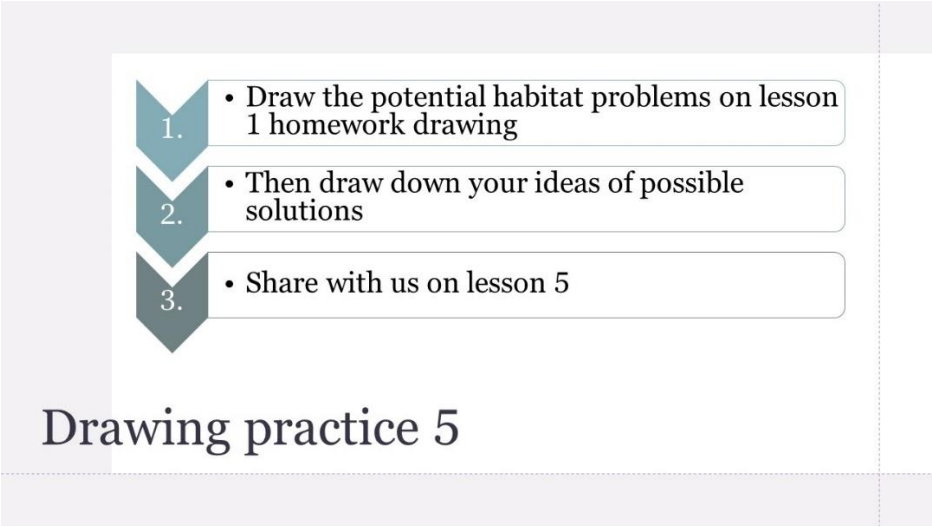


Figure 24. G2S3's fourth drawing

G2S3 used some Mandarin to communicate his interpretation of endangered animals as one of the potential habitat problems as illustrated in his drawing (Figure 24). Based on his description, the teacher-researcher was able to confirm that the student fully understood an ecosystem has

multiple habitats with different species, which made sense to the absent visual elements (e.g., dolphin, whale, and turtle). His use of Mandarin usefully indicates the language needed to progress communication in English.

In a similar vein, group 3 students also created and described their drawings with written text in lesson 4 when doing the fifth learning task. That is representing existing habitat problems whilst providing feasible solutions as required in the following slide.



Lesson 4 slide – drawing task 5

Students managed to demonstrate what was depicted in their drawings (e.g., G3S1) and explained why they decided to draw in certain ways (e.g., G3S2, G3S6) to reveal their thinking about protecting ecosystems and habitats.

(After lesson 4 Learning Conversation with G3S1):
T/R: Can you talk about what is in your drawing?
G3S1: This people cut tree, but a policeman use the gun to stop him.
T/R: So, you think the solution is to ask policemen to stop illegal lumbering?
G3S1: Yes.
T/R: Do you have any other solutions to help protect the trees?
G3S1: Also, I think we can use some paper we can use it in more than one time.
T/R: How do you use paper more than one time?
G3S1: A paper have two, one side can write, have two sides can write the words, and on my drawing, there have some, there is white, we can use this kind to write the word and to do some other things.
T/R: So, you mean a piece of paper has two sides, and we write or draw on one side, you can use the other side, and in your drawing, there are some white parts left on this side of the paper, so you can write on it or draw something extra on it.
G3S1: Yeah.
T/R: How do you protect the habitats or environment in your daily life?

G3S1: I think grow some plants and don't throw the trash in the habitat and use the electric power.
T/R: Do you mean electric-powered vehicle?
G3S1: Yea, electric vehicle and ride the bike or on foot to go to the school.

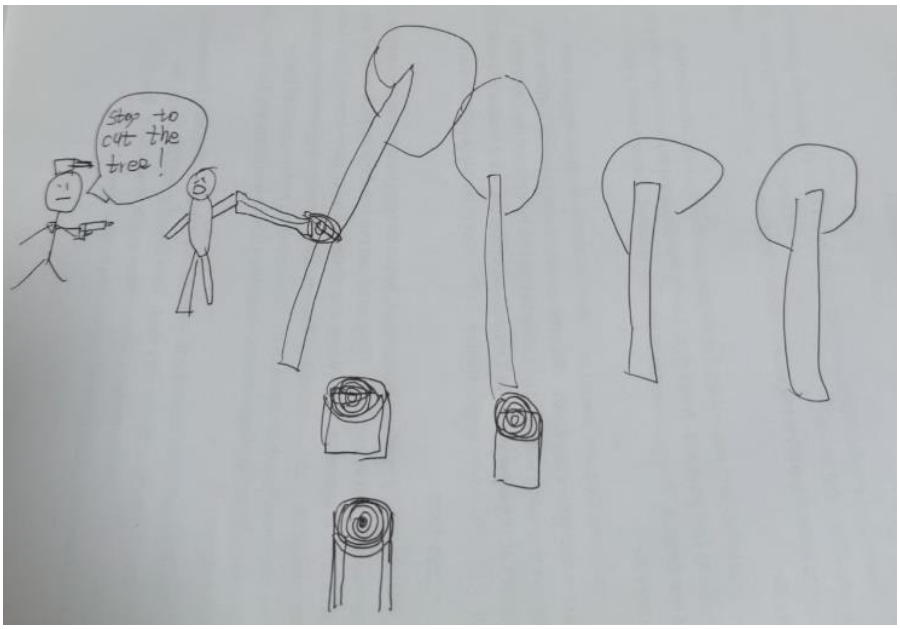


Figure 25. G3S1's fifth drawing

After lesson 4 Learning Conversation with G3S2	Commentary
T/R: Let's have a look at what you just drew, I'd love to hear how you are gonna describe it to me. G3S2: Ok, I drew about a forest and that trees all be cutting, and I also drew a bird, that bird lost it home, and I think solution is protect those trees or forest, don't cut them. T/R: I can see there are some tears on the bird's face. G3S2: Yes.	*G3S2 used the language of description to add details of the impact of deforestation with the suggestion of protection.*
T/R: Ok, so that's one solution to protect those trees, don't cut, c-u-t, not cute, c-u-t-e. Can you see it? G3S2: Oh, oh, ok, I fix it.	*T/R directly corrected G3S2 language form - spelling of 'cut'.*
T/R: Why do you choose to draw this scene, this problem? G3S2: Because I think this problem is so hard to fix it, because people need words, we need paper and we also need maybe sofa or bed or table, yes we need wood, but maybe we don't want to hurt that trees, but we need, so I draw about this problem, I think this problem is so hard to fix it.	*G3S2 explained the problem of human needs versus protecting the environment.*
T/R: Yea, we have to use it, but we also need to protect it, so your suggestion to fix this problem is protect those trees, don't cut them, do you have any other suggestions? G3S2: Okay, and now in China we have, we can plant trees on app. T/R: Yea, what app?	*T/R confirmed her suggestion and encouraged G3S2 to elaborate more on her thinking of the habitat's*

G3S2: That is in 支付宝 (Alipay) Ant Forest. T/R: Yes, Alipay 支付宝 (Alipay). So, did you plant trees in Alipay Ant Forest? G3S2: Yes, I think maybe this is also a solution of this problem. T/R: So everyone can participate, can you talk about how it works, this app? How does it work?	*problem focusing on the use of a digital app game.*
G3S2: Ok, you will choose a kind of trees you want to plant and you plant this trees, you will…If you plant this trees online and also will have people help you to plant a real tree, and some… if we use that is… if we use 支付宝, that will be made the…made that trees to be grow up and we will also to help other people to plant trees and other people will also plant trees for us. T/R: So, you mean you cooperate to plant trees together like with your friends, can you plant trees with other people who are strangers? G3S2: No, but we can plant trees together, like two friend can plant a trees that both they can, and can water this plant every day, and you two plant the same trees and this tree will grow up. If this trees grow up, you can plant another trees. T/R: Mm, do you mean if one tree has been grown up by you or your friends or together, there will be some people in real life to help you plant a tree somewhere in China? G3S2: Yes, it's in the place that have some many sand, and we can plant trees. First plant trees can protects our our maybe place and also that trees can make sand to be leese. T/R: Less. G3S2: Yea. T/R: That's a very good suggestion.	*G3S2 described how to use a digital tool for protecting habitats through engaging in spontaneous/scaffolded conversation with T/R.* *G3S2 was prompted to develop her description involving explanations and further suggestions.*

Table 18. After-class Learning Conversation extracts with G3S2

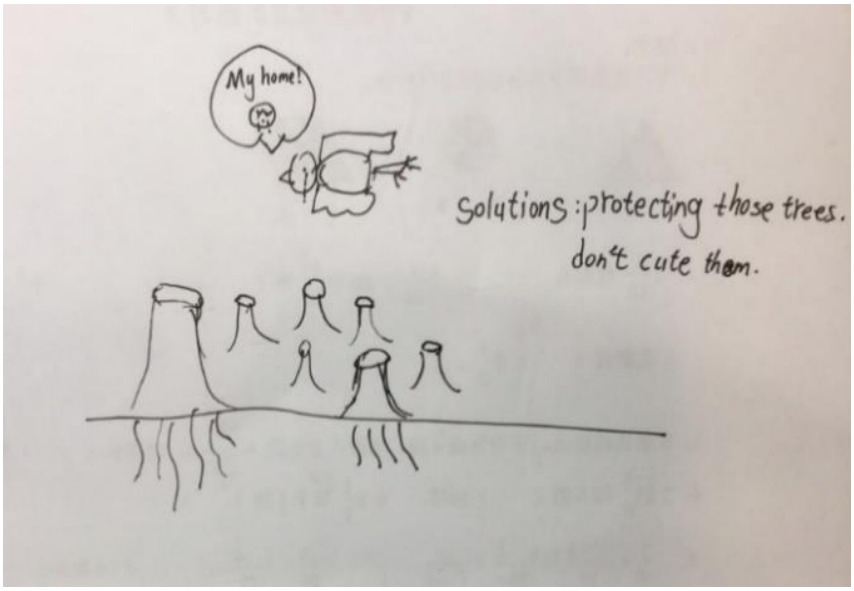


Figure 26. G3S2's fifth drawing

Through *visual languaging* her drawing, G3S2 demonstrated a deeper understanding of environmental protection by suggesting and describing a digital game, which also expressed her empathy for animals whose habitats are destroyed. G3S6 also described her drawing regarding the challenge to habitats and animals with suggestions of feasible solutions.

(After lesson 4 Learning Conversation with G3S6)
T/R: Can you describe what is in your drawing, why did you draw those things?
G3S6: Um, well, first, I draw drew a forest, and then there's a fox that eat trash, maybe it will sick or even die.
T/R: Yea, why, why the fox feels sick?
G3S6: Because it eat trash and plastic.
T/R: Oh, plastic trash, why would it eat plastic trash? I think foxes eat small animals, rodents.
G3S6: Yes, the people throw the trash in the forest and sometimes the fox eat it when um… 可能不小心吃的 (maybe eat it by accident), I think the fox did eat it in accident.
T/R: Oh, eat it accidentally. What can we do to stop animals from eating trash?
G3S6: When we go to the forest to have a trip and when we are going home, and we can pick our own trash to leave the forest and not just throw it in the forest and to protect the animals.

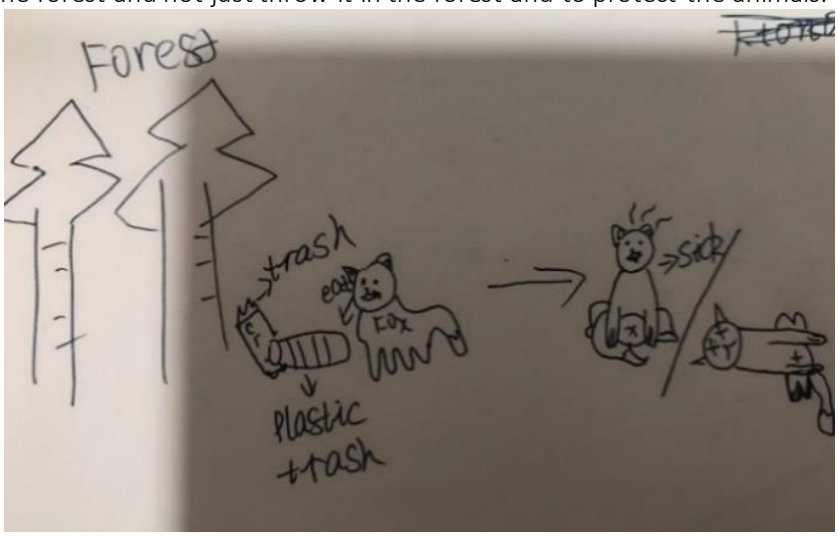


Figure 27. G3S6's fifth drawing

As seen in their drawings created for drawing task five, written text was frequently used by the students, such as the speech bubble in Figure 25, the thought bubble regarding over-lumbering in Figure 26, and descriptive notes of trash pollution in Figure 27. Similarly, other drawing tasks were also completed by students using written text (e.g., G3S3's notes of co-existing Arctic animals with a hunter in Figure 28 for drawing task two, and G2S4's conceptual descriptions of habitats and ecosystems in Figure 29 for drawing task three).

Figure 28. G3S3's second drawing

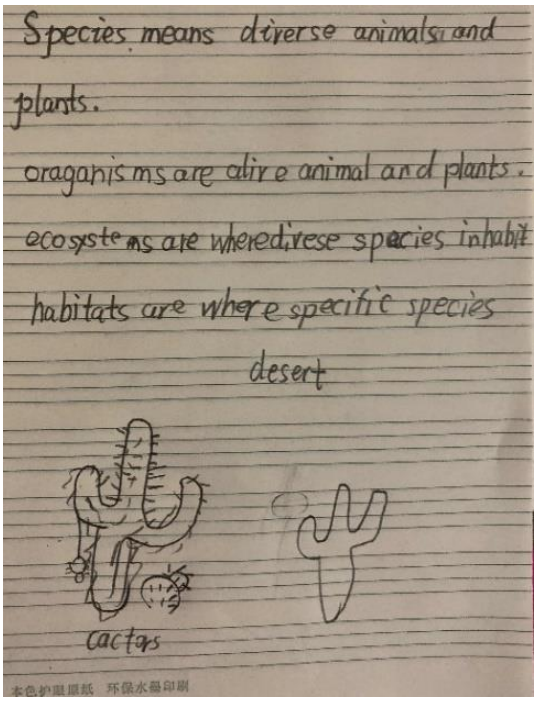


Figure 29. G2S4's third drawing

The combination of visual and written modes for languaging conceptual understanding was also advocated by students in the interviews (e.g., G3S6), which further allowed the teacher-researcher to identify more precisely students thinking and to what extent they were able to understand and articulate the content. Students were also provided with the language needed to express their conceptual understanding in the lessons (see the slides in section 5.7.1).

(Interview with G3S6):
T/R: What has helped you learn the topic, such as habitat, ecosystem?
G3S6: I learned ecosystem, draw a food chain, and get a better understanding.
T/R: You mean drawing?
G3S6: Yes, and writing.
T/R: What kind of writing?
G3S6: Writing the ways like how to protect the nature and writing what's this ecosystem about like there is what and 它们的关系是什么 (what their relations are).
T/R: Ah, their relation, do you think the drawing and writing helped you to learn habitats and ecosystems?
G3S6: Yeah, yeah.
T/R: Is it the drawing and writing in our class?
G3S6: Yes.

Students adopting and integrating the written text with their drawings for languaging reinforced the connectivity between visualisation and the use of cognitive discourse functions. As such theirthinking was not only verbally expressed but also visually represented as written text on their drawings. These two forms of representations are addressed as verbal languaging and written languaging in this study to differentiate from *visual languaging*.

Drawing on the data thus far, students' utterances in interviews and Learning Conversations offered the locus for both the students and teacher to identify gaps or misrepresentations in their drawings. Moreover, they also created opportunities for students to fully express their thinking and offered the teacher-researcher a more holistic view of students' learning according to individual student needs, thereby providing conceptual and linguistic scaffolding or learning advice. As such, the integration of *visual languaging* and language functions naturally emerged in Learning Conversations as students articulated their learning with drawings whilst supported by others (e.g., peers and the teacher-researcher). To further understand and capture individual students' thinking, combining and comparing the following two types of data was necessary.

- The visual data - students' drawings and written text created in learning tasks pertaining to the content in the lessons.
- The verbal data - students' verbal languaging using specific cognitive discourse functions to express their thinking with the visual data in Learning Conversations.

It was noted that a few students integrated Mandarin with English in the interviews and in-class Learning Conversations to sustain the flow of communication. For the teacher-researcher, using students' first language (i.e., Mandarin) was also necessary after-class Learning Conversations, especially in supporting students with appropriate linguistic forms (such as the language of describing and the language of explaining) to demonstrate their conceptual understanding. It was noted that 8 students (5 in group two and 3 in group three) used both Mandarin and English to communicate in after-class Learning Conversations. Moreover, students were provided with the language necessary to describe or explain their learning in class (see slides in section 5.7.1). Therefore, by taking into account Mandarin for English learning, the holistic resources adopted in this case study consist of:

- Non-linguistic resources: the visual data - images in the lessons and students' drawings with written text.
- Bilingual resources: the verbal data – students' use of translanguaging when describing, explaining, and evaluating learning in English and Mandarin.

Students using such dual resources for demonstrating and communicating their understanding of the content resonates with the notion of multimodality (Kress, 2009; Tang et al., 2014) that values the potential of combining multiple modes, tools, or resources for learning (e.g., words, visual, audio, spatial, and gestural modes). Moreover, it aligns with the positioning of translanguaging (García & Li, 2014). As reviewed in Chapter 2, translanguaging practices are built on the multilingual and multimodal foundation that brings together different linguistic, multimodal, semiotic, and cognitive capacities for learning and teaching (Li, 2018). The translanguaging practices in this study consist of two visual types (i.e., images and drawings) and two languages (i.e., Mandarin and English) that students purposely deployed from their repertoire for completing the drawing tasks. This raised the importance of guiding and supporting students to use such sources for enhancing their English learning. As inspired by Rajendram (2021) and Conteh's (2018) advocacy of translanguaging as a pedagogy and its strategic approaches to teaching additional languages (Celic & Seltzer, 2013; García & Sánchez, 2015), the teacher-researcher's translanguaging practice for teaching English in this project concerns two dimensions:

- Scaffolding students' visual use for languaging by providing them feedback, advice, and encouragement in the process of drawing.
- Leveraging their verbal use of Mandarin and English whilst focusing on their English development.

This translanguaging lens of teaching for learning from Shanahan and Shanahan's (2008) specification of literacy development aims to practice students' basic literacy in English reading, writing, or speaking to construct their language for articulating and communicating their understanding of the content (e.g., habitats, ecosystems). Moreover, it intends to develop

students' multiliteracy skills including visual literacy for overcoming challenges that emerged in different learning tasks (e.g., a lack of artistic skills or linguistic form needed for visualisaton and languaging). Such challenges require the teacher-researcher to support students to build their confidence in doing tasks whilst enhancing their interests and engagement for sustainable learning. For example, suggesting and supporting some students' preference for combining the written text with drawing when they lacked the confidence or artistic skills to draw the complex concepts (5.8.1), teaching the content with images to elicit their interest in drawing, providing linguistic support when they were languaging in English, and clarifying conceptual misunderstanding (5.6.1).

As students visualised their thinking through drawing, they gradually comprehended the notion of *visual languaging* as proposed in this study, which was unanticipated by the teacher-researcher. For example, G2S1 succinctly described how she interpreted and practised this visual approach for learning in the interview: "*We finish the drawing homework and on lesson we talk about it and we share our ideas"*. Apparently, she understood the process of using *visual languaging* for doing the learning tasks. That is creating drawings relating to the content, then articulating their drawings and communicating with peers. These activity phases integrated conceptualization and visualisation (Herga et al., 2014; Ainsworth et al., 2011) with languaging (Swain, 2006; Dalton-Puffer, 2013) facilitated in Learning Conversations (Norris & Bullock, 2017) for mentoring learning and in interviews for research purposes.

Therefore, in the process of doing tasks for achieving optimal learning results, students' purposeful multimodal use of their repertoire provided evidence for mentoring. In return, the teacher-researcher offered and adapted scaffolding to support the process of drawing and using cognitive discourse functions – especially describing, explaining, and evaluating to articulate their conceptual and language learning.

Students completed five drawing tasks with both pictural and written elements to scaffold their articulation of conceptual understanding revealing their thinking and English learning trajectories in this study. Such a combination of visual elements for languaging from Saussure's semiology theory (Meisel & Saussy, 2011) can metaphorically regard students' drawings as the signifier and

the meanings transmitted through the drawings as the signified. In other words, the students' thinking and understanding of the content were signified in their different styles of drawing (5.6) with creatively written text (e.g., speech, thought bubbles, annotations, notes of defining objects and concepts in their drawings), which to some extent encouraged learner creativity (5.11). Similar creative practices that students adopted beyond this case were also shared and described by them in the interviews as follows.

5.7.3 Prior Visual Experiences

Individual students' creativity drawing on prior experiences was revealed when they were describing their previous visual experiences. G3S2 indicated a lower frequency of regular visual practices in her school which instead focuses on skills and knowledge for passing English tests. The school advocated students use visuals as a tool for learning different English thematic content such as designing logos and posters about wilderness survival. However, it may be that an exam-oriented approach focused on learning results via summative assessment can be complemented by creative visual practices with formative feedback promoting learner agency in sustaining learning.

(Interview with G3S2):
T/R: Have you had similar drawing experiences before?
G3S2: Maybe no, I think it's so least because other teacher they just need we to do some test paper, drawing is so least, some teacher will also let we draw, but it's just one or two.
T/R: One or two drawings?
G3S2: Yes.
T/R: What did you draw for these one and two pieces of drawing?
G3S2: You mean in here or other place?
T/R: In other classes, not with me.
G3S2: Oh, ok, one teacher let us to draw sign that you know. And another teacher let we draw some things, that teacher is in…(name of the sample school), in her class, we will draw lots of things.
T/R: What signs or things, road signs?
就是你自己设计一种标识 (it's to design your own logo).
T/R: Design, you design a sign. 这个设计的标识是和你们上课的内容相关吗?
G3S2: Yes …(name of the sample school) 会经常画海报 (often has posters drawing activities), 比如说救生携带的物品 (such as drawing items carried for lifesaving), 制作木筏的过程 (the process of making a raft), 野外求生的那种经历啊什么的 (the experience of survival in the wild or something).
T/R: Wow, that's interesting, did you like it?
G3S2: Yes, I like drawing this things, but I think I am not good at drawing.
T/R: It's ok, so long as you can demonstrate what you want to say on a picture or a piece of paper.

Some visual practices had been adopted for project-based learning (G3S3) and subject-specific learning in the sample school. The ways students described how drawings were used for learning math (G3S5) and science (G3S6) resonate with relevant research on integrating drawing with academic subject learning including science (Forbus & Ainsworth, 2017), biography (Sheredos & Bechtel, 2017), and chemistry (Ryan & Stieff, 2019).

(Interview with G3S3)
T/R: Have you had similar drawing experiences before?
G3S3: Yes, Arctic, once time in… (name of the sample school), I draw Arctic.
T/R: Was it in … (name of the sample school) English class, science class, or geography class?
G3S3: It's a PBL class about the nature.

(Interview with G3S5)
T/R: Have you had similar drawing experiences before?
G3S5: Yea.
T/R: Can you give me an example?
G3S5: It is math class and we learned like…how to say 分数乘除法 (multiply and divide fractions) this words?
T/R: 分数乘除法 - multiply and divide fractions. How did you understand this method through drawing?
G3S5: I draw a square and the first one is a half and I will draw line let the square have two same rectangle, I don't know how to say it. I think I can draw it, like this picture (see the image on the right).
T/R: Okay, let me see, 所以这是你画的 (you drew this)?
G3S5: 嗯 (Yes)
T/R: 所以这个图片是解答分数乘除法对吗?
G3S5: 嗯，比如上面这个二分之一就是现在红色的这个正方形先用蓝线分成两半，再用黄色把这个涂色，再乘三分之二，就是把上面这个二分之一的面积分成三份，然后再取其中的两份用绿色涂色，就这样的. (Well, for example, the above half was divided by the blue line from the red square, then painted yellow and multiplied by two-thirds, that is the above half area that is divided into three parts, two of which were painted green, and that's it.)
T/R: Oh, I got it, that's interesting.

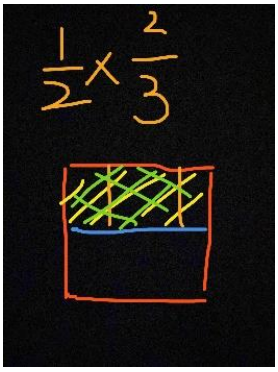


Figure 30. G3S5's drawing in the interview

(Interview with G3S6)
T/R: Have you had similar drawing experiences before?
G3S6: In our own class, like in the science class, there is one about the nature, the teacher let us draw some picture like draw the animals that you think can live on the grassland or something like that, it's only one class, but I think it's gonna be a little be about ecosystem.
T/R: So only one class you did a drawing?
G3S6: Yes.
T/R: Would you like to draw more of that topic, about science?
G3S6: I think yes, and we will have more classes in our school about it, many people say our science class is about like the nature and a lot of things…I don't remember that much, but I still can think about

it…sometimes we draw and sometimes we write, but I think more it's about writing and sometimes we draw too.

During the interview, only G3S6 mentioned that he learned a bit about ecosystems in his science class via Mandarin, not in English class. This study was not only changing the language (from Mandarin to English) but also teaching students new knowledge by building on their prior knowledge. Based on their prior learning experiences, students creating visuals for language or subject learning needed to be guided and encouraged by teachers. In this study, students were supported whilst creating drawings and languaging their understanding which may have enhanced their interest in using drawing for learning. For example, G3S5 demonstrated initiative in drafting a digital drawing (Figure 30) to explain a math question to the teacher-researcher, which was not anticipated in the interview. Then he articulated with the digital drawing to explain how he solved a question of multiplying and dividing fractions: $\frac{1}{2} \times \frac{2}{3}$. This corroborated the potential of *visual languaging* in cultivating students' interest in creating visuals (either traditional or digital drawings) for learning.

Group 2 students in after-class Learning Conversations further emphasised their prior experience of combining visuals with oral presentations for learning, for instance, drawing and retelling an article (G2S1), and designing and articulating posters as a team (G2S2).

(After lesson 2 Learning Conversation with G2S1)
T/R: Have you done some similar drawing practices before?
G2S1: Um, yeah.
T/R: For example?
G2S1: Um, for example, um, in this week, our… (name of the sample school) homework that has one is to um write um draw some image that um and tell the article.
T/R: Tell the article, can you be clearer? Tell what article?
G2S1: The article that is called 'Slip of the tongue'
T/R: What did you draw for this topic, for this article?
G2S1: For this article, I draw six picture because there have six um six signs
T/R: Six pictures for six signs?
G2S1: Umm because it is a reader centre.
T/R: It is reader centre?
G2S1: Theatre, um…it is a kind of play.

(After lesson 2 Learning Conversation with G2S2)
T/R: How do you think about this drawing practice? Have you had similar experiences before?

G2S2: Umm, yes. 就是在课上可以画海报，然后呢后面就是自己来演讲. (It's about drawing posters and talking about it in class.)
T/R: 海报的内容有没有老师规定画什么内容? (Is the content of the posters assigned by the teacher?) 还是你们自己自由发挥? (or depends on you?)
G2S2: 老师规定 (Assigned by the teacher).
T/R: 老师规定的内容，然后你自由发挥画什么，然后上去演讲. (The teacher specifies the content or topic of the posters, then you can draw anything within this range and talk about it in front of the class.)
G2S2: 对. (Yes.)
T/R: 是你一个人画吗? (Did you draw alone?) 还是和其他同学一起 (Or with other classmates?)
G2S3: 是每个人分成每个小组，然后每个小组自己合作来画的 (We were divided into groups and each group drew the posters together.)

These practices echo the process of *visual languaging* for communicating and facilitating learning in this study as iterated in section 5.7.2. Nevertheless, what differentiates this study from their prior visual experiences is the learner-teacher partnership that was gradually constructed as students participated in the lessons and after-class Learning Conversations, and interviews with increasing interest and engagement. Not only the content of their learning was being discussed in those activities but also how best they could learn, the strategies, the thinking, and then practices which they 'owned' were revealed through those activities. These processes need to be sustained requiring learner agency which was noted with students increasing motivation to enhance their English learning. For example, some students spontaneously raised questions about improving linguistic skills for doing English practices (section 5.6.3), and some students intuitively employed written text with pictural representations (e.g., Figures 25 to 27) for demonstrating their thinking. Therefore, this study suggests ways in which learner agency (e.g., creativity and motivation) can be facilitated by learners creating visuals as a demonstrating strategy complementing their process of languaging conceptual understanding whilst being scaffolded. This stance aligns with the four-dimensional PTDL model for deeper learning (Coyle & Meyer, 2017).

Nonetheless, it is anticipated that more discussions with students regarding how their school integrated visuals in teaching may offer deeper insights into extending ways drawings can be used to support regular learning. This can be a research direction for future relevant studies. The

next section will focus on discussing student feedback on drawing-related learning tasks designed in this study for enhancing their English learning.

5.8 Student Feedback on Tasks

With students' drawings analysed and discussed from the researcher's perspective so far, it is also essential to explore visuals from students' perspectives to feed-forward visual-based teaching for learning. Therefore, this theme focuses on students' evaluations of tasks designed for this online case, which can be summarised into three categories: i) the extent of learning tasks in facilitating concept understanding; ii) visual approach; iii) the application of other learning resources (Diagram 8_2).

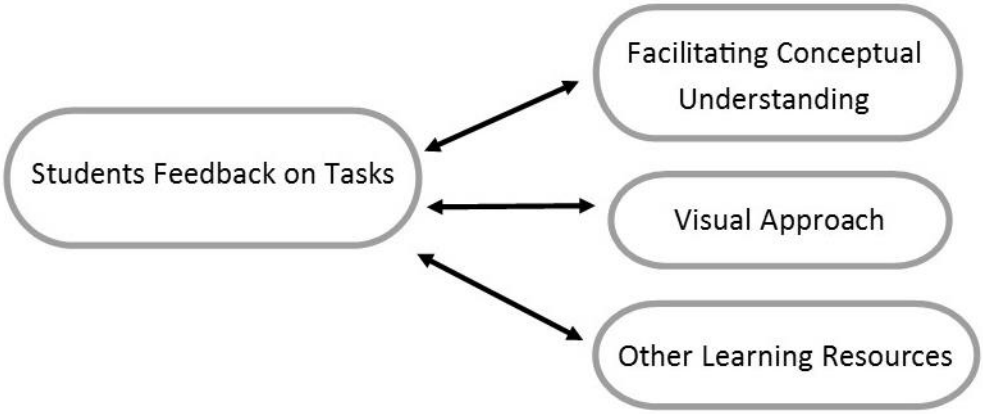


Diagram 8_2. RQ2 theme 5

5.8.1 Facilitating Concept Understanding

Both groups shared a convergence on the effect of visuals in facilitating their conceptual understanding during the interviews, for example, G3S6 evaluated the potential of drawings and writing for enhancing learning. In a similar vein, G3S2 stressed the impact of drawings on both conceptual and language understanding. G2S2 maintained their perspectives and specified learning the concepts (e.g., habitats and ecosystems) via visuals.

(Interview with G3S6)
T/R: How do you think about the drawing and the writing practices we did in the class?
G3S6: I think like the drawing and writing helps us to understand like what we learned, like there's a sentence like the definition, like we learned a definition, and sometimes we need draw our own thinking and it can help us to understand more about the knowledge that we learned.

(Interview with G3S2)
T/R: What did you learn by doing those drawings in the class?
G3S2: First, I think my drawing is not good, but I think I can use my drawing to know about things for this class, like I will draw a habitat, and I know what is habitat, also.
T/R: Do you mean you learned the definition of a habitat by drawing?
G3S2: Yes, and I will know this word clearly.

(Interview with G2S2)
T/R: How do you think about the drawing and writing homework?
G2S2: I think it's great. Because it can let me, uh, uh, it good for me to learn today, it can good for me to learn the knowledge.
T/R: What knowledge?
G2S2: Uh, like habitat and ecosystems.

As students express their thinking, it emerged that they were not only using specific cognitive discourse functions (e.g., describing or explaining how and what they drew and learned) but also triggered their agentic roles in process of completing the drawing tasks, posing conceptual or language questions on their own to address their learning concerns. The integration of *visual languaging* with cognitive discourse functions that promoted learning and learner agency was facilitated by learner-teacher conversations which are also referred to as Learning Conversations. This finding highlights the importance of Learning Conversations in mediating and sustaining students creating visuals for languaging learning using specific language functions whilst receiving scaffolding on their conceptual understanding and linguistic use.

5.8.2 Visual Approach

The drawings in this study were proposed as a heuristic learning tool to support students languaging their conceptual knowledge, hence *visual languaging* was considered the analytical focus. However, it is also worth noting the impact of images that were selected and applied by the teacher-researcher to illustrate the content. Using images that were more comprehensible to students whilst maintaining the cognitive and linguistic complexity of the content was necessary. Therefore, drawing tasks were embedded in the lessons to check students' conceptual and language learning. As students were encouraged to share their drawings and discuss their thinking and opinions, they were naturally offered more dialogic opportunities and scaffolding to shift from memorising to internalizing, thereby enhancing their language use in English. The

drawing tasks also received most students' positive feedback. For example, G2S1 advocated the effect of languaging with drawings for learning and suggested how drawing can be combined with writing in order to assist students to express their thinking explicitly as in the following table.

Interview with G2S1	Commentary
T/R: How about questions for our homework? G2S1: The drawing homework and the writing homework help us to understand better of the class. T/R: Oh, why do you think they helped you understand better? G1S1: Uh, when we practise, when we do the homework, we just know the, what's we don't understand because we didn't know like these questions how to answer, and, um, we finish the drawing homework and on lesson we talk about it and we share our ideas.	*G2S1 provided positive feedback about visualising and articulating her thinking with drawings, which supported her to realise and clarify what she did not quite understand in lessons.*
T/R: I see, so when you finish the drawing homework, we share the drawing homework in our lessons and talk about your ideas, is that what you mean? G2S1: Yeah, I think the drawing homework we can just let student they write the ideas under the picture…Because like you draw this picture and you write your idea and in the lesson we share the idea, some of the students they forget what the idea of them. T/R: I see, okay, so these ideas they wrote down can help them remind themselves of what they were thinking… G2S1: Yea.	*G2S1 suggested combining visual and written tools in students' drawings can support them and encourage reflection and further thinking.*

Table 19. Interview extracts with G2S1

Other students also positively evaluated the potential of combining writing with drawings, such as fostering interest in classroom learning (G3S2), facilitating the meaning-making of peers' drawings (G2S3), and supporting longer memorisation of the content (G3S5). This resonates with Glaser's (2008) positioning of drawing in representing visually recorded perceptions and clarifying and evoking specific memory, which in this case, is long-term memory (Christodoulou, 2017; Ormrod, 2011).

(Interview with G3S2)
T/R: How about the drawing and writing practices we did?
G3S2: I think that is also good, because some teacher in China will do some practice, some test to learn, I think drawing is better than that way.
T/R: Why do you think it's better?
G3S2: Because I don't like to write some test, I think drawing it's a good way to learn in class.

(Interview with G2S3)

T/R: How do you think about the visual and written homework? 你觉得我们的作业有视觉的表达怎么样? (How do you think about the homework with visual representations?)
G2S3: 我觉得他们是画的很好…就是他们画的很细致，旁边也有文字标注 (I think they drew quite well…they also drew in detail with annotations aside).

(Interview with G3S5)
T/R: What helped you to learn those new things?
G3S5: I think this new thing can let me have more let me know the more of the world.
T/R: 那什么帮助于你学到这些新的东西呢? (What helped you these new things?), 我们课堂当中什么帮到你学什么是 ecosystem, 什么是 habitats (like what helped you learn habitats and ecosystem in our class)?
G3S5: Drawing, drawing.
T/R: Anymore?
G3S5: And class, the meaning of the words.
T/R: Do you mean the words in the ppt?
G3S5: Yeah.
T/R: How do you think about our drawing and writing homework, practice?
G3S5: I think it can let me remember it and I think I remember for a long time.
T/R: Remember what for a long time?
G3S5: Like some keywords, some interesting drawing for a long time.

The data indicates the combination of drawing with written text can not only complement students articulating thinking but also make up for their lack of confidence in drawing. The quality of student drawings was not the focus of this study. Moreover, strategies for supporting individual students who lack drawing skills were not adequately considered before conducting this research. As the lessons proceeded, it emerged that adding written text to drawings can make students' thinking more explicit and the process of drawing less challenging or stressful. For example, as addressed in 5.5.1, G3S1 lacked confidence in drawing and expressed his uncertainty in continuously using drawing for learning the lessons. This issue was resolved during Learning Conversations by suggesting trying writing. He then became more engaged in subsequent lessons and drawing tasks as revealed in the way he drew (Figure 25) and described his drawing during in-class Learning Conversations (5.7.2).

Another concern was raised by G3S3 who pointed out the similarity of drawings students made for completing the tasks. Without written text, it would be ambiguous to confirm the difference in individual students' thinking and understanding of the content, which explains why he preferred writing more than drawing.

(Interview with G3S3)
T/R: How do you think about the drawing and writing practices we did in the class?
G3S3: I like these two also and I like writing more…I think the drawing is a little bit of same very time.
T/R: Do you mean you drew a bit similar every time?
G3S3: Yes, a bit of similar
T/R: Would you make it different, how?
G3S3: I think what I can do is every time draw different animals and different habitats.

Drawing alone or combined with writing are both approaches of visualisation, which were intended to develop learner awareness of metacognitive (i.e., knowledge and regulation of cognition) strategies for meaning-making. As students creatively used written text in their drawing for languaging, there were also reflecting on their own thinking, thereby motivating themselves to pose more questions to develop their learning. Therefore, students' preference for using written text (i.e., words and phrases for labelling the visual content) in drawings was advocated as an alternative way to support creativity, which may counterbalance and complement more traditional teacher-controlled practices, all in the quest for motivating and engaging them in learning.

5.8.3 Other Learning Resources

Drawing is one of several tools used by students for learning. Thus, other factors affecting the depth of their conceptual understanding and the sophistication of English language use were considered. For example, the influence of their families and schools on constructing a learning environment, offering available learning resources created and supported by their parents or teachers. During the interview, G3S2 shared multiple resources for learning including reading books, looking at illustrative images, and listening to the English audio transcript of the content. Regarding using digital resources, she recommended a mobile phone application – Alipay and described how habitats and ecosystems can be protected by playing an online game called 'Ant Forest' on this app. With a few clicks on her phone, trees can be planted and grown in sandy and stormy regions in China (Table 18). In a similar vein, G3S6 described digital-mediated learning from the angle of online self-learning courses (e.g., documentary videos of world geography). She watches them regularly with both English and Mandarin subtitles to scaffold conceptual understanding and language development. Another digital application – DingTalk was

recommended and evaluated by students for its convenience in online learning during the pandemic (G2S1) with good sound quality (G2S3), which was also adopted for this study data collection.

(Interview with G3S6)
T/R: 你自己平常课后怎么提高你的 writing 或者关于更多 nature 的 knowledge? (How do you usually improve your writing or learn more knowledge of nature after class?)
G3S6: 我妈在网上给我买了一套世界地理的课，全英文配音的 nature programme, 一节 40 分钟, 一共十几集，然后每一集都是英文，下面有中文字母，不懂的话可以看中文字幕，然后就可以学习更多英语单词， 这种方式我也比较喜欢，因为还可以看很多世界上各种关于 nature 的, 动物啊，地方啊，比如说 cave, what is the biggest cave, 会讲到很多关于地理的东西，相当一个纪录片 (My mom bought me a set of world geography lessons online which is an English dubbed programme about nature with over 10 episodes in total. Each episode is 40min dubbed in English with Chinese subtitles, then I can learn more English words. I quite like this way of learning, because I can watch the word nature including animals, places, such as caves, what the biggest cave in the world is. It covers a lot about geography, like a documentary).

(Interview with G2S1)
T/R: What support or help you have received form our classes?
G2S1: I think I support from our learning machine, our school there is in 2012 there is an epidemic, our school all use QQ to have lesson, but now we use DingDing (DingTalk) to have lesson.
T/R: Ah, you think it's the app helped you to learn the class.
G2S1: Yea.

(After lesson 2 Learning Conversation with G2S3)
T/R: 你觉得这个课堂进行的怎么样? (How do you think about the class?)
G2S3: 我觉得这个课堂进行的挺和谐的，…也很少，不像有些其他的网课. (I think the class went well with very little…unlike other online classes)
T/R: 什么很少 (What's very little)?
G2S3: 噪音 (noise).

Student experiences in employing digital tools for learning both online and in person resonate with the need for digital literacy in 21st-century civic education that aims to develop a range of competencies beyond basic literacy (Sharples, 2016; Fuster, 2017). With the backdrop of the increasingly multilingual and multiliteracy society, such competencies were highlighted by García and her colleagues (2007) as *pluriliteracies* to capture the dynamic and creative nature of literacies development in the plurilingual and sociocultural digital era. From a broader perspective of literacy development, this is the rationale for integrating the PTDL model with the visual languaging strategy in this study.

In addition to digital resources, students also described how other relevant resources supported their current learning. In the following interview excerpts, G3S1 evaluated the effect of combining learning in the lessons with his own book about ecosystems. G3S3 drew attention to his prior knowledge about nature which supported him in learning the topic of habitats and ecosystems along with the images used in the lesson to facilitate understanding. G2S2 summarised learning through both teaching presentations and drawing practices.

(Interview with G3S1)
T/R: What helped you learn these things?
G3S1: My some book have the habitat and ecosystems, and books can help me to learn these thing, and our class also can learn many thing of the habitat and ecosystem.
T/R: Is it the book in your own school or the book you bought?
G3S1: Books I bought.
T/R: What is the name of the book?
G3S1: I don't know how to say it in English, I can use Chinese?
T/R: Yea, you can tell me in Chinese.
G3S1: 生态平衡的重要性 (The importance of ecosystem), 在我的一本科学杂志里的一个文章 (from one of the articles in my science magazine).
T/R: The importance of ecosystem balance.
G3S1: Yea.

(Interview with G3S3)
T/R: What has helped you to learn in our class?
G3S3: Maybe the knowledge about this nature before I learn, and the image help me to know and to write. Pictures and the text.

(Interview with G2S2)
T/R: What do you think has helped you learn?
G2S2: The ppt helps me to learn.
T/R: Okay, and what do you think about the images or pictures we used in the class?
G2S2: I think it's good.
T/R: Why do you it's good?
G2S2: Because I think it can tell me this class is tell me today I will learn what.
T/R: How do you feel about the lessons overall?
G2S2: Uh, uh, I feel the, I feel very good.
T/R: Okay, you said you felt good, 你觉得是哪一方面让你这么觉得 (which aspect of the lessons made you think so)?
G2S2: 就是这个内容 (It's the content).
T/R: Oh, the content, 还有吗 (anymore)?
G2S2: 还有那个, 就是那个绘画的作业 (And the drawing homework).
T/R: Ah, the drawing homework. 还有吗 Anymore?
G2S2: Ah, I think that is.

The integration of students' own resources (book, prior knowledge) with the multimodal resources (teaching materials, drawing practices) provided in this project may enrich their existing repertoire. This is substantiated by their use of-

- translanguaging including bilingual languages (i.e., Mandarin and English) and plurimodal adoption of visuals (drawing, images in teaching presentations) for languaging;
- digital (Ant Forest, geography videos, DingTalk) and other relevant resources (the ecosystem book, prior knowledge of nature) for deepening their understanding of content (e.g., habitats and ecosystems).

These data suggest that their learning was enriched and deepened partially through drawing tasks and with the support of other relevant resources, individual learners in meaning-making and conceptual understanding can be enhanced. Moreover, the synergy of their drawings (either hand or digitally made) and supplementary resources that students described offered insights into how students usually learn on their own and how teaching with visuals can be designed to integrate those resources that students prefer or often use for learning. Such insights can be embodied in future classroom activities or tasks to further support the articulation of learning in English and foster the development of multi or pluri-literacies.

As students visualising and languaging their understanding of the content in Learning Conversations or interviews, their pluriliterate skills (e.g., linguistic, and non-linguistic literacies) were practised whilst being scaffolded by the teacher-researcher via the digital space (DingTalk) advocated by themselves. This suggests that through mentoring, student motivation and engagement in learning are sustained, which represents the foci of the third research question as addressed in the following part.

PART 4. Research Question 3

This part focuses on exploring students' personal feedback on their overall learning experience in this study, thereby gaining a holistic understanding of mentoring learning and learner agency. Derived from the data relevant to mentoring and learner agency, themes and categories specifically addressing the third research question are refined and summarised in Diagram 9.

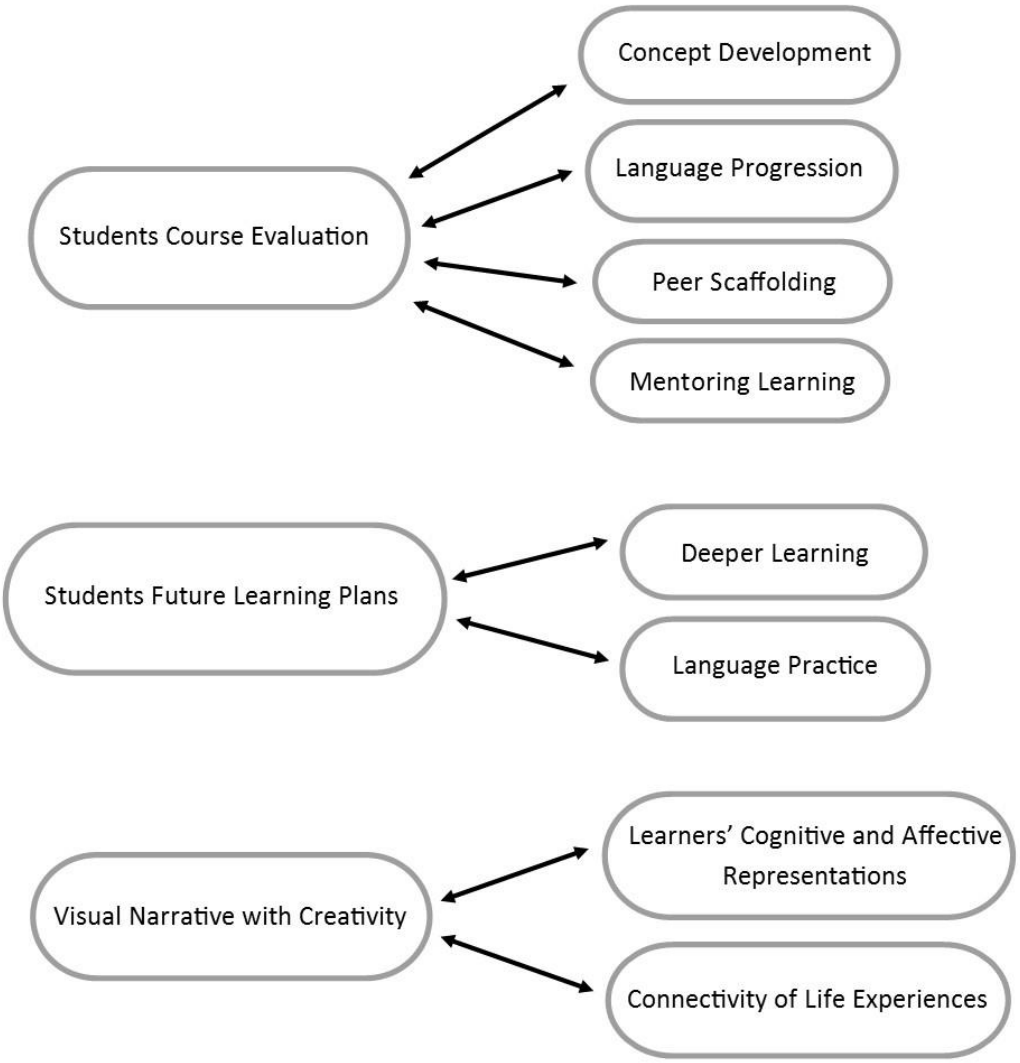


Diagram 9. RQ3 themes and categories

5.9 Student Course Evaluation

Based on the interview data, students' feedback for participating in this online visual learning project was analysed from their evaluations of –

- The learning results regarding their conceptual knowledge and language development (5.9.1, 5.9.2)
- The effect of peer scaffolding (5.9.3)
- Mentoring learning (5.9.4)

These three categories are outlined in Diagram 9_1.

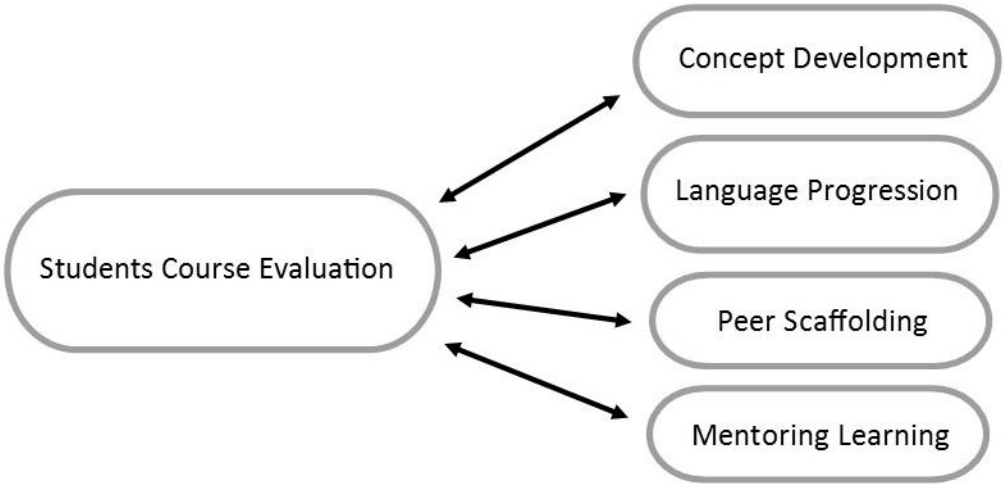


Diagram 9_1. RQ3 theme 6

5.9.1 Conceptual Development

Echoing sections 5.4 and 5.8.1, the data informing this category also demonstrated the depth of conceptual knowledge building via *visual languaging* with a focus on gaining insights for enhancing the quality of online teaching from students' perspectives. Based on the following interview extracts, students described what and how they transferred their knowledge built in this study to other learning contexts, such as to the sample school projects (G2S3) and science tests (as G3S3 described in the interview in 5.6.2).

(Interview with G2S3)

T/R: How do you feel about the lessons overall? 整体上你觉得我们这个课怎么样呢? (What do you think of our lessons overall?)
G2S3: 还可以, 就像一个人拿了一个大麻袋, 感觉满载而归, 对我们… (name of the sample school) 的 PBL 也很有帮助. (It's pretty good, like someone carrying a big sack loaded with stuff back home, it's also very helpful to our PBL course in… (name of the sample school)).
T/R: 什么 PBL 呀 (What is the PBL about)?
G2S3: PBL 就是给我们讲一些有关于动物保护啊, 然后的话, 一些帮助穷苦的人民啊, 一些海报演讲啊 (PBL is about animal protection, helping the poor and poster presentation).
T/R: Oh, 所以对于你们自己学校的课程有帮助 (so it's helpful for the courses in your own school).
G2S3: Yes.

Students also described meaning-making that was ambiguous or unknown to them before. For example, G3S5 evaluated the effect of using drawings and class interaction for enhancing understanding of the content (ecosystems and they relate to habitats) highlighting the potential of peer scaffolding in doing tasks. Such impact of peers co-constructing learning will be further discussed in section 5.9.3.

(Interview with G3S5)
T/R: 那我们的课你获得的帮助有什么 (what help did you receive from our class)?
G3S5: 感觉就是让我认识到了一些不同的方面, 虽然有的单词还是有点模糊, 但是经过互动让我清晰了蛮多蛮多, 比如说第一节课我可能 habitat, ecosystem 不知道, habitat 以前学过但还是有点陌生, 然后 ecosystem 就完全没有听过, 什么都不知道的, 这两个词语以前也没有想过有多少联系, 但是通过这几节课的画图, 互动还有一些理解的意思, 感觉瞬间就出来了, 知道他们的关系和意思了 (It made me realise some different aspects. The interaction made some words clear to me, for example, I wasn't very familiar with habitat though I have learned it before, and I have never heard of ecosystems nor thought about their connections, however, through the drawings and interactions, I know their meanings and relationships.
T/R: Ok, 你说的互动是 (you mentioned interaction) what kind of interaction?
G3S5: 比如之前有个分组的活动 (such as the group task before).

The data above demonstrates that this research was not simply repeating what the students had already done in a different language (i.e., English) but encouraging them to independently transfer their knowledge to other settings. This finding aligns with the conduit of deeper learning as the embodiment of knowledge automatisation (Pellegrino & Hilton, 2012).

5.9.2 Language Progression

As students *languaged* their conceptual development with drawings, their language use in English was also supported through Learning Conversations aiming to enable a meaningful flow of

communication and enhance their linguistic knowledge. The impact of such scaffolding was corroborated in the interviews when students reflected on and described their learning results of specific linguistic development. For example, G2S2 and G3S2 emphasised language progression in terms of spelling, the syntax for sentence construction, and lexis in English.

(Interview with G2S2)
T/R: Can you give some examples of what help you received in the class?
G2S2: Like some like some how to spell the words, I learned many more new words, uh, and how to spell sentence.
T/R: Oh, how to say a sentence, spell 一般指拼写单词 (usually refers to words spelling), 你说的 spell a sentence 你指的是什么含义 (what do you mean by spelling a sentence)?
G2S2: ……
T/R: 你觉得是写一个句子吗，组织一个句子? (Do you mean to write or construct a sentence?)
G2S2: Um, 我觉得是语法 (I think grammar).
T/R: Oh, 语法 (grammar), 句子里的语法(syntax) the grammar of the sentence.

(Interview with G3S2)
T/R: Do you think you practised your speaking and learned some new words from our class?
G3S2: Yes, I think this class is use English to tell me something, it's good, and also that word habitat and ecosystem and food chain I heard it before, and biotic, abiotic and other two I don't heard about before.
T/R: So that's something new you learned?
G3S2: Yes, new word.
T/R: How do you feel about our course overall?
G3S2: I feel, mm… sometimes I feel great, because it's long time…I think I mean this class lots of time using English, I think this is great, it's good at my English.
T/R: Mm, it's good for your English.

The way that students use language for learning and communication not only encompassed an increase of lexis or enhanced understanding of grammar and syntax but also revealed the extent of their linguistic registers. For example, as students articulate their thinking (e.g., describing how their drawings link to the concepts) with written notes on their drawing margins, different registers were used. By reviewing the recordings of the lessons, it was noted that when students were talking to each other about their drawings or conceptual understanding in the lessons, they tended to use an informal register to define concepts with their intuitive expressions of language. Whereas during the interviews and after-class Learning Conversations when they were talking with the teacher-researcher about their learning and perspectives on tasks that were drawing and languaging related, they tended to make their language use more formalised.

Their intention to use English formally revealed their individual language learning needs which offered specific foci for scaffolding. Their informal use of English during whole-class conversations triggered more peer discussions and engagement in online class learning. The extent of student awareness of registers used in these two settings inspired new thinking about how to design teaching to appropriate their language use for adequately expressing and enhancing conceptual understanding. First, there is a need to be aware of when students communicate with peers, it is natural for them to use informal registers. Second, designing tasks could integrate students' informal peer discussions with content learning to complement their formal language use when they communicate with teachers to express their thinking. Scaffolding informal language in peer discussions can focus on facilitating communication whilst formal language in learner-teacher conversations emphasises supporting learners' languaging to describe, explain, and evaluate learning for meaning-making. As guided by Polias' (2016) scientific processes of constructing knowledge with corresponding genres and purposes (Table 1), tasks that enable learners to identify purposeful and genre-based cognitive discourse functions that explicitly scaffold their formal language use are essential. Such nuances between informal and formal registers scaffolding may guide teachers to support learners' language progression with more precision. In this sense, supporting students' informal and formal language use with appropriate linguistic forms is of equivalent importance for conceptual knowledge teaching and learning. By drawing attention to the supplementary role of students' informal language use in peer communication for their formal language use in meaning-making, the potential of peer scaffolding raised its importance for learning, which will now be discussed.

5.9.3 Peer Scaffolding

According to Swain and Lapkin (2011), the process of learners developing appropriate language and conceptual understanding when they communicate their thinking with others can be scaffolded by both teachers and peers. Based on the interviews, their feedback (especially in response to: "how do you think about the help you received in our class?") emphasised the potential of peer scaffolding. The importance of peer scaffolding was also revealed through students' plans for future learning in section 5.10, which provided further insights for adapting mentoring for learning.

The following extracts demonstrate how students receive help from peers. For example, G3S3 and G3S6 described how other students' languaging and drawings support their expression in English and expanded their thinking of the content. Moreover, it is worth noticing that G3S1 and G3S6 both emphasised learning through questions raised by other students that they originally did not think about or know how to answer. This enabled the teacher-researcher to scaffold all students to holistically enhance their content learning by answering such questions explicitly during whole-class Learning Conversations. Such data suggest peer scaffolding also complemented teacher mentoring.

(Interview with G3S3)
T/R: How do you think about the help you received in our class?
G3S3: Um, help from you and also from our classmate. Some time they give me some good evidence.
T/R: What evidence?
G3S3: Just like …(name of a student), once a time I said about Arctic and I forget what animal, she helped me say it.
T/R: And how do you feel about our classes overall, do you have any suggestions?
G3S3: I think it's great now.

(Interview with G3S6)
T/R: How do you think about the help you received in the class?
G3S6: It's maybe about the other students, they can send the picture (drawing) and they are sending to the group, I can understand more, for example, I think the animal on the grassland is elephants, but the other will write other animals like the lion, deer, the things I didn't think of, and I can know more, like the shark in the sea. I think I learned a lot from other, yes.
T/R: From other students when they are talking about the drawings?
G3S6: Yes, and when they are asking questions maybe I don't know the answer, like …(name of a student) I think, he is a small boy, I learned about him, I can know the answers from him, I think it's great.
T/R: If other students answer or ask some questions.
G3S6: Yeah.
T/R: How do you feel about the lessons overall, do you have suggestions?
G3S6: Not really, I think it's really great already.

(Interview with G3S1)
T/R: What help did you receive in the class?
G3S1: Um, I get many help from the teacher and other children.
T/R: How did you get help from other children?
G3S1: Other children ask some question, I also can learn something in that.
T/R: How do you feel about our class overall?
G3S1: 感觉学到了很多东西，感觉非常的不错. (I felt good that I learned a lot.)

Peer scaffolding through the means of providing language resources, sharing drawings, and raising conceptual-relevant questions was triggered by drawing tasks. These tasks were designed to encourage students to articulate and exchange ideas and perspectives regarding their drawings and the content in whole-class Learning Conversations. This was also emphasised by G3S5 in section 5.9.1 that when working in pairs in the third drawing task (i.e., illustrating the relationship between habitats and ecosystems), his conceptual understanding became more clarified in terms of the concept of ecosystems and their relationship with habitats. Students evaluating each other drawings also provided opportunities to practise their language use of describing and explaining their thinking. As mentioned in section 5.5.2, G2S5 evaluated G2S1's drawing by suggesting using pictural representations, which triggered G2S1 to explain why she chose to draw a mindmap (Figure 21). In this sense, in-class Learning Conversations and drawing tasks promoted the effect of collective thinking in peer scaffolding for learning.

In sum, as students articulated their thinking specifically describing, explaining, and evaluating each other's drawings during whole-class Learning Conversations, the potential of peer scaffolding emerged. Holding such conversations with their pairs in the group not only scaffolded students' content and language learning, but also supported the teacher-researcher to understand individual student needs. It was noted through their *visual languaging*, some students needed conceptual clarification whilst some needed guidance in using appropriate linguistic forms. In return, students also provided feedback to the teacher-researcher for mentoring learning online as addressed below.

5.9.4 Mentoring Learning

Mentoring refers to the feedback, support, or scaffolding, which students received for learning in this project. For instance, G2S1 evaluated the classroom teaching in Mandarin: "*不是那么随便, 然后的话不是随便讲一下就过*" *(It's not so casual, and the teacher did not just talk about the content casually and move on to the next part without clear explanation).* Students also offered explicit advice for enhancing the quality of teaching and learning. As G3S5 suggested, every student's camera should be turned on to assure they stay focused and engaged in the

online lessons. In addition, G2S1 and G2S4 both emphasised the importance of questions for assisting learning.

(Interview with G3S5)
T/R: How do you feel about the classes overall, 你有什么建议吗 (Do you have any suggestions)?
G3S5: 我有个建议哈我觉得你可不可以上课的时候把摄像头打开 (I suggest you turn on camera in class).
T/R: 每次我上课都打开了 (I turned on mine every time in class).
G3S5: 不是老师 (not the teacher's), 是成员 (it's the students'), 比如学生在下面低头做其他事的时候 (for example when students bow their heads to do other things), 老师可以看到 (the teacher will be able to notice).
T/R: 因为我也顾及到学生的隐私, 所以没有主动打开, 但这个建议非常好, 让学生融入进来, 那你平常上网课会打开摄像头吗 (Considering students' privacy, so I didn't turn on their cameras, your suggestion is very good as it can engage students more, do you usually turn on your camera when taking online classes)?
G3S5: 一般不怎么上网课, 有一次是几千人一起上网课, 老师经常点不到我, 看不到我 (I usually don't take online classes, there was once I had an online class with thousands of students, and the teacher didn't see me or ask me questions).
T/R: 那可能你口语表达的机会就比较少 (Then probably you had less chance to practice your speaking).
G3S5: 对, 觉得像这种小班的课蛮好的 (Yes, classes like this with a small number of students are pretty good).

(Interview with G2S1)
T/R: 那有什么帮助你去学呢 (What helped you learn this project)?
G2S1: We have some questions and it help us to learn, we find the answer of the questions and we we learn from this…uh, I think we can add more questions.
T/R: May I ask what questions? Is it questions in our class or questions from somewhere else?
G2S1: Question in our class.

(Interview with G2S4)
T/R: 那你觉得在学习中有没有什么方面需要提高 (What aspects of your learning do you think need improving)?
G2S4: 在课堂当中回答问题多一点 (Answer more questions during the class).

By taking a holistic view and analysis of students' feedback for this case study, four key considerations for mentoring learning online emerged.

1. **Task Design:** consider learners' prior knowledge (including their informal language use) related to the content when designing learning tasks that are not only cognitively accessible to them but also deepen their current knowledge. The drawing tasks integrating visualisation and languaging were designed to enhance students' understanding of the thematic content combining drawing (possibly with written notes) and articulation.

2. **Teacher scaffolding:** provide opportunities for learners to articulate their conceptual understanding by focusing on purposeful functional language. In this study emphasis on English language forms for describing, explaining their own drawings and evaluating peers' drawings, were experimented with to develop learner conceptual understanding and language use.

3. **Peer scaffolding:** create tasks to facilitate peer scaffolding. As indicated in 5.9.3, students gained more understanding of the content by informally discussing their drawings and communicating their thinking during in-class Learning Conversations.

4. **Learner feedback:** value learner feedback for adapting mentoring learning. As this case study was conducted in an online setting, therefore, online scenarios, such as turning on students' cameras to keep their engagement and posing more questions to check their understanding need to be considered for future teaching with visuals online. Moreover, as guided by Hattie and Timperley's (2007) feedback model aiming to shift from task processing to self-regulating, students' feedback in this study encouraged their reflection and self-directed learning. They reflected on their learning processes across different tasks (section 5.8) and set appropriate plans for their future English learning, this latter embodiment of learner agency will be discussed in section 5.10 as follows.

5.10 Student Future Learning Plans

This theme including deeper learning and language practice (Diagram 9_2) explores the potential of *visual languaging* for fostering learner agency by discussing students' future learning plans. Data emphasised student desire for developing their conceptual and linguistic knowledge by

setting learning objectives and employing feasible methods to attain them (Benson & Lamb, 2021).

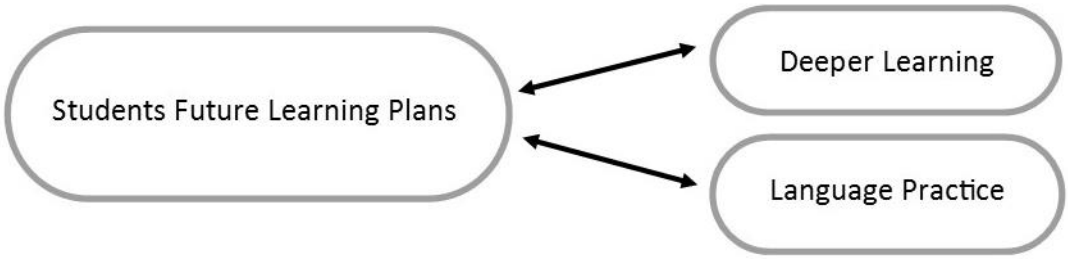


Diagram 9_2. RQ3 theme 7

5.10.1 Deeper Learning

As students spontaneously came up with their own learning plans, they gradually became more engaged and self-directed in learning when they were describing approaches to achieve their learning goals. For example, G3S6 showed a strong interest in learning more about nature through participating in learning activities beyond schooling.

(Interview with G3S6)
T/R: How about improving your ability in event planning and learning nature?
G3S6: Maybe like our 社区举办的一些活动 (some activities organised by the community) and I can improve something of the nature.
T/R: Your community, where you live?
G3S6: Yes where I live.
T/R: What kind of activities have they planned before?
G3S6: About the nature like 沙龙活动 (salon activities), they will give you some sand and you can build a place and you put your favourite animals in it, and you can talk about the animals, the second part you build a food chain, and you talk about it, the third part, you build a place that you like.

G3S3 planned to learn more about fiction and history by reading even though history is not a compulsory subject in his primary school. Whereas G2S1 described her desire to deepen her understanding of ecosystems beyond what she learned from this study (e.g., biotic and abiotic factors, species, and habitats) whilst improving her ability to fully express herself in English.

(Interview with G3S3)
T/R: Is there something you want to learn in the future?
G3S3: In the future, I want to learn some about the fiction and some book that other write.
T/R: Books about what?
G3S3: About stories and about the history.

T/R: How are you going to improve your knowledge about history?
G3S3: Maybe in the class I can say something more.
T/R: In your history class?
G3S3: I don't have a history class; I learn history by book.

(Interview with G2S1)
T/R: What areas of learning do you want to improve?
G2S1: I want to improve about just I think like the like the the ecosystems there are expects animal and some water, mountain, they are abiotic and what else it is in.
T/R: And what else it is…?
G2S1: What in the ecosystem.
T/R: So how do you think what is going to help you learn this part of learning?
G2S1: This part of learning, I just I improve my mm… ex…
T/R: Improve your what?
G2S1: Express of English.

5.10.2 Language Practice

In addition to deepening conceptual understanding, students described what and how they plan to improve their English language forms (e.g., writing, speaking, spelling, pronunciation, and vocabulary). For example, G3S2 demonstrated her motivation in enhancing writing in English by spontaneously doing more dictation practices (teachers dictate words, sentences, or passages for students to write down). Whilst G3S6 expressed interest in taking additional lessons in English writing.

(Interview with G3S2)
T/R: Which parts of your learning do you want to improve?
G3S2: Writing because I think drawing is a good way to learn English, but we also need to writing, because my word, sometimes I cannot write in the correct way.
T/R: How are you going to improve?
G3S2: I think I will do lot of 听写 (dictation), yes, maybe.
T/R: So, some listening and writing?
G2S2: Yes.

(Interview with G3S6)
T/R: What areas of learning do you want to improve in the future?
G3S6: For my own, I like the things about the nature, and when … (name of the school) have the special event about a charity group, I like doing the plants, I like learning about how to make a charity group and do you do a special event and I like learning about the nature.
T/R: So, more knowledge about nature and how to plan an event such as a charity group are something you'd like to improve or know more about?
G3S6: Yes.
T/R: How about English learning?

G3S6: Writing, I like writing, in our… (name of the sample school) class, we will write a little school, one about the adventure, we can write our own story, I like writing for my own.
T/R: So, you want to improve more of your writing?
G3S6: Yes.
T/R: How are you going to improve these things you just talked about, like your writing, your event planning?
G3S6: My… (name of the sample school) class is finish and I think maybe on the English class at the other places, maybe there are writing so I can practice more over there.

Moreover, both G3S5 and G3S1 agreed that reading can enhance lexical foundations though they had different foci for linguistic progression. Based on their interview data, G3S5 was overall confident with his grammar and pronunciation but lacked understanding of words even though he knew how to pronounce and spell them. Whereas G3S1 lacked confidence in English speaking and pronunciation. Their feedback and reflection to some extent offered insights into mentoring in terms of guiding them with consideration of their specific learning needs. For example, after teaching the content, encouraging G3S5 to use new words in doing concept-checking tasks (e.g., the visual languaging task) and answering concept-checking questions can support him to make meaning of the words and deepen his conceptual understanding. In the case of mentoring G3S1's learning, creating opportunities for him to express thinking adequately in both English and Mandarin, from which scaffolding his speaking and pronunciation by offering English language resources such as via directing teaching and modeling in sentence construction and lexical pronunciation.

(Interview with G3S5)
T/R: 那今后学习中你有什么要提高的吗? (What would you like to improve for your learning in the future?)
G3S5: 觉得还是词汇量不够 (I think I don't have enough vocabulary), 语法还可以 (my grammar is ok), 读也没有什么太大问题 (so is my pronunciation), 就是看到这个词会拼会读但就是不知道什么意思 (I don't know the meanings of the words though I can spell and pronounce them).
T/R: How are you going to improve your vocabulary?
G3S5: 有的时候就是读一下英语，早上读一下 (Sometimes I read in English like in the mornings).

(Interview with G3S1)
T/R: Any parts of learning do you want to improve in the future?
G3S1: 我觉得我的英语表达能力还不是很好 (I think my ability in English expression is not very good).
T/R: How are you going to improve your English speaking?
G3S1: 就是多读吧 (Just read more).
T/R: Read what?
G3S1: Some English book.

T/R: 通过读英文书你可以怎么提高口语呢 (How are you going to improve your speaking by reading)?
G3S1: 主要是提高词汇量 (mainly to improve my vocabulary), 然后读音也不是很标准 (and my pronunciation is not very standard).
T/R: Oh, reading some English books can improve your vocabulary and pronunciation?
G3S1: Yes.

Similar to group 3 students, group 2 also expressed similar language concerns (e.g., grammar and spelling), however, with different strategies for improving their linguistic skills. They suggested an integration of self-learning and support from knowledgeable others, which resonates with the constructivist sociocultural theory that foregrounding the importance of social interactions for scaffolding and enhancing learning. According to the following interview excerpts, group 2 students highlighted the potential of parental involvement and peer scaffolding. For example, G2S5 suggested asking classmates or teachers to check her spelling. G2S2 revealed her learning plan about practising English speaking with parents and watching English videos to enhance her capacity in using English language forms with appropriacy.

(Interview with G2S5)
T/R: What areas of your learning do you want to improve?
G2S5: 就是单词的拼写 (Vocabulary spelling).
T/R: What is going to help you improve spelling?
G2S5: 就是那种遇见的那种拼错的单词，写完单词后可以让别人来帮你来检查单词有没有拼错 (I can find others to check my spelling after I finish writing the words that are easy to be misspelled).
T/R: 你指的别人是谁啊，同学老师还是爸爸妈妈 (Who are the others, your classmates, teachers, or parents)?
G2S5: 指的是那种别人，别人会帮助你的那种，比如老师可以帮到 (I mean people who can help you, like teachers).
T/R: 那像同学有的时候帮你查看吗 (Do your classmates sometimes check for you)?
G2S5: 可以 (Yes).

(Interview with G2S2)
T/R: What areas of learning do you want to improve?
G2S2: 就是那个语法 (It's grammar).
T/R: What is going to help you improve grammar?
G2S2: Grammar book. And some grammars questions.
T/R: Oh, 还有什么可以帮到你提升语法吗 (Any other ways that can help you improve grammar)?
G2S2: Use English to talk with my parents.
T/R: Oh, use English to talk with them, 还有么 (anymore)?
G2S2: Look some video.
T/R: Oh, watch some videos. What kind of videos?
G2S2: Grammar.

After students reflected on their learning experiences in this study as discussed in 5.9, they came up with personalised plans for their future English language learning with defined aims and strategies. This echoes Heemsoth and Heinze's (2016) position of self-regulated learners who knowingly set learning goals, select, and adapt strategies to monitor and guide their own progress after reflecting on their learning processes, which also resonates with learner autonomy purported by Benson and Lamb (2021). In this sense, if the students can experiment with their own learning strategies that they believe to be useful for their English learning and possibly make progress, they may become more confident, committed, and agentic in directing and sustaining their learning. Nonetheless, if trialing with such approaches (e.g., peers checking lexical spelling, watching grammatical videos, and taking English training classes) as mentioned in the above interview data appeared less effective for learning, students can continue to make adaptations with guidance from teachers who can provide personalised feedback based on their current learning conditions, results, and progress. That is, students can further refine and construct new approaches to achieve their personal learning goals with teachers' support and guidance.

This process of implementing and testing students' own learning strategies and making adaptations for realising their learning goals can prepare them to become and be self-regulated learners through developing cognitive and metacognitive awareness (Heemsoth & Heinze, 2016; Winne, 2021). To be specific, when students reflect on their own ways of thinking, evaluating, and adapting their strategies for learning including problem-solving and decision-making, they may develop an awareness of their learning processes and actively control them for accomplishing future learning goals. This process of learning progression and mindset growth requires teacher mentoring. According to Fullan and Langworthy (2014), teachers need to have "sophisticated pedagogical capabilities" or more precisely "expertise across a repertoire of different teaching strategies" to design classroom learning and continuously evaluate "where students are in their learning progressions" (p. 8). This highlights the importance of teachers' pedagogical capabilities for providing appropriate mentoring. In this sense, the integration of students' reflection, cognition, metacognition, and teachers' professionalism can enhance learning and promote learner growth.

As guided by the PTDL model, this integration also aligns with the pluriliteracies teacher-learner partnership for deeper learning. According to Coyle and Meyer (2021), as learners reflect on their strategies for constructing different types of knowledge (conceptual, procedural, and strategic or metacognitive) with teachers' mentoring, they can develop the mindset of sustaining and directing their own learning, thereby facilitating the process of applying what they have learned to other novel and challenging situations. Such a mindset enables learners to know and believe they have the capabilities to learn and gain personal insight from all learning experiences and produce initiatives for realizing knowledge automatisation (transfer), which is crucial for deeper learning (Pellegrino & Hilton, 2012). Having discussed students' directive roles in their future learning, other considerations of learner agency as emerged from the data will be delineated as follows.

5.11 Visual Narrative with Creativity

Based on students' languaging, the emergence of learner agency was also interconnected with their cognitive and affective representations and life experiences (Diagram 9_3) as revealed from their drawings. Such interconnection was derived from students –

- using their preferred drawing styles and written text to demonstrate their thinking and conceptual understanding (sections 5.5, 5.7, and 5.11.1),
- recalling prior visual learning practices (section 5.7.3),
- redirecting their future English learning with purposeful goals and actions (section 5.10),
- relating their personal life experiences with the drawings they created (section 5.11.2).

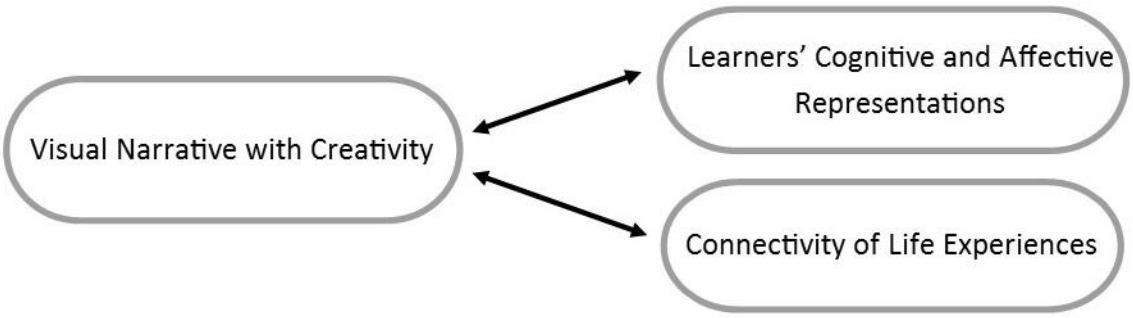


Diagram 9_3. RQ3 theme 8

These four phases of student activities for learning are in line with Huang's (2017) five categories of reflection (5Rs) including:

- recalling (e.g., recalling an event or learning episode),
- recapturing (e.g., capturing challenges, accomplishments),
- relating (relating to previous personal experience),
- rationalising (e.g., understanding and creating meaning from all experiences)
- redirecting (e.g., directing future learning with purposeful thinking and actions).

Resonating with Huang's (2017) '5Rs', the way each student reflected on their thinking and learning in this study is interdependent with how they recalled their previous visual learning experiences, redirected their future English learning, and related visuals to their life. These elements of reflection can vary based on each student's different life and learning experiences affecting how they feel, think, draw, and learn, which will be detailed below.

5.11.1 Learner Affective and Cognitive Representations

Resonating with Huang's (2017) '5Rs', students reflected on their prior visual learning experiences and future English learning plans by relating visuals to their learning. The visuals students created in this case study also revealed how they felt, thought, and learned. Moreover, as Ni (2012) espouses, emotions, feelings, mood, and so on are affective factors crucially impacting second language acquisition. This also raised the importance of addressing students' affective factors in order to understand how they learned English as a second or additional language, which can provide insight into English teaching.

Students' affective factors were identified by the way they visually represented their thinking. Some students spontaneously combined written text with their drawings to demonstrate their understanding of the content, from which their different emotions were identified. As discussed in section 5.7.2, existing habitat problems and ways of protecting the environment as depicted in G3S2's drawing (Figure 26) infused her empathy for the bird losing its habitat due to over-lumbering as accentuated by the tree stumps and human intervention. This feeling was made visible in the action of drawing. In a similar vein, G2S2 drew a dolphin inhabiting the ocean with

a diver riding on its back (Figure 31). The way he depicted his favorite animal and habitat for the first drawing task to some extent represented his wish for harmonious co-existence between humans and ocean creatures. As he further described in lesson 1 whole-class Learning Conversation: *"The dolphin is catch the fish and this man is on the dolphin to play, they is living in ocean, he can catch the fish to eat."*

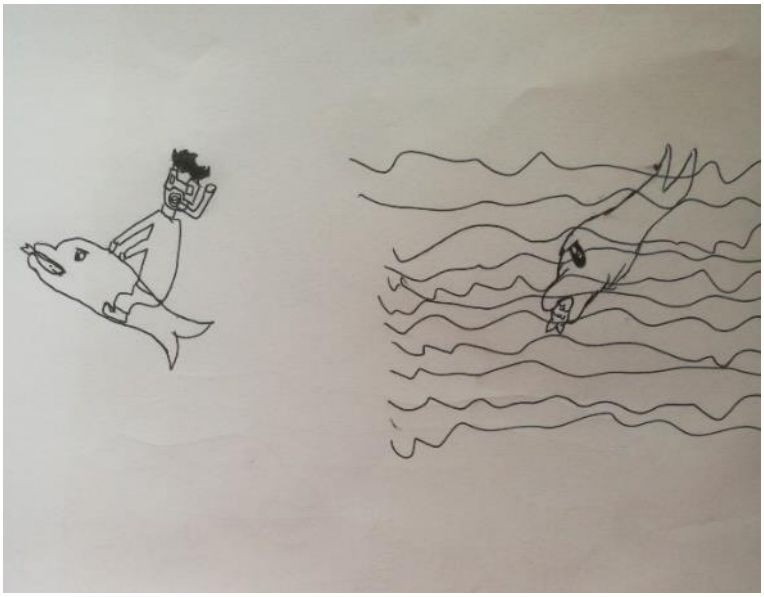


Figure 31. G2S2's first drawing

Given the teacher-researcher comes from an art background, unfolding student thinking through drawings was also taken into account. It was anticipated that by nuancing the way students visualise their conceptual understanding, their unique perceptions, memory, and experiences relevant to the content can also be revealed and used for mentoring learning. As indicated by Silver (2001), Cicalò (2020), and Glaser (2008), children's thinking or cognition can be revealed from and recorded by their drawings when they create inner images on an external surface. Students' improvised use of colours and lines for drawing was also a representation of their inner selves. As shown in the following figures, G2S5 and G3S5's thinking of coexisting species within a habitat was revealed with their creative use of lines and colours. They both decided to draw the ocean as the habitat with co-existing sea creatures, however with different visual content. It was noted that G2S5 used more subtle lines to depict some fish, a crab, and a jellyfish whereas G3S5

used more bold and random lines to highlight the intense atmosphere of a shark hovering over some fish and seaweed. Another compelling difference is the nuanced receding purplish colours of the ocean in G2S5's drawing (Figure 32) compared to the typical blue as rendered in G3S5's drawing (Figure 33).

Figure 32. G2S5's second drawing

Figure 33. G3S5's first drawing

These visual differences represent individual students' perceptions of the world (ocean, sea creatures), from which their creative visual representations emerged. It was acknowledged that the quality of the drawings was not important since their function is to trigger languaging opportunities. Instead, students' intrinsic visualisations through drawings were essential and encouraged because their function is to demonstrate conceptual understanding or express their unique thinking. As G3S5 articulated in Lesson 1 whole class Learning Conversation: "*I think it is so cool, I draw a shark and it is in ocean and I draw small fish swim, also in the ocean, I think this shark didn't see these fish because I want to draw a people was run but the time is up and I doesn't draw."* Interestingly, he also gave an alternative explanation that the person was swimming and trying to escape from the shark and therefore clarifying why he did not draw the person in his drawing (Figure 33), which led to discussion triggered by a perceived limitation of the medium. Whilst G2S5 emphasised describing other sea creatures in lesson 2 Learning Conversation: *"I think crab can eat and the crab is delicious… eat by me…because I think the jellyfish is cute, that*

two fish is goldfish because I think goldfish live in the sea." Based on G2S5's *visual languaging* as triggered by her drawing (Figure 32), the teacher-researcher was able to clarify G2S5's understanding that goldfish inhabit freshwater rather than saltwater.

This is one of the scenarios where *visual languaging* supported the teacher-researcher to capture students thinking and offer defined scaffolding to deepen their conceptual understanding. Other scenarios where mentoring was supported by *visual languaging* were discussed in sections 5.5 and 5.7.2. For example, as students *languaged* their drawings (Figures 12, 16, and 17), their conceptual understanding was monitored and guided by the teacher-researcher that habitats involve the elements of different animals and food for survival. Meanwhile, student language use was appropriated by the teacher-researcher during Learning Conversations triggered by student drawings (e.g., sections 5.4.2 and 5.6.1). Therefore, drawing as an alternative way to activate students' thinking or cognition provided visual evidence for mentoring learning.

Students' creativity in drawings was also triggered by different requirements of the drawing tasks designed to encourage their practice and communication of the content. For example, Figures 34 and 32 created by G2S5 appeared different in styles, content, and levels of detail for drawing tasks 1 and 2. To reiterate, drawing task one was to visually represent students' favourite animals in their corresponding habitats while drawing task two required them to depict coexisting animals in the habitats they drew for task one. Students creating drawings for different tasks enabled the teacher-researcher to learn more about each student's unique ways of thinking and representing conceptual understanding, which was encouraged and supported via Learning Conversations to enhance their content and language learning.

Figure 34. G2S5's first drawing

Figure 32. G2S5's second drawing

Moreover, students' shared understanding using visual representation was also noted. Considering the affordance of the DingTalk platform, students were able to share their drawings with peers and the teacher-researcher in or after lessons. Some students' process of visualisation might have been influenced by others who posted their drawings on the platform during the lessons where all students could see and discuss upon. This probably explains the similarity between figures 33 and 34 below though they were drawn by two students. However, their thinking was different based on G2S5's *visual languaging* in lesson 1 whole-class Learning Conversation, which instantly made sense to the teacher-researcher and peers.

(Lesson one whole class Learning Conversation)
G2S5: I thought draw a jellyfish fly in the sea and this jellyfish is…is white,
T/R: Why did you draw the jellfish white and fly in the sea?
G2S5: Because I just like jellyfish, because jellyfish fly in the sea that is very beautiful.

Figure 33. G3S5's first drawing

Figure 34. G2S5's first drawing

This corroborated the importance of integrating visuals with languaging for meaning-making as students' visuals are not always explicit and their underpinning thoughts may be different even though their visuals appear to be similar. Moreover, this combination gave the teacher-researcher clear direction or focus on scaffolding individual students. For example, some students needed more guidance in conceptual understanding (5.5) whilst some needed linguistic scaffolding in terms of using appropriate language forms in their academic discourses (5.6).

In sum, the processes of students creating and languaging their own drawings provided them with opportunities to express their unique thinking, perceptions, or experiences. Some drawings shared visual similarities (e.g., Figures 21, 22 for the third drawing task, Figures 33, 34 for the first drawing task), however, their conceptual understanding and the ways of verbally describing, explaining, and evaluating their drawings were different. Such differences revealed from *visual languaging* offered evidence and insights for specific scaffolding which was provided via whole-class and after-class Learning Conversations (e.g., Tables 17 and 14). Learner affective and cognitive factors as represented so far concern their emotions, creativity, and conceptual understanding identified through drawing and languaging using specific language functions. This will be revisited for the third research question in section 6.3. Next, the links between student life experiences and their drawings will be detailed.

5.11.2 Connectivity of Life Experiences

The data suggest that student drawings related to individual life experiences as set out in Huang's (2017) '5Rs' – recalling and relating memories of personal life with new learning. For example,

figure 35 demonstrated a link between the concept of habitats and the cat in G3S6's daily life. Based on lesson 1 whole-class Learning Conversation, she related her understanding of habitat to real life: *"The first drawing is my cat and it lives in her cat house and probably sometimes on my bed, I think its habitat sometimes is in cat house playing and sometimes on my bed sleeping"*. As she described that her cat has two habitats (i.e., her bed and its house), the teacher-researcher was able to naturally draw attention to the whole class that one kind of animal can live in multiple habitats.

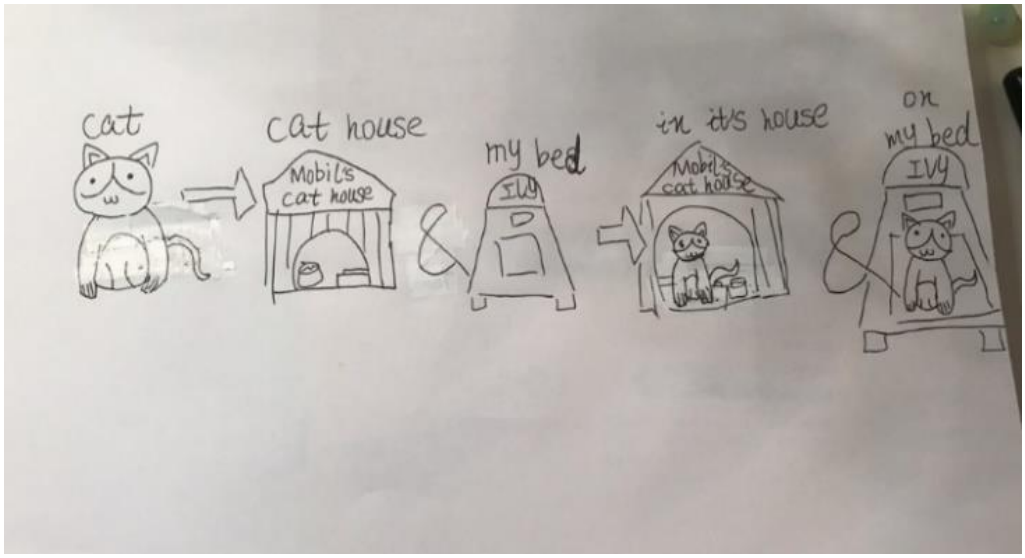


Figure 35. G3S6's first drawing

In a similar vein, G3S4 drew a house cat and a wild cat (Figure 36) and explained in lesson 1 Learning Conversation: *"I draw the four cats, the two is in the grassland and another two is a house that we build, my friends have two cats, these mice is food for the cat and that bird is the food for cat too, because it's in the grassland and I think there might be birds so I draw a bird and cats also eat birds too"*.

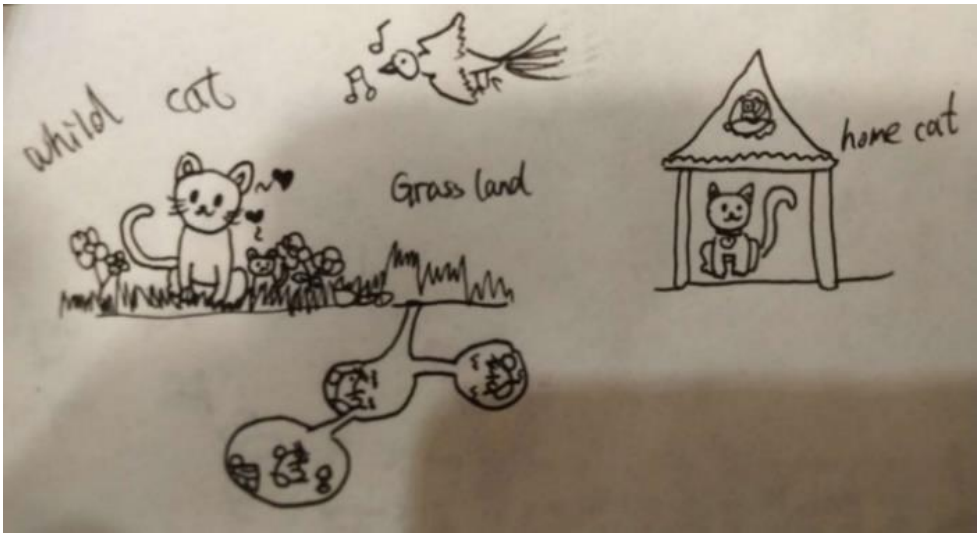


Figure 36. G3S4's first drawing

Both students illustrated feline habitats yet their languaging differed due to life experiences (i.e., G3S6 focused on the multiplicity of habitats while G3S4 expressed how habitats provide food for animals to survive). This demonstrated individual student learning foci and progression. As they were encouraged and scaffolded to articulate their understanding of key concepts (e.g., habitats) with an emphasis on using appropriate language forms in describing, explaining, and evaluating, their language skills for deepening conceptual development were honed and enhanced (e.g., section 5.6.1, 5.9.2).

Moreover, the process of students languaging with personal experience resonates with Priniski et al.'s (2018) 'relevance continuum' (Figure 11), where 'personal association' was embodied as students associated their personal life with the content and made practical plans to enhance their English language learning, from which 'personal usefulness' was revealed. That is students gradually realised the usefulness of doing *visual languaging* practices for conceptual and language learning whilst being scaffolded through Learning Conversations. For instance, as indicated by their feedback, students evaluated how drawing tasks enhanced their conceptual understanding and triggered their use of other resources (e.g., visual or digital) for future English learning (5.10). Therefore, the increasing personal meaningfulness of practising English was constructed when students were supported in drawing and languaging their learning in this case

study and can be continuously promoted and supported as students put their future learning plans into practice.

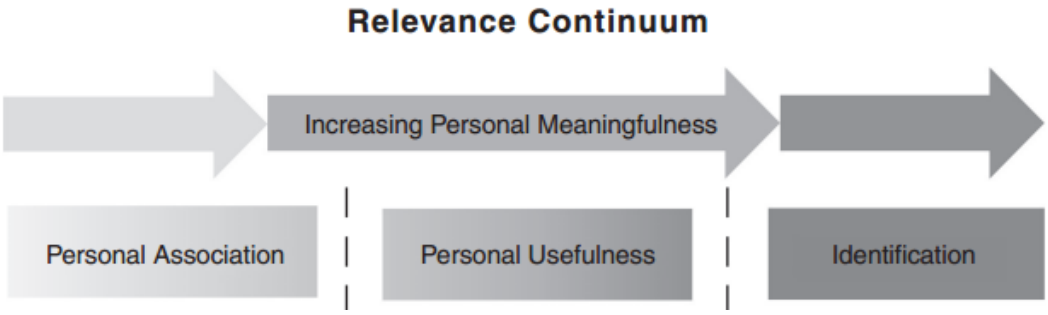


Figure 11. Relevance Continuum (Priniski et al., 2018)

The extent of *visual languaging* fostering learners owning and directing their learning was investigated through the lens of affective and cognitive factors. These factors include student feelings, creativity, conceptual understanding, and life experiences depicted in their drawings and verbalised by languaging during Learning Conversations. The data suggest that *visual languaging* made transparent the process of student conceptual and languaging learning as it represented how students interpreted the new content, which also offered insights into adapting mentoring. For example, the teacher-researcher can scaffold students to engage in the drawing tasks by integrating the written text to express their thinking regardless of the quality of the drawing (e.g., Figure 14), and deepen student conceptual understanding and language of constructing description and explanation of the content via direct teaching and modelling academic discourses through Learning Conversations (e.g., Table 17).

To conclude, the combination of visualisation and languaging in this study concerns drawing and language practices, which involved materialising abstract concepts through visualisation, languaging the artefacts (i.e., drawings) in Learning Conversations, and demonstrating understanding using specific language functions with appropriate language forms. This process also involved scaffolding from the teacher-researcher and peers through Learning Conversations. Therefore, as guided by the PTDL model, the learner-teacher partnership as mediated via Learning Conversations sustained the potential of *visual languaging* for enhancing learning and teaching with the ultimate goal of realising deeper learning (Coyle & Meyer, 2021).

PART 5. Chapter Summary

This chapter discussed findings that emerged from the Main Study to explore the potential of *visual languaging* for online English learning drawing on the Pluriliteracies model. It addressed how *visual languaging* can interweave with content and language, cognitive discourse functions, mentoring, and learner agency as emphasised in the research questions. Each research question was addressed with corresponding themes and categories, derived from the visual and verbal data including participants' drawings and their utterances in Learning Conversations and interviews. By reflecting on the data as presented in the eight themes, key findings emerged below:

- Students' content and language (language needed for describing and explaining the content) development were enhanced by *visual languaging* mediated through Learning Conversations.
- Students' feedback provided insights for mentoring learning with visuals online, such as combing drawing with writing, designing tasks to facilitate peer scaffolding, encouraging students' individuality in terms of their unique ways of feeling, thinking, and visualising their conceptual understanding as revealed from their drawings.
- Students' future learning plans to some extent demonstrated their agentic roles in learning.

As shown below, Table 20 is adapted from Table 8 after analysing the Main Study data. It explicitly illustrates the methods adopted for generating the themes and categories from Groups 2 and 3 students' data in the right column, which are linked with the research questions in the left column, respectively.

The first research question proposes *visual languaging* as a learning tool bridging conceptual and language development, which was investigated from the angles of concept construction (5.4), concept enhancement (5.5), and language learning (5.6).

The second research question explores the role of *visual languaging* in the appropriacy of developing learner understanding of the use of cognitive discourse functions, which was

scrutinised through the lens of visualisation (5.8), and students' feedback for the learning tasks (5.9).

The third research question links *visual languaging* with the teacher-learner affective domain analysed from students' course evaluation (5.11), future learning plans (5.10), and visual narrative with creativity (5.11).

Research questions	Data sets	Themes	Categories	Group 2	Group 3
				Methods	
RQ1. In what ways might visualisation serve as an intermediary learning tool (visual languaging) that bridges knowledge construction and language learning in EFL classrooms?	Transcriptions of interviews and Learning Conversations	**Concept construction**	Concept description	Interviews, Learning Conversations	Interviews, Learning Conversations
			Concept review	Learning Conversations	Learning Conversations
			Deepening understanding	Interviews, Learning Conversations	Interviews, Learning Conversations
		Language learning	Building linguistic forms	Interviews, Learning Conversations	Interviews, Learning Conversations
			Applying thematic language in another context	Interviews	Interviews
			Language strategies	Learning Conversations	Interviews, Learning Conversations
	Learner-created drawings	**Concept enhancement**	Pictural representations	Visual participatory method	
			Mindmaps		
RQ2. How can students develop their appropriate use of specific cognitive discourse functions through visually	Transcriptions of interviews and Learning Conversations, Learner-created drawings	**Visualisation**	Visual understanding	Interviews, Learning Conversations	Interviews
			Visual languaging	Interviews, Learning Conversations, drawings	Interviews, Learning Conversations, drawings
			Prior visual experiences	Learning Conversations	Interviews
	Transcriptions	**Student feedback on tasks**	Facilitating concept understanding	Interviews, Learning Conversations	Interviews

scaffolded languaging?	of interviews and Learning Conversations		Visual approach	Interviews, Learning Conversations	Interviews
			Other learning resources (e.g., digital tools)	Interviews, Learning Conversations	Interviews, Learning Conversations
RQ3. a) To what extent can visual languaging support teachers in adapting mentoring online?		**Student course evaluation**	Conceptual development	Interviews, Learning Conversations	Interviews
			Language progression	Interviews	Interviews
			Peer scaffolding	Interviews, Learning Conversations	Interviews
			Mentoring learning	Interviews	Interviews
b) How might visual languaging foster learner agency?		**Student future learning plans**	Deeper learning	Interviews	Interviews
			Language practice	Interviews	Interviews
	Learner-created drawings	**Visual narrative with creativity**	Learners affective and cognitive representations	Visual participatory method	
			Connectivity of life experiences		

Table 20. The updated themes, categories, methods of the Main Study for RQs

After finalising the themes and methods for each research question, the next chapter will discuss how such themes answer the research questions, from which the alignment between *visual languaging* and the PTDL model forms. This alignment will also be visually represented as a rotating 3D mechanism depicting how the pedagogic strategy – *visual languaging* critically complements the PTDL model for deeper learning.

Chapter 6. Discussion of the Research Findings

6.1 Chapter Introduction

This chapter focuses on discussing the findings as presented in Chapter 5 in order to answer the research questions. To reiterate*, visual languaging* describes learners elaborating their thinking and understanding of knowledge through self-created visuals in Learning Conversations, especially in situations when learners do not have the appropriate linguistic means to articulate learning in the target languages. Taking this study as an example, drawings were created and used as a heuristic tool supplementary to the oral expression of students' conceptual content understanding. When it was challenging for students to articulate in English or draw their thinking fully, multimodal text (i.e., words and phrases for labelling or annotating the visual content) was suggested and used by students in various styles. With visual, oral, and written data analysed in Chapter 5, the following sections will delineate how *visual languaging* when integrated with Learning Conversations can address the research foci about conceptual and language learning, cognitive discourse functions, mentoring, and learner agency.

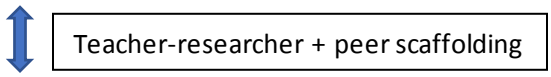
6.2 Discussing Research Question One

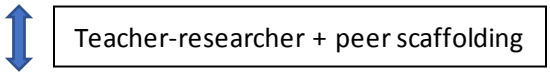
Both students' pictural representations (section 5.5.1) and mindmaps (5.5.2) demonstrated their understanding of the content by representing how they used visuals to explore the content (e.g., habitats, ecosystems, and their relationships) and articulating their thinking by using specific language functions during in-class Learning Conversations. For example, some students described how their learning progresses, some explained their understanding of the content, and others asked the teacher-researcher questions to further improve their learning. These two categories of concept enhancement (5.5) provided insight for the teacher-researcher to investigate the potential of *visual languaging* in linking and supporting learners' conceptual and linguistic development. This theme complements students' concept construction (5.4) and language learning (5.5), which are mediated in Learning Conversations with supplementary images used for teaching.

Findings suggest that Learning Conversations enabled students to articulate their drawings whilst receiving ongoing conceptual and linguistic scaffolding from the teacher-researcher. As Black and

Wiliam (2009) note, scaffolding learners using dialogic strategies can provide teachers with evidence for explicit formative feedback. Moreover, students' drawings provided visual evidence that triggered peer conversations where peer scaffolding emerged (Swain & Lapkin, 2011). During the whole-class Learning Conversations, students constructed conceptual knowledge by visualising and communicating their understanding of the content with peers and the teacher-researcher using language(s) (i.e., English and or Mandarin) mediated through Learning Conversations and using their prior knowledge in new ways – visualing and verbalising self-made drawings. By drawing on three themes as discussed thus far, the potential of *visual languaging* bridging the development of concepts and language can be addressed in three stages scaffolded by peers and the teacher-researcher to answer the first research question:

> RQ1: In what ways might visualisation serve as an intermediary learning tool (*visual languaging*) that bridges knowledge construction and language learning in EFL classrooms?

Stage one: Visualisation – students create drawings to represent their conceptual understanding, 

Stage two: Languaging – students verbally *language* their drawings and conceptual understanding using their prior language, 

Stage three: Cognitive discourse functions – students were guided to use specific CDFs to enhance their conceptual understanding and academic use of language in the process of visual and verbal languaging.

It was noted that students had some conceptual misunderstandings, linguistic form mistakes, or lack of confidence when they were drawing and languaging. This raised the importance of the teacher-researcher's scaffolding. Take examples of G3S1 (Figure 14 in Chapter 5) and G2S1 (Figure 21 in Chapter 5), mentoring their process of visualising and languaging the conceptual content (e.g., ecosystem) by supporting them to use alternative approaches (i.e., written notes) to represent their thinking when they lacked the willingness or *perceived* artistic skills to visualise (a lion or an ecosystem) appeared necessary and effective in building their confidence and engagement to continuously depict and communicate what they intended to represent.

Through these three stages, individual students' needs can be identified for the teacher-researcher to offer support focusing on scaffolding their conceptual understanding and appropriate language use, thereby facilitating their self-agency and self-belief mindset building. For example, supporting students to use appropriate linguistic forms in their languaging, designing learning tasks that trigger peer conversations or scaffolding, and challenging and encouraging students to practice using language functions (e.g., describing and explaining the process, meaning, or reasons for their visual compositions, evaluating peers' drawings with constructive feedback).

Therefore, the nature of the teacher-researcher's scaffolding is essential in facilitating the successful operation of these three stages to integrate knowledge construction and communication through visually and verbally articulating the content. This integration that requires the teacher-researcher's role in guiding students to enhance learning resonates with the pluriliteracies view of teacher-learner partnerships (Coyle et al, 2018). According to Fullan and Langworthy (2014), learning is co-constructed by both learners and teachers building on respectful, transparent, mutual learning goals or benefits. Such rapport in this study was built on mutual respect and trust aiming for promoting students' English language learning, which was realised and reinforced from two angles:

- The teacher-researcher needed to consider, identify, and feedback on students' voices, interests, and specific learning needs in designing the lesson content and providing conceptual and linguistic support throughout the research activities.
- The students constantly communicated with the teacher-researcher and asked for feedback on how to solve their existing English learning problems (5.6.3), reciprocally, they also offered the teacher-researcher feedback on how to improve teaching with visuals during the interviews (see section 5.9 in Chapter 5).

To holistically answer the first research question, the supportive role of the teacher-researcher in realising the potential of *visual languaging* in the previously mentioned three stages, appeared to be essential. This also echoes the focus of the third research question which explores how

mentoring can be adapted based on *visual languaging*, which will be further discussed in section 6.4.

6.3 Discussing Research Question Two

To reiterate, the theme – visualisation (5.7 in Chapter 5) encompasses two forms of visuals:

- Images that were chosen by the teacher-researcher to visualise the thematic content for facilitating students' conceptual understanding (5.7.1).
- Drawings that were created by students to visualise their conceptual understanding and articulate their understanding using cognitive discourse functions (5.7.2).

As students experienced these two stages of the visualisation process, they were able to evaluate how visuals facilitated conceptual understanding (5.8.1), offer feedback on the complexity of the conceptual content and the integration of visuals with written text (5.8.2), and other learning resources (5.8.3). Hence, the theme – students' feedback on tasks (5.8 in Chapter 5) emerged from their evaluations providing insights for integrating the pluriliteracies model with this study as discussed in the previous section.

Derived from the way students visualised and verbalised their thinking and conceptual understanding, they constructed and enhanced knowledge of the content via *visual languaging* by using three types of cognitive discourse functions (CDFs) – describing, explaining, and evaluating based on Dalton-Puffer's (2016) seven categories of CDFs as reviewed in Chapter two. In this sense, through specific teacher support, students' language use of CDFs was triggered and complemented by *visual languaging*, which aligns with the key components of the second research question:

> RQ2: How can students develop their use of specific cognitive discourse functions through visually scaffolded languaging?

RQ2 intends to explore how languaging learning with self-created drawings can develop students' appropriate language use of cognitive discourse functions. As illuminated by the verbal and visual data collected and analysed so far, it was noted that the language students used to evaluate

peers' drawings and their learning experience with this case study was based on their prior linguistic knowledge, which was not directly taught by the teacher-researcher. Nonetheless, the evaluation constructed by students triggered their reflection on learning, providing feedback for their own future learning plans and online teaching with visuals. Whilst encouraging student spontaneity to actively engage in making their own meaning using prior knowledge, the teacher-researcher directly taught them to construct and use academic language to *describe* and *explain* their conceptual understanding in order to deepen their learning. Therefore, students' articulations of their own drawings mainly revolved around two CDFs –

- Describing (and when mentored explaining) the content of their drawings involving what they planned to depict when they were cognitively processing the drawing tasks.
- Explaining their conceptual understanding that underpins their drawings through Learning Conversations to further deepen their learning.

Describing is used to relay the main points of concepts that students learned in the lessons with the guidance of content and language input by the teacher-researcher (e.g., 5.4.1, 5.6.1). To build learning on this surface practice, describing is then deepened into explaining students' conceptual understanding through drawing tasks as learner output. That is students showcase and articulate their drawings whilst being scaffolded via Learning Conversations. In other words, students demonstrated some conceptual understanding when describing the concepts, providing a foundation upon which their explanation was built. For example, explaining how they engaged in meaning-making (e.g., the meaning made via the images used for teaching), and the rationale of their drawings (e.g., why thought or perceived the content and draw in certain ways).

In this sense, explaining was not only intended to answer the teacher-researcher or peers' questions that emerged during Learning Conversations but also provided opportunities for articulating their thinking and deepening conceptual understanding. It functions as a practice for learning progression that students experienced from describing to explaining. Simply put, describing is the first stage in demonstrating some understanding but that deeper understanding

requires explanation triggered by their drawing and languaging mediated in Learning Conversations. This is the link between describing and explaining as found in this study.

It was worth noting that the ways students used describing, explaining, and evaluating for languaging their drawings resonate with the pluriliteracies knowledge pathways – doing, organising, explaining, and arguing (Meyer et al., 2015). The purpose of students' using these three CDFs also became evident when they were languaging in Learning Conversations. That was to make meaning of the content and develop conceptual and linguistic knowledge, which in this study was usually triggered by describing their drawings, explaining their thinking revolving around the content, and evaluating peers' drawings and this case study's visual learning experience. Hence, describing, explaining, and evaluating were frequently used by students with describing and explaining emerging as critical discourse functions for deepening students' content and language learning.

This can be evidenced by student language use in describing and explaining what was taught in the lessons (5.6.1) whilst being scaffolded via whole-class or individual-based Learning Conversations when they were languaging with their drawings. The drawings made visible student thinking and complemented their language capacity to fully express themselves in English with Mandarin as linguistic aid for meaning-making. This allowed the teacher-researcher to provide scaffolding for personalised learning concerns, such as clarifying conceptual misunderstandings and supporting their use of appropriate language forms and academic discourses. Students increasing language appropriacy and complexity were corroborated when they were asked to write their understanding of the key concepts in English with their own words as an after-class language and concept-checking practice. For example, G2S5 wrote and photographed her understanding of habitats and ecosystems after the first two lessons (Figures 37 and 38). It is worth noting the increasing sophistication and appropriacy of her English language in describing concepts of habitats and ecosystems in lesson two compared to lesson one, which to some extent demonstrated her enhanced conceptual understanding.

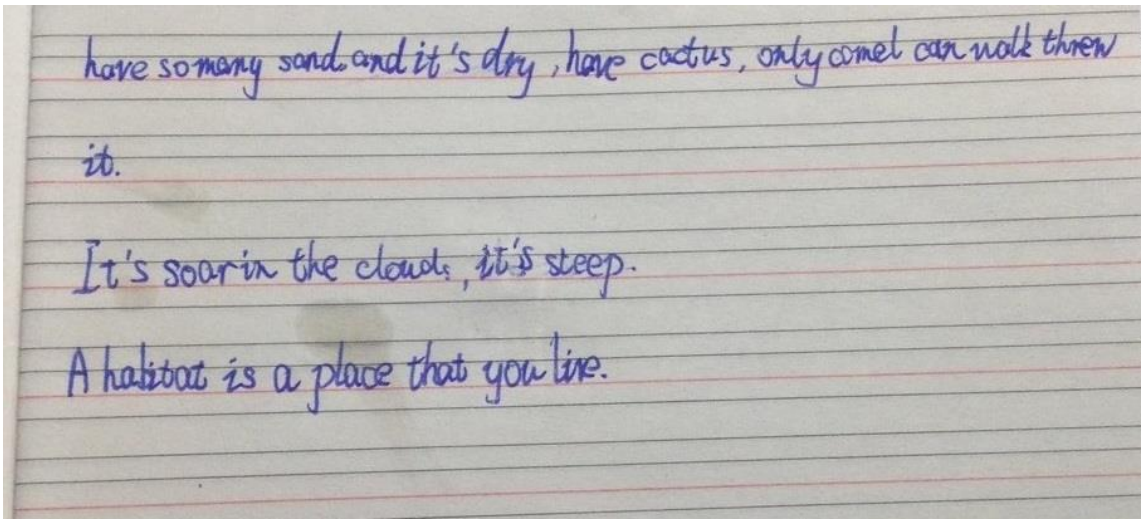


Figure 37. G2S5's concept explanations after lesson 1

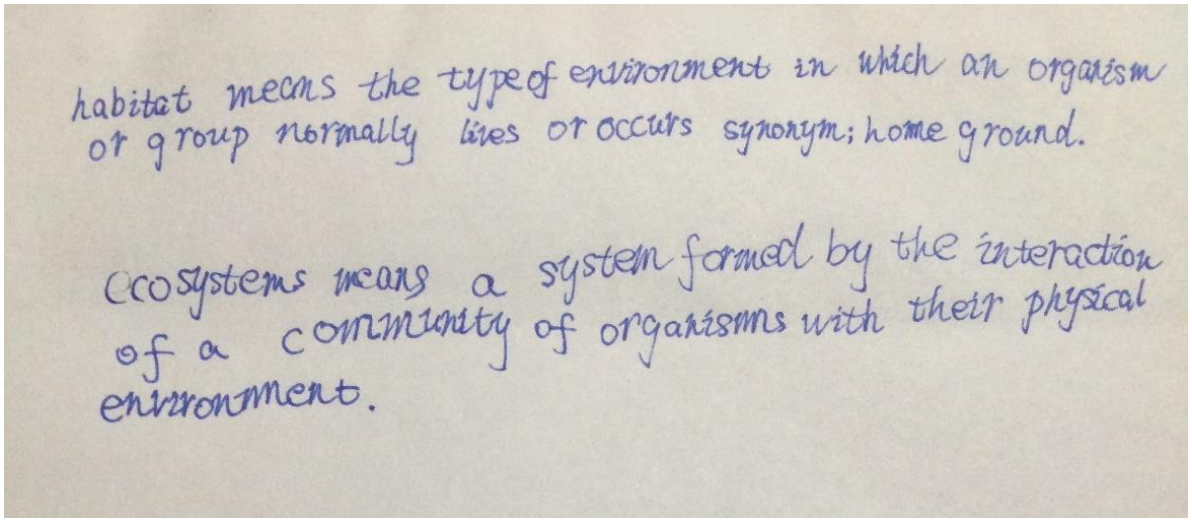


Figure 38. G2S5's concept explanations after lesson 2

By considering individual students' drawings and languaging, the teacher-researcher was able to identify the extent of each student's conceptual understanding and support communication with increasing complexity. It became possible to map learner development by using cognitive discourse functions with increasing appropriateness. This underscores the importance of task design and scaffolding. As guided by Swain (2006), Dalton-Puffer et al. (2014), and Morton (2020), cognitive discourse functions are needed for learners to express higher-order thinking (Bloom, 1956; Anderson et al., 2001) and gain a deeper understanding of knowledge with the increasing

sophistication of language use. The drawing tasks that involved drawing, writing, and languaging were intended to practice and reveal students' levels of conceptual understanding and language use (e.g., Table 17, Figures 37 and 38). This process of languaging informed the teacher-researcher of individual learning needs that emerged in or after the lessons necessary for personalised scaffolding. For example, some students lacked a full understanding of the key concepts (Figures 16, 17) and some students' language use of cognitive discourse functions lacked appropriate linguistic forms (spelling, pronunciation of the keywords, or grammatical structures) (5.6.3). In these cases, the teacher-researcher was able to provide more personalised scaffolding via whole-class or individual-based Learning Conversations.

Hence, purposeful task design and scaffolding such as the integration of visualisation and languaging mediated via Learning Conversations appeared to be the key to developing learners' increasing use of appropriate language functions in this study, from which the *visual languaging* pedagogical strategy was constructed. This development process can be summarised in the following steps:

Step 1: Students can articulate their conceptual understanding by *describing* at the surface level, using their prior conceptual or linguistic knowledge,

Step 2: Students can create visuals to complement the verbal demonstration of their thinking or conceptual understanding more fully.

Step 3: As students engage in meaning-making by *visual languaging*, teachers can provide specific scaffolding to meet individual student learning needs emphasising increasingly more appropriate cognitive discourse functions (academic discourse), thereby enhancing their conceptual understanding.

Adding visualisation as a complementary strategy to languaging can provide learners with an emotionally safe or supportive space (Fullan & Langworthy, 2014) created by themselves where a fuller elaboration of their thinking can be triggered. These visual and verbal representations of thinking can enable learners to receive scaffolding from knowledgeable others when communicating with them (Vygotsky, 1978; Lantolf & Poehner, 2014), which in this case is

facilitated in Learning Conversations with the teacher-researcher and peers (Swain & Lapkin, 2011). For example, G3S2's and G3S4's drawings (Figures 16 and 17 in Chapter 5) and languaging during whole-class Learning Conversations were challenged by G3S1, from which they were able to clarify and enhance their conceptual understanding of habitats.

As indicated by the Pluriliteracies model (Coyle et al, 2018), the role of mentoring learning starting with learners' perspectives for supporting their in-depth knowledge-building and communication is important for deeper learning. *Visual languaging* demonstrated students' prior knowledge, intrinsic thoughts, perceptions, and understanding of the content, upon which mentoring was built. Whilst building on students existing knowledge to develop new knowledge, students spontaneously used such new knowledge in other contexts, such as applying linguistic knowledge to their school lessons (5.6.2) and using digital resources for learning English on their own (5.8.3). According to Pellegrino and Hilton (2012), developing and transferring knowledge and skills is the conduit to deeper learning. Therefore, the potential of *visual languaging* in developing student content and language learning for deeper learning consists of four aspects, which need to be scaffolded via Learning Conversations:

1) language appropriacy of students' specific cognitive discourse functions,
2) meaning-making (i.e., construction of conceptual knowledge),
3) development of pluriliterate skills (basic, visual, and digital literacy skills),
4) the possible transfer of knowledge and skills acquired from the prior three aspects.

6.4 Discussing Research Question Three

The potential of *visual languaging* for mentoring was noted not only from students' feedback (5.9) and learning reflection (5.10) but also from their drawings embedded in their different individuality in terms of affective and cognitive factors (5.11). This resonates with the foci of the third research question – mentoring and learner agency:

> RQ3: What are the necessary conditions for online learning experiences which encourage the interactive development of *visual languaging* for pluriliteracies growth in a digital learning space?

a) To what extent can *visual languaging* support teachers in adapting mentoring online?
b) How might *visual languaging* foster learner agency?

RQ3 specifically investigates the two continua of the Pluriliteracies model - adapting mentoring (subquestion a) and promoting learner agency (subquestion b) through *visual languaging* practised by learners and scaffolded by the teacher-researcher in the networked learning environment- online English classrooms afforded by a digital application (i.e., DingTalk). Drawing on the discussion thus far especially from sections 5.10 to 5.11 in Chapter 5, conditions for encouraging students to use *visual languaging* as a scaffolding tool for developing pluriliteracies awareness, skills, and understanding in online settings depend on the following factors:

Factor one: Construct safe learning spaces owned by students themselves where drawing is normalized whilst being supported via Learning Conversations.

Factor two: Identify students' prior knowledge and experiences of using visuals for learning, thereby supporting the teacher-researcher to design teaching and adapt mentoring to meet individual learner needs.

Factor one:

Fundamental spaces that emerged from this study include the online platform commonly agreed with the sample school, student self-created drawings, and Learning Conversations constructed by the teacher-researcher and students. Aligning with Siemens' (2005) connectivism, these spaces constructed learning by traversing personal (i.e., drawings, individual-based Learning Conversations); social (i.e., whole-class Learning Conversations); and online (i.e., DingTalk platform) networks. According to Bozkurt and Hilbelink's (2019) perspective on networked learning derived from connectivism (Siemens, 2005), online networks create evolving, collective, transitional learning ecologies that comprise learners' physical and digital worlds together including real-life classrooms, online learning environments, and those where learners study, live and play. Such network-supported learning can provide informal learning opportunities to

challenge and shape formal classroom teaching including instructional practices (Ko & Rossen, 2004; Frey et al., 2010).

The affordances of the online platform – DingTalk as used in this case study enabled the teacher-researcher to create virtual learning groups for group communication and online classrooms for teaching. Students can also send instant online messages, upload, and share drawings for languaging and communication either in the online classroom or learning group with the whole class, or privately with the teacher-researcher for their own learning concerns. This networked space, therefore facilitated online teaching, learning, and scaffolding by supporting students in demonstrating and communicating their thinking and understanding through creative drawing and languaging practices whilst being scaffolded by teacher-researcher via Learning Conversations.

Learning Conversations that occurred during the lessons via DingTalk were constructed by the whole class for individual students to describe and explain their drawings and conceptual understanding, and for peers to discuss and evaluate each other's drawings to provoke new thoughts and enhance learning. As students articulated and communicated their drawings and thinking, they spontaneously sent relevant messages to each other in the DingTalk learning group including photos of their drawings, and English language expressions with emojis. Such active online interactions facilitated by the platform supported their enhancement of conceptual understanding and language needed to express their thinking using specific cognitive discourse functions, which were also guided by the teacher-researcher and supported by their peers. Regarding Learning Conversations that occurred after lessons 2 and 4, they were constructed by the teacher-researcher with individual students focusing on scaffolding personalised learning needs as each student had different learning questions and goals, which also provided a space for students who were quiet and shy in the lessons to further express their thinking freely without worries.

The drawings were solely owned by students to create their inner image or visualise their understanding of the content (e.g., habitats and ecosystems) in their preferred visual styles. The process of languaging drawings was also student-led while the teacher-researcher acted as a

guide to facilitate their sense/meaning-making for peer discussions in whole-class Learning conversations. Integrating students' drawings with conceptual and linguistic knowledge in this online setting not only practised students' literacies in writing and speaking with English as practised when they were languaging, but also their visual and digital literacies that were enhanced when they were making drawings, searching, selecting, and sharing relevant online resources (e.g., online images, the AntForest mobile phone game for environmental protection) for internalising the English thematic content.

Factor two:

Such conditions required the teacher-researcher to design and conduct learning tasks with students in ways that can encourage learner engagement (Fullan & Langworthy, 2014). For example, discussing with students' own teachers in the sample school helped confirm the online platform for this case study and understand students' current English learning schedule and levels, which were insightful for designing learning tasks with visuals. As students participated in the lesson tasks, the teacher-researcher was able to adapt mentoring to meet individual learner needs that emerged in the process of students visualising and verbalising their understanding, thereby promoting their engagement in this study. Mentoring learning for learner engagement ultimately aims to realise the deeper learning goal, which aligns with the Puriliteracies model (Coyle & Meyer, 2021; Meyer, et al., 2015) for supporting students to internalise and automatise conceptual and language knowledge for future learning and life contexts. As discussed in 5.10 of Chapter 5, students shared their learning goals and anticipated methods to achieve them), which to a certain extent revealed their increasing learner autonomy (Benson & Lamb, 2021), engagement, and motivation to direct and enhance their English learning beyond this case study.

Drawing on the previous two factors, learning through *visual languaging* can be feasible if teaching and learning are implemented in emotionally 'safe' spaces that are 'owned' by learners and supported by teachers. The data suggest such teacher support includes assisting learners to make meaning when they demonstrate and communicate their 'at the moment' conceptual understanding to others during Learning Conversations. Scaffolding in such a natural, respectful, and dialogic way may be essential for nurturing learners' mindset of self-value and self-belief. It

is suggested that teachers can dialogically provide feedback and encouragement to support learners to gradually value and trust themselves in developing the capabilities, skills, and knowledge needed for solving future learning challenges or problems. For example, the teacher-students Learning Conversations data in section 5.6.3 reveals students' drive and motivation to solve their questions about using English in linguistic-related practices after they reflected and evaluated their learning in this project.

Such growth of learner mindset according to the Pluriliteracies model is crucial for learners playing agentic roles in learning. According to Mercer (2012) and Blaschke et al. (2021), learner agentic roles encompass their engagement, motivation, and sustainability for progressing learning. This agency can foster learner reflection and self-regulation encouraging them to independently apply pre-acquired strategies and knowledge to other novel contexts. In this study, learner agency was transparently linked with students' affective and cognitive factors such as reflection, motivation, emotion, creativity, and thinking as discussed in sections 5.6.3, 5.10, and 5.11. Therefore, necessary conditions for enhancing learning using *visual languaging* can be succinctly specified as -

- **'Safe' learning environments** – encouraging students to try out digital resources and engage in meaning-making using their prior knowledge and visuals in spaces that are *supportive and positive*.
- **Teacher and peer scaffolding** – supporting students to use the language of CDFs for meaning-making, and to listen to their peers and teacher for feedback.
- **Learner growth mindset** – fostering learner agentic roles in thinking, reflecting, and making plans for their learning.
- **Teacher-learner partnership** – co-constructing learning by offering opportunities for individual learners to express thinking and providing personalised scaffolding, which reciprocally offers insights for mentoring.

Having identified the necessary conditions for learning with visualisation and languaging, the next step unravels the specifics of how *visual languaging* affects mentoring and learner agency to

address the following subquestions [a), b)] of the third research question whilst echoing the above four conditions.

a) To what extent can *visual languaging* support teachers in adapting mentoring online?

As illuminated by students' feedback, mentoring learning through *visual languaging* can become feasible by:

- Designing learning activities while considering their existing knowledge of the thematic content,
- Encouraging them to visually represent their conceptual understanding,
- Scaffolding their languaging when they lack the necessary target language to verbally demonstrate and communicate their thinking,
- Building progression through guiding learners from describing to explaining their learning,
- Facilitating peer discussion and peer scaffolding by integrating their informal and formal language use in Learning Conversations,
- Providing formative feedback (e.g., clarifying any misconceptions) after explicitly capturing students' thinking as revealed by *visual languaging*,
- Valuing students' feedback for adapting mentoring learning online.

By providing scaffolding to meet individual students learning needs, engaging them to participate in doing learning tasks, and stimulating them to set future learning goals, their agentic roles in learning may be nurtured. This relates to the next subquestion:

b) How might *visual languaging* foster learner agency?

By constructing 'safe' spaces as discussed above, students were encouraged to process learning tasks by creating drawings in any style they preferred for languaging their conceptual understanding. Their agentic roles were captured in such a *visual languaging* process as they spontaneously -

- combined written text in their drawings to explicitly communicate their thinking with peers and the teacher-researcher (see data in sections 5.5, 5.7, 5.8.2),
- set personal English learning goals with feasible ways to realise them after reflecting on their learning in this case study (section 5.10),
- created drawings with relevance to their prior knowledge, visual learning experiences (5.7.3), emotions (Figures 26, 31), and life experiences (Figures 35, 36) (5.11).

Students making future learning plans represented their motivation for accepting responsibility for managing their own learning and achievements. It is anticipated that if they can make progress or achievement in learning by utilising their self-planned learning strategies in different conceptually or linguistically challenging tasks, their confidence, motivation, and engagement in learning may be enhanced. To facilitate this anticipation, the data in section 5.11 indicates learner agency refers to student agentic roles revealed in their affective and cognitive domains after they reflected on learning constructed in this case study. This revealing process can be summaries as:

> **Affective domain** – drawings with relevance to individual students' emotions, creativity (5.11.1), and personal life experiences (5.11.2).
>
> **Cognitive domain** – drawings with relevance to individual students' understanding of the content (5.7.2, 5.11).

Both domains were identified through *visual languaging* and mentored via Learning Conversations. In this thesis, *visual languaging* as a holistic concept includes not only drawing and language but also integrating with Learning Conversations to support mentoring, feedback, and reflections. Therefore, findings suggest that learner agency can be facilitated by *visual languaging* – in this case focusing on scaffolding learners through Learning Conversations, thereby encouraging learners to take more control of and own their learning. The data indicates this can be realised through three phases, which also resonate with the steps of adapting mentoring learning via *visual languaging* (subquestion a):

- Phase one – Introducing and engaging learners to create visuals of the content in creative ways depending on their personal preferences and relevance with the content.
- Phase two – Encouraging them to articulate and communicate their visuals with the class in their own words.
- Phase three – Scaffolding them to use appropriate linguistic forms to demonstrate their conceptual understanding with their own visuals.
- Phase four – Scaffolding them to explain in more depth their conceptual understanding using their drawing as a stimulus for enhancing learning.

Each phase is learner-centred with the teacher-researcher acting as a mentor or facilitator co-constructing learning with students. It is prospective that learners may progress to a level that allows them to independently solve problems in different settings and become self-regulated learners, thereby generating and sustaining their commitment to lifelong learning. From a holistic view, subquestions a) and b) have to integrate to fulfill the aforementioned four necessary conditions for pluriliteracies growth via *visual languaging* - safe learning environments, teacher and peer scaffolding, learner growth mindset, teacher-learner partnership. By drawing on the findings and discussions revolving around each research question, *visual languaging* can be seen as being a potential stimulus for forging links between visualisation, languaging, knowledge construction (RQs 1 and 2), teacher mentoring, and learner agency (RQ3). From this ecological perspective, learner agency is interconnected with increasingly progressing capabilities in languaging their visuals and thinking. It involves attention to appropriate language use of content-specific cognitive discourse functions (e.g., describing, explaining) to demonstrate and communicate their conceptual understanding.

6.5 Chapter Summary

As guided by the Pluriliteracies model (PTDL), this study explicitly investigates the impact of combining visual creation with languaging as a heuristic tool for appropriating students' language use of cognitive discourse functions, developing mentoring and learner agency for constructing and communicating knowledge. After finalising the investigation into such research foci, the

alignment of this proposed pedagogical strategy - *visual languaging* with the PTDL model will be summarised.

6.5.1 *Visual languaging* with Conceptualising and Communicating Dimensions

In the lessons, students were introduced to the content that they had some understanding of based on their descriptions of prior knowledge in 5.4.3. Due to their conceptual ambiguity and linguistic uncertainty, they lacked sufficient understanding of the content and appropriate linguistic forms to communicate it with peers and the teacher-researcher before participating in the lessons. It was in such circumstances that they were encouraged to create visuals complementing verbal languaging for demonstrating conceptual understanding whilst receiving scaffolding from the teacher-researcher via Learning Conversations. Therefore, their conceptual learning was deepened and expanded as well as the language needed for articulating the content was appropriated.

Students visually supported languaging used specific cognitive discourse functions that embodied the alignment of *visual languaging* with the conceptualising and communicating dimensions of the PTDL model, which include –

- describing and explaining conceptual understanding,
- evaluating peers' drawings, the drawings tasks, and their overall learning experience with this case study

6.5.2 Visual languaging with Mentoring Dimension

By encouraging students to create drawings to support their languaging in English, *visual languaging* also offered insights into mentoring by providing both visual and verbal evidence for the teacher-researcher to identify individual students' learning needs. For example, some students lacked the specific lexis and phrases to *languag*e (as discussed in 5.5), and some were uncertain about the conceptual differences and relations between habitats and ecosystems (see section 5.6). As students visually represented and verbally articulated their interpretations of the content, the teacher-researcher was able to provide scaffolding and feedback by comparing the visual elements in their drawings and their utterances when they were languaging with drawings.

In this sense, *visual languaging* integrates with the mentoring dimension of the PTDL model as it offers a means to identify learner thinking through observing the inconsistencies between –

- what students uttered with their drawings, and
- what they actually drew.

Such inconsistencies revealed individual students' thinking processes, especially the extent of their conceptual understanding and the appropriateness of their language use, which offered insights for personalised mentoring. Therefore, the teacher-researcher was more precise in supporting learners with appropriate linguistic forms for languaging conceptual understanding using specific language functions (explaining, describing, evaluating) during whole-class and individual-based Learning Conversations.

6.5.3 *Visual languaging* with Learner Agency

Learner agency according to the Pluriliteracies model requires teachers' mentoring. That is supporting learners in the process of constructing, communicating knowledge for academic progression, and fostering their roles as primary agents of their own learning. In this study, student agentic roles were revealed in their:

- creativity – creating drawings (pictural representations, mindmaps) with spontaneously written text (e.g., thought or speech bubbles, annotations),
- reflection – reflecting on their learning, thereby forming personalised future English learning plans with feasible approaches for achieving them.

Learner agency also requires an enabling classroom ethos, where attention paid to task design, learner-led activities, and careful reflection is part of everyday classroom practices. Expectations that students will take on increasing responsibility for their learning guides teacher and learning behaviours. Students learning plans can provide them opportunities to practically implement and test their learning strategies in real-life settings and make adaptations for enhancing learning if such strategies resulted in less effectiveness for realising their learning goals. It is anticipated that as students move along the pathway of setting, applying, and reflecting on their learning plans

and strategies, their mindset of independently solving problems and autonomously regulating learning as self-reflective learners will be developed.

By respecting students' improvisational ways of drawing, an emotionally safe space was constructed in the process of creating drawings and was controlled and owned by students themselves, within which they articulated, discussed, and reflected their conceptual learning with the teacher-researcher. This space to some extent reinforced the partnership of co-constructing learning between the teacher-researcher and the students (Fullan & Langworthy, 2014). This was corroborated as student reflection on learning with drawings also provided insights for online mentoring with visuals (section 5.9) and stimulated their thinking of future learning plans (5.10). Therefore, *visual languaging* integrated with learner agency by promoting learner creativity and reflection, which echo the learner affective dimension of the PTDL model.

6.5.4 Illustrating Visual Languaging

Having addressed the potential interplay of *visual languaging* with the pluriliteracies model's four dimensions for learning, teaching, and growth mindset, an emerging 3D pedagogic strategy was created to illustrate such complementary interplay, which can be coined as 'Visual Languaging for Deeper Learning' (Figure 39).

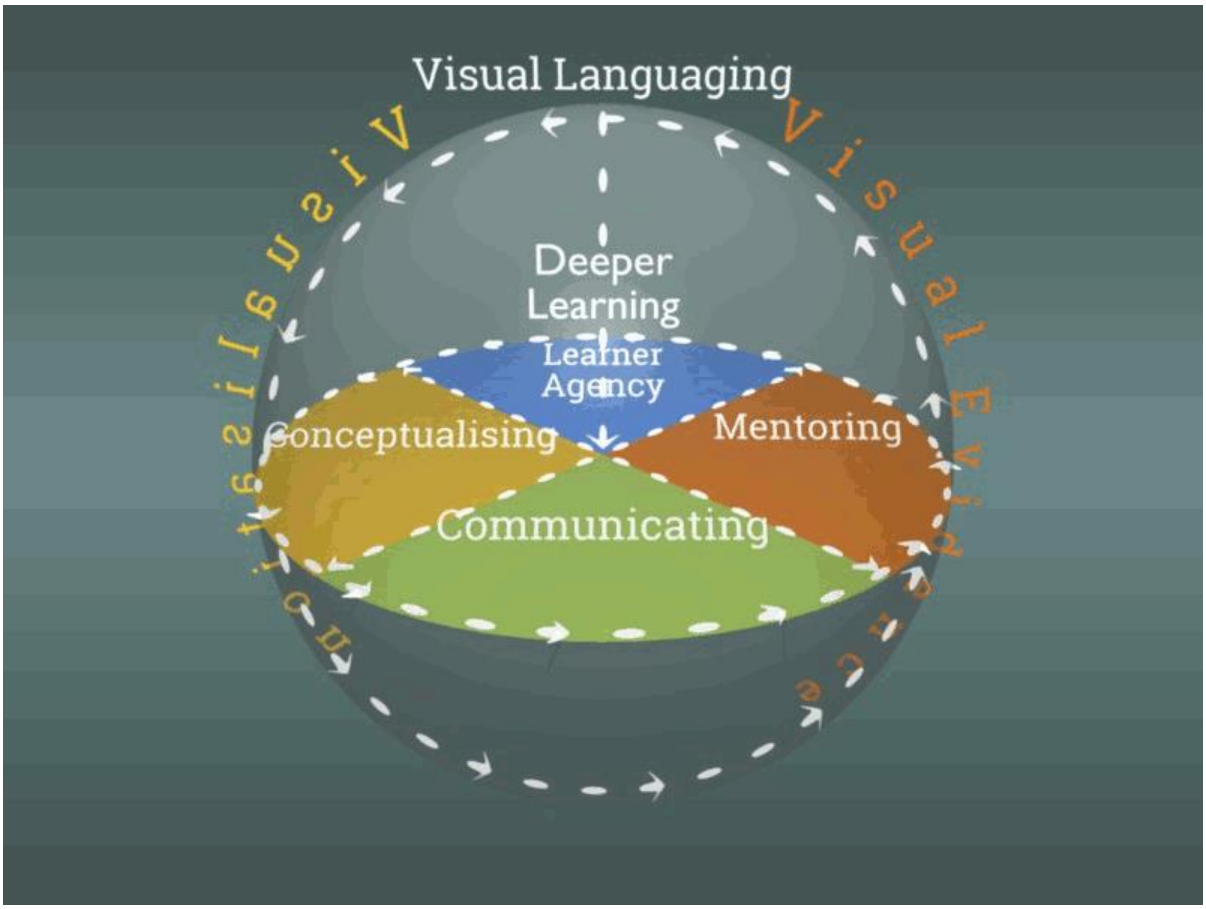


Figure 39. Visual languaging for deeper learning

This visual strategy was designed as a 3D rotating mechanism to resemble the ecological nature of the pluriliteracies model for deeper learning. It explicitly depicts the dynamic integration of *visual languaging* with PTDL through:

- visualising and languaging conceptual understanding using CDFs for the conceptualising and communicating dimensions,
- providing visual evidence for mentoring,
- promoting creativity and reflection for learner agency.

In conclusion, data suggest that *visual languaging* can be considered complementary to verbal languaging for its value in learning and teaching from both learners' and teachers' angles. It encourages learners to creatively make visuals when they lack the linguistic means for languaging, which in turn provides tangible evidence for learners' reflection and teachers to adapt mentoring

learning. These features differentiate *visual languaging* from other visual-related studies of language or other subject education.

Another crucial feature of *visual languaging* is the exigencies of partnering with Learning Conversations which supports the ecological alignment of *visual languaging* with the pluriliteracies model. This addresses the growing trust, mindsets, and co-construction of learning and teaching between learners and teachers, or mentees and mentors. These can be promoted through mutually respected, emotionally safe Learning Conversations where learners' visuals and languaging of the content using specific language functions can be communicated and scaffolded. In this study, for *visual languaging* to work and embed in the pluriliteracies ecological ethos for deeper learning, Learning Conversation became part of that process.

It is also worth underlining that though the data provided insights and evidence about *visual languaging* for supporting learning, mentoring, and learner agency that appeared adequate for answering the research questions, the potential of developing students' sustainable self-regulation for generating and maintaining achievements in learning via *visual languaging* is yet to be found. This is one of the limitations of this study and will be further addressed in Chapter 7. Moreover, the 3D pedagogic strategy has yet to be adopted and experimented with in other research or contexts (e.g., combining with other digital technologies or platforms, learners creating other forms of visuals rather than drawings) to fully corroborate its potential for deeper learning. Therefore, more empirical studies are needed for further refinement and adaptation of this heuristic learning tool for deeper learning in order to fit and fulfill the learning purposes of potential stakeholders in different learning contexts beyond English language learning in the digital era.

Chapter 7 Conclusion

7.1 Summary and Implications of Findings

By discussing and synergising the answers to the research questions, the potential of *visual languaging* for learning was substantiated through two activities – visual creation and visual articulation. As the younger learners created and articulated drawings correlating to the thematic content introduced in the English lessons of the Main study, they also practised their understanding of the content and language needed to verbalise their conceptual understanding to peers and the teacher-researcher. More precisely, students' conceptual and language development was demonstrated by their utterances in using specific cognitive discourse functions (e.g., describing, explaining, and evaluating) to communicate their conceptual understanding during in/after-class Learning Conversations and interviews. Their language including the use of discourse functions for articulating conceptual understanding was triggered by their own drawings and appropriated by scaffolding from the teacher-researcher and peers.

The explicit process of students receiving input of the thematic content from the teacher-researcher and creating output in visual and verbal forms for learning with scaffolding is clarified and discussed throughout Chapters 5 and 6, which is also succinctly summarised in sections 6.2, 6.3, and 6.4. This process encompasses four components that are essential for enhancing and sustaining learning through *visual languaging* facilitated by Learning Conversations:

- visual evidence – visualising thinking via the drawing tasks,
- verbal evidence – languaging thinking using cognitive discourse functions (CDFs) in Learning Conversations,
- mentoring – scaffolding conceptual understanding and language use via Learning Conversations whilst adapting mentoring by referring to the visual and verbal evidence,
- learner agency – encouraging learner creativity and reflection.

These four components mediated through Learning Conversations demonstrate how *visual languaging* can be aligned with the four-dimensional pluriliteracies teaching for deeper learning (PTDL) model. The interplay of *visual languaging* with the PTDL model is therefore captured and

represented in a 3D rotating figure (see Figure 39 in Chapter 6) intending to complement the dynamic growth of conceptualising, communication, mentoring, and learner agentic mindset for ultimately realising deeper learning.

Based on the above review of findings, implications for applying and adapting *visual languaging* for English thematic content and language learning can be perceived from how teachers design learning tasks and support students to do such tasks. At the core, this involves the integration of visualising and languaging for developing conceptual and language understanding, literacies, and learner agency in conjunction with the quests of the Pluriliteracies Model. Moreover, it is crucial to highlight the importance of Learning Conversations as the vehicle for enabling this deeper awareness of how students can learn and be supported whilst they languaging their learning. These elements of implication will be unravelled as follows.

7.1.1 Designing Visual Creation and Articulation Tasks

Communicating with learners about specific English thematic content is suggested so as to develop a holistic understanding of their current English levels for designing teaching. Since the researcher did not have the access to contact all participants before conducting the online case study, consulting with their teachers appeared to be the only option to gain insights into participants' learning progress in the sample school. As indicated by the data in Chapter 5, some students had some experiences of learning through creating visuals whilst a few showed less interest in visualising and were therefore encouraged to combine drawings with writing for demonstrating their thinking. This highlights the necessity for teachers to discuss learning with individual learners to explicitly take into account their interests, prior knowledge, and learning experiences in order to develop the pedagogic approaches or strategies that learners can relate to, with a starting point of content that may be familiar at the surface level to be developed to an in-depth level. Such practices support learners in deepening specific aspects of content with which they may have some or limited understanding.

This raised the concern of designing content-related tasks to challenge and enhance learners' current language and cognitive capabilities. As *visual languaging* is experimented with to support

learning in this research, tasks were, therefore, designed to integrate the target concepts of the content with students' visuals. The choice of using drawing as students' visual form to output their understanding of the content was discussed and confirmed in the Pilot Study implications in Chapter 4. According to student evaluation, visualisation was also evidenced as a preferable and interesting tool for learning by most students in the Main Study with strategies explored for those more reluctant to engage. Encouraging students to create drawings as supplementary to the oral expression of their conceptual content understanding implies a natural lead-in with (i) explicit guidance, (ii) infusion of the content and the drawing activity, and (iii) strategic scaffolding and feedback.

These three factors are derived from the researcher's experience of teaching and researching with the participants to sustain their process of comprehending the thematic content by supporting them in using and communicating such content in the English language with linguistic appropriacy. A natural lead-in refers to the teacher-researcher ensuring the input is accessible using a careful selection of relevant images to facilitate students' understanding and encourage to create their own visuals to externalise their thinking of the content during Learning Conversations. The infusion of the content with drawings was realised as students articulated their thinking with drawings in English with encouragement to use specific language functions to develop both their conceptual and language understanding. The scaffolding and feedback were strategically integrated into Learning Conversations with students as natural daily talks to trigger more thinking, engagement, reflection, and peer discussions. This leads to the next implication about the essential nature of Learning Conversations.

7.1.2 Supporting Students via Learning Conversations

The concept of Learning Conversations in this research is key to activating and facilitating the potential of *visual languaging* for learning, mentoring, and fostering learner agency. It encompasses dialogic talks that naturally occurred between students and the teacher-researcher when students articulated and communicated their drawings and conceptual understanding in the lessons. In addition, follow-up conversations with individual students were scheduled after every two lessons, which offered a safe space where individuals' thinking was expressed freely

without interference from other students. Within such a space, every student also received personalised feedback on their specific learning concerns or needs. In-class Learning Conversations with all students facilitated peer discussions and scaffolding with peer collective thinking of the content. This combination of in and after-class conversations provided students with more learning time and opportunities to practice and appropriate their English language use for languaging their conceptual understanding.

Moreover, such a dialogic combination not only intended to explore the effect and potential of Learning Conversations but also suggests changes to the current practices for teaching and learning across a range of contexts. For example, depending on cultural contexts, it is acknowledged that school teachers may not have time to offer 'additional conversations' with individual students after class. This indicates the need for teachers to redesign tasks in ways that factor in time for Learning Conversations. In other words, when teachers themselves redesign some of the in-class learning tasks so that Learning Conversations are embedded as part of regular practice, then the need to position Learning Conversations as additional or after-class 'burdens' will be removed.

Alternatively, such a challenge might also be overcome through greater home-school collaboration since teachers can design tasks where students can work more independently at home given a diversity of resources, conditions, or environments supported by parents. For example, giving students options (e.g., Dropbox, online resources links) to access learning materials for preparing in-class activities, so that teachers can plan for further Learning Conversations within the allocated hours for teaching. Such conversations can be designed to reintroduce the learning materials in the form of problem-solving individual tasks or group work whilst scaffolding students via whole-class Learning Conversations or can be transformed into individual-based Learning Conversations to check how each student's work is done at home.

In essence, this is similar to working on a 'Flipped Classroom' model – which may be a future consideration. It is a blended learning approach where learners cooperate with their teachers to construct their insight and knowledge based on engaging and effective learning experiences, progressive networking learning activities afforded by flexible, learner-centred environments,

and diversified learning platforms of flipped teaching (Yousufi, 2020). Therefore, this study has identified the need for developing teachers' use of technology and pedagogical approaches when transforming their classroom practices. Such teacher development may encourage students to participate in pre, in, or after-class activities for language and content learning and to independently link and apply the new learning to broader life issues. This leads to another future consideration – teachers' cognition of the PTDL model as suggested below.

7.1.3 Fostering Learner Agency

Given the ultimate goal of deeper learning by integrating Learning Conversations with *visual languaging* to promote learner thinking, discussion, and reflection on their learning, learner agency as one of the key conduits is emphasised in this study. By retrospectively reviewing participant-initiated plans for their future English learning in Chapter 5, it is possible that more agentic roles may have been triggered by this case study. However, the impact of plans or strategies for improving their English language capability requires longitudinal research to conduct follow-up interviews with the same groups of participants to collect data on their learning progress or status. This can allow the teacher-researcher to gain insights into the effectiveness of their learning strategies and offer them feedback to make changes to further promote and sustain their English learning.

Fostering learner agency requires a stable teacher-learner partnership to encourage learners to reflect on the learning process and make learning plans, facilitate the implementation of their plans, and provide feedback for making adaptations of their learning strategies for enhancing learning. This partnership that synergises teacher-learner mindsets for knowledge construction also needs more research to further investigate learner affective factors through the lens of reflection, metacognition, and teachers' mentoring. Taking this study as an example, it would be necessary to work with the Main Study participants for a longer period of time to collect and interpret data on how they reflect and make changes to the plans proposed to attain their learning goals (e.g., advancing their English learning). To achieve such demanding ambitions involves further investigation into growth mindsets and learner resilience, teacher beliefs and confidence to take risks which bring into question traditional expected pedagogies whilst

adapting teaching to encourage learner confidence, motivation and resilience to sustain their learning. This therefore would also enable greater insights into teacher cognition and design processes in collaboration with learners as co-researchers.

This process of motivating and supporting students to design, reflect and redesign for their own learning aligns with the PTDL model. It implies the need for teachers' professional learning in terms of their cognition of PTDL – what the model is, how its four dimensions can facilitate learning, and especially understanding the importance of mentoring learning, learner-teacher partnerships, and task design. It requires practice in how dialogic communication works best in the classroom – how to ask questions that lead to further discussion and how to encourage learners to ask their own questions and take agentic action. Developing such teacher cognition, and innovative pedagogies and practices for motivating students in language learning and language use, require time for teachers to reflect, experiment, and take risks. This also underscores the necessity to rethink some pedagogic approaches or strategies in contextually-aware ways and how these might be adopted by teachers, given the constraints of national priorities (e.g., exam-oriented education in China) in order to develop more appropriate classroom ethos, task design, and ways of promoting learners' thinking and agency. Given the demands on teachers and the policy and practice priorities, this is indeed a challenge and one for future consideration.

7.2 Limitations

After reflecting on the research findings and implications accentuating task design, Learning Conversations, and learner agency, three limitations were identified – researcher identity, research time, and research design regarding sample size as elaborated below.

7.2.1 Researcher Identity

The first concern focuses on the teacher-researcher and the potential bias or subjectivity of data analysis. In addition to the researcher's scrutiny of video recordings, approaches including member checking, and comparing codes with an intercoder were applied to mitigate the subjective interpretation and analysis of data. As guided by Tracy's (2010) 'Big-Tent' criteria, these approaches were explicitly elaborated in section 3.8.2 of Chapter 3. However, whilst the

focus of this study has been on learning, a more critical perspective on the researcher as the teacher takes into account cultural exigencies and expectations. A related concern is the possible lack of holistic understanding of individual participants' current English learning progress and levels in their own schools. The teacher-researcher was not their usual school teacher, and the learners were engaged in this study voluntarily. This may have impacted the appropriateness of teaching presentation design in terms of the complexity of the target language and its thematic content. As has already been noted, it may also have influenced the learning behaviours of participants (e.g., their willingness to contribute out of lesson time, parental involvement, and positive attitudes towards learning) though most of them appeared motivated and engaged during data collection. This raises issues to be resolved around the sustainability of such a pedagogic innovation without more diverse applications for embedding across the curriculum.

An alternative scenario to work with these concerns in the first instance would be for the researcher to develop alternative teaching materials or work with the participants' teachers to co-design and observe teaching. In this sense, the researcher plays the role of a co-designer and an observer whilst the teachers deliver the English classes in the classroom. A recommendation for future research would be for the researcher to have frequent and in-depth discussions with the teachers regarding the overall research design and objectives (i.e., integrating visual creation and visual articulation in English learning) for co-constructing the learning tasks together to bring about sustainable change. In essence, the teachers then become co-researchers and engage intuitively in professional learning.

However, collaborating, determining, and finalising the specifics of the teaching sessions can be time demanding. For instance, the selection of topics, the requirements and assessment criteria of in-class visual tasks, and after-class practices need to be considered and confirmed before proceeding with the formal teaching phase for data collection. This also requires attention to the cultural expectations and contexts with regard to teachers' availability for extracurricular teaching activities in addition to their schools' teaching agendas. In this study, it was not possible due to contextual reasons and COVID-19.

7.2.2 Research Time

The duration for collecting data was mutually agreed upon between the researcher, the school, and the participants with consideration of their availability beyond their own school schedule and the given time for the researcher to conduct this Ph.D. study. It was noted that most participants take extracurricular classes in addition to their primary school teaching agenda, which possibly explains their absence in a couple of lessons. As clarified in Chapter 3, the Pilot Study and the Main Study took three months to complete data collection followed by ongoing and retrospective analysis. In order to gain a more trustworthy and deeper understanding of the data for answering the research questions, checking and rechecking underlying information that was possibly overlooked and nuances between different times of scrutiny continued even during the process of writing this thesis. The analysis completed and reflected thus far as discussed in Chapters 5 and 6, therefore, indicated the previously articulated implications (section 7.1), provide the potential for enhancing the overall quality and credibility of the data and results with further research and adaptions.

If conditions allow, for example, the availability of the participants, their teachers, and the researcher conducting this study longitudinally could comprise the researcher designing and adapting teaching with the teachers, observing and interacting with the participants, scaffolding and providing feedback to their learning, and especially supporting them in experimenting and adjusting their own future learning strategies to nurture learner agency for lifelong learning. This later stage was derived from students' future learning plans, which is also what the teacher-researcher intends to explore in future phases of this study. Moreover, engaging more than the sample school to allow for cross-school collaboration and comparison would also lead to a realistic assessment of the impact of such studies to contribute to curriculum reforms in China or elsewhere.

7.2.3 Sample Size

The third limitation concerns the limited number of students in the case study. This research is based on a small sample from one school – limited partially due to the COVID pandemic. There was a total of 11 primary school students who voluntarily signed the consent form for the Main

Study and five for the Pilot Study. During data collection, 10 students fully participated in the Main Study and three in the Pilot Study. This study was presented to participants as exploring a 'new' approach to learning English. In emphasising that the study did not take into account the quality of the drawings from an artistic perspective but focused on student drawings for languaging and communication in whole-class and individual-based Learning Conversations and interviews, which to some extent supported the proposal of *visual languaging* as beneficial for enhancing their English learning. It also highlighted language and content understanding and more importantly, their initiative and motivation to plan and direct their future learning. However, such a relatively small sample size evidently cannot be representative of primary school students across different regions of China. Hence, the potential of visual languaging emerging from their data must be seen as a small, first step toward refining and testing its heuristic potential for learning in the Chinese context and beyond.

Recruiting more participants and experimenting with the potential of *visual languaging* for primary students with varied learning needs is now necessary. To broaden the scope of designing and exploring teaching and learning with *visual languaging*, future studies can explore the applicability of *visual languaging* for different education levels in contexts with different educational policies and learners from varied educational, cultural, and social backgrounds.

In addition, the limited sample size determined the use of data collection tools. Qualitative semi-structured interviews as the main research tool for data collection in this study triggered more discussions regarding students' learning through *visual languaging*, especially while being supplemented by scaffolding tools – Learning Conversations and drawings for the researcher to interpret and analyse the data. Given the importance of Learning Conversations and the time needed to ensure these become regular practices, it requires a rethink in classroom task design. Moreover, carrying out future relevant studies with larger groups of samples through using some quantitative data collection methods may potentially enhance data triangulation. As guided by Denzin (2012) and Hastings (2010), a mixed method that integrates qualitative and quantitative methods could lead to more rigorous *data triangulation*. This term refers to using multiple data sources as emerged from a combination of research methods (e.g., individual or focus group

interview, observation, questionnaire, or survey) to garner richer data for in-depth scrutiny and analysis with increasing validity and reliability of the results, which to some extent can also mitigate the prior limitation regarding the researcher's subjectivity.

7.3 Future Recommendations

As set out in Figure 39 in Chapter 6, *visual languaging* as a pedagogic strategy that emerged from this case study suggests more empirical research focusing on classroom teaching and learning to use this strategy to activate further elements of the PTDL model. Such changes require systematic planning for teachers' professional learning. For example, practices of *visual languaging* could be further enhanced by drawing on specific elements of the PTDL model that highlight the importance of scaffolding learning with Learning Conversations. In other words, learning mediated by Learning Conversations needs to be understood more fully not only in further research but also supported by classroom evidence in order to provide further input on shaping and adapting the *visual languaging* strategy for different learning contexts, especially for collecting more in-depth data from learners and teachers.

Such contexts may encompass modern languages or subjects teaching for different educational levels (e.g., secondary and tertiary education) in regions or countries with varied educational policies and systems, and sociocultural and socioeconomic conditions. This study used one small sample of primary-aged learners in China to create visuals for English language learning with specific political and cultural contextual variables. This led to the initiative of the *visual languaging* strategy that intended to contribute to changes to the educational climate and methods by motivating learners to take ownership of their learning and develop pluriliteracies beyond basic literacy in one language. However, as already discussed, due to its limitations, the explicitness of designing more holistic learning episodes integrating visualising, languaging, and Learning Conversations for pluriliteracies development, requires more participants and a lengthy time to explore, reflect, and strategically adapt this strategy for supporting and encouraging all learners to enhance and direct their learning. In short, this visual-based strategy now needs to be further researched with larger groups of learners and teachers to test out its feasibility for sustainable pedagogic changes.

Another recommendation on exploring how *visual languaging* strategy applies in other learning contexts requires synergies from all potential stakeholders' perspectives. As both the researcher and the teacher, this strategy was formed mainly based on the researcher's interpretation and analysis of the primary students' data, which to some extent also integrated learner perspectives (e.g., student feedback on using visuals to learn). However, students during data collection were not asked questions or engaged in discussions which might inform more rigorously the research on the alignment of *visual languaging* with the PTDL model for their English learning given the limited time and the complexity of explaining the alignment to them.

Given the 3D *visual languaging* strategy is still in the process of development, it is anticipated that feedback from researchers, educational practitioners, learners, and their parents can trigger more discussions, research, and classroom implementations to enhance its applicability and effectiveness for teaching and learning. Therefore, it is recommended that the next phase in this development can focus on teachers enhancing their professional learning by critiquing and developing the PTDL model to understand and use *visual languaging* with other alternative strategies in their own classroom teaching for deeper learning. If learners are introduced to and practise alternative pedagogic strategies in schools, they might spontaneously consider adapting the strategies to fit their extracurricular learning with initiatives. In return, researchers of relevant studies can receive feedback from both teachers and learners on how to develop *visual languaging* to better facilitate learning.

As this study proposes the complementary effect of combining visuals with Learning Conversations for facilitating learner languaging, therefore, it is recommended that teachers can run trials of this combination whilst considering the possibility of integrating *visual languaging* with other pedagogies. For instance, content and language integrated learning (CLIL), Learning Conversations, translanguaging as addressed in Chapters 2, 5, and 6, or other strategies that teachers use or exclusively design for their own classroom teaching. This underlines the importance of considering contextual factors including teacher cognition and pedagogic understanding, student learning needs and progress, and schools' teaching agendas and policies when applying and customising *visual languaging* to specific contexts. The need for a focus on

teacher professional learning as well as student learning is crucial for classroom dialogue and teacher strategies as well as learner strategies to support deeper learning. For instance, teachers may encourage their students to create other visual forms (e.g., digital drawings, paintings) instead of hand drawings if students are more interested in digital technology-assisted learning and if the teaching objectives also emphasise developing their digital literacies.

In conclusion, as an emerging researcher coining *visual languaging*, it is important to witness the development of the alignment of *visual languaging* with the pluriliteracies model. This pedagogic visual strategy is built upon the notions of visualisation and languaging. The use of visuals (e.g., drawings) or languaging to support learning is not itself a new idea, but the conceptualisation of integrating these two learning tools as visual languaging in the contexts of PTDL which incorporates Learning Conversations is not yet fully explored, and worth further attention and exploration. Therefore, what makes the *visual languaging* strategy different throughout this thesis is its potential in constructing an ecological 'safe' space for students to make their thinking visible and own that process of visualisation. This became accessible by scaffolding students through Learning Conversations that offer individual students personalised feedback and confidence, given some are shy to meaningfully communicate with the teacher-researcher about their learning needs when they were in a whole class discussion. In this sense, students' cognitive and linguistic development is mediated by bringing together visual and languaging as a scaffolded endeavour facilitated in Learning Conversations, thereby providing potential for pluriliteracies growth and deeper learning.

The findings in this study are not a panacea. Understanding *visual languaging* is still in an early stage starting by initialising, experimenting, and reflecting on the idea of using visuals for languaging in English learning as proposed in this project. How to make transitions to a more refined stage requires more empirical studies to further critique, adapt, and refine the strategy for other contexts of learning. It is believed that the endeavors and collaboration of teachers and researchers who share and utilise their teaching and academic expertise and repertoire can optimise the potential of *visual languaging* across diverse learning contexts and ultimately shape

it into a channel for all learners to use with ease for directing and deepening their own learning as pluriliterate life-long learners.

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Appendices

Appendix I: The Pilot Study Data

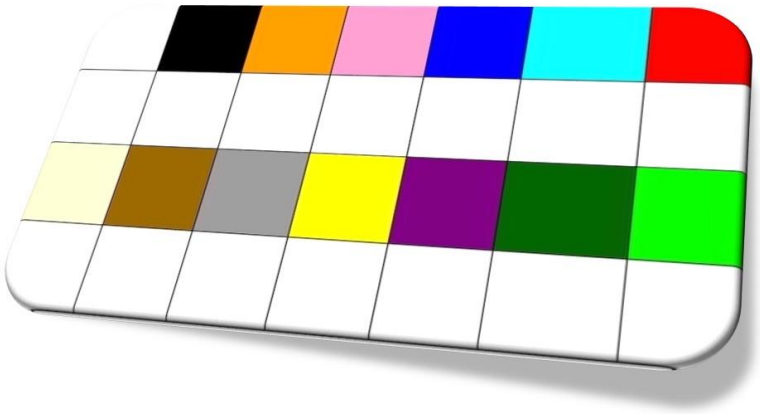
The Pilot Study Class PowerPoint Presentations

Lesson 1

Your turn

- Your hometown
- hobby
- favorite colour

Can you recognise these colours?



Language scaffold

- I can see _____.

I can see white, beige, green.

Do you agree?

Green	Yellow
Red	Black
Blue	White
Brown	Purple
Grey	Pink

Language scaffold

- I agree/ disagree, I think '_____' should be in _____colour.

I think 'Green' should be in green colour.

Let's check

Green

Red

Blue

Brown

Grey

Yellow

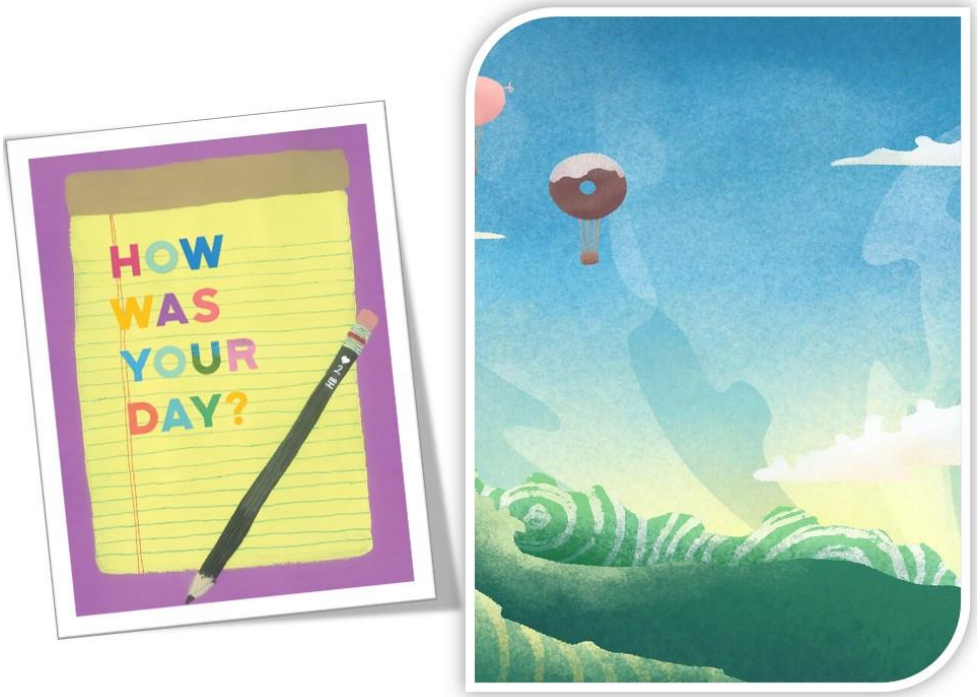
Black

White

Purple

Pink

	RED RED		GREEN GREEN
	LIGHT BLUE LIGHT BLUE		DARK GREEN DARK GREEN
	BLUE BLUE		PURPLE PURPLE
	PINK PINK		YELLOW YELLOW
	ORANGE ORANGE		GREY GREY
	BLACK		BROWN BROWN
	WHITE		CREAM / BEIGE



Language scaffold

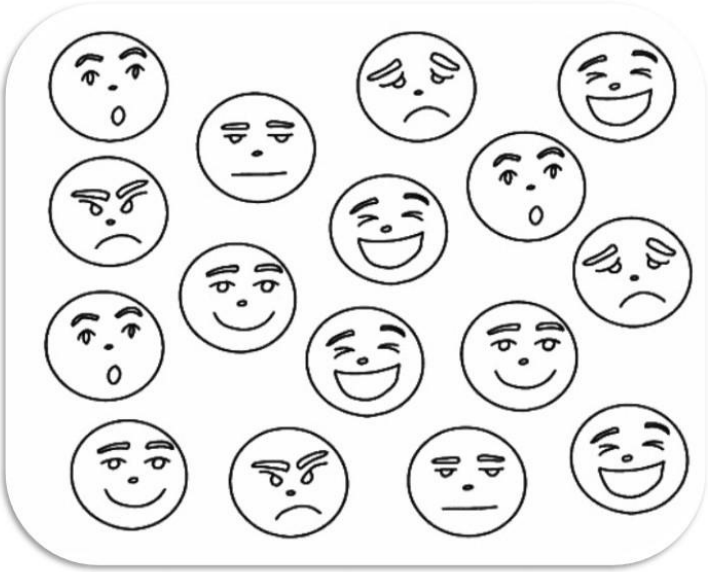
- I felt_____ today, because I _____.

I feel excited today, because I got a gift.

- I was_____ today, because I _____.

I was sad today because I failed a test.

Pick one face to match your feelings

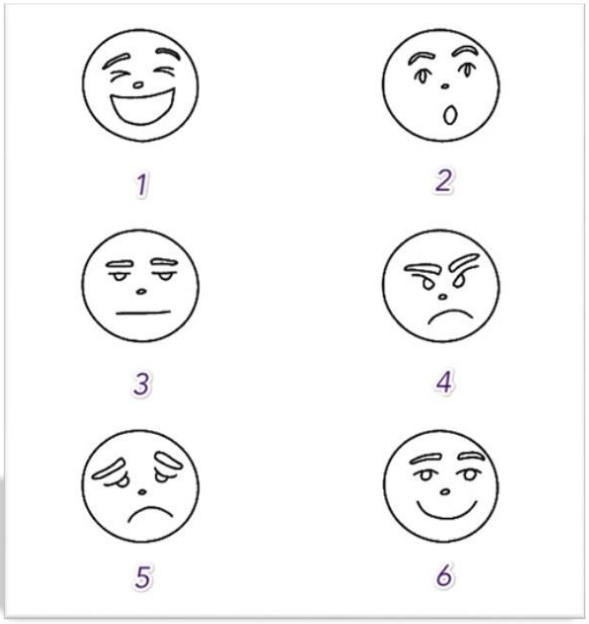


Language scaffold

- I feel _____ when I_____

I feel calm when I read a book.

Can you colour them?

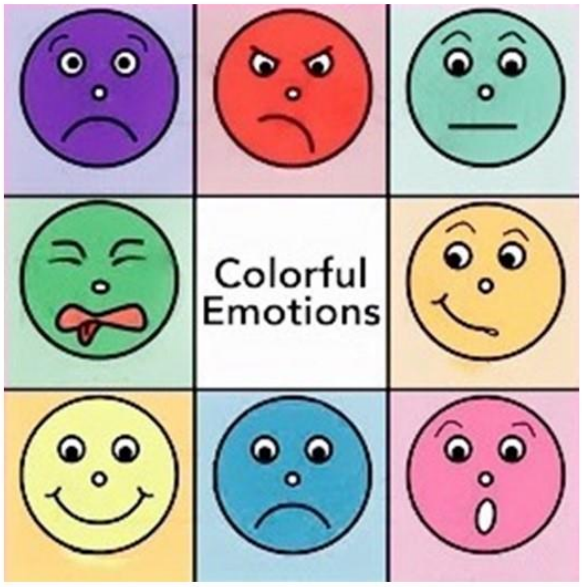


Language scaffold

- I choose number___, It's a ___face and I colour it_____.

I choose number 5, It's a sad face and I colour it blue.

How about these colours?



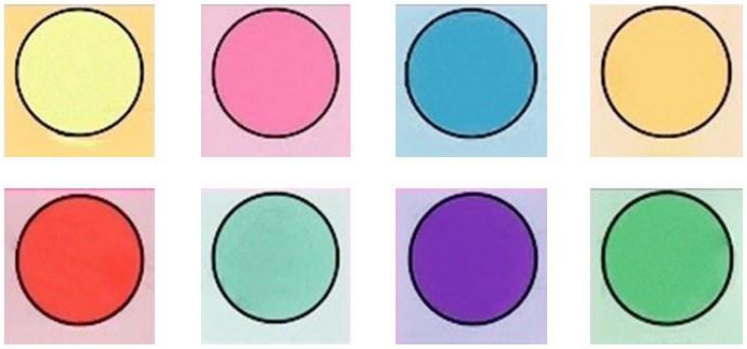
Language scaffold

I think _____means/represents _____in ____culture.

I think red means luck in Chinese culture.

I think blue means sad in western culture.

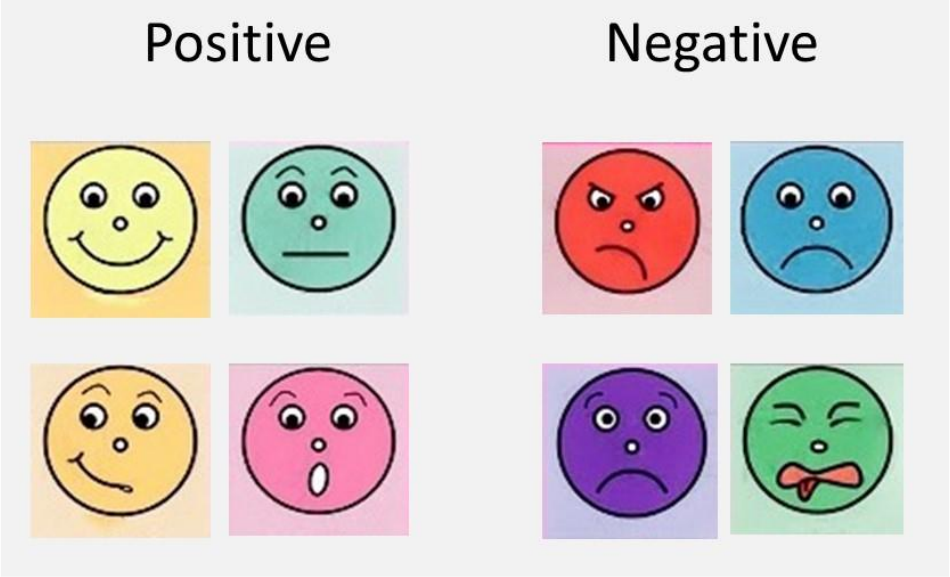
Which colours are positive or negative?



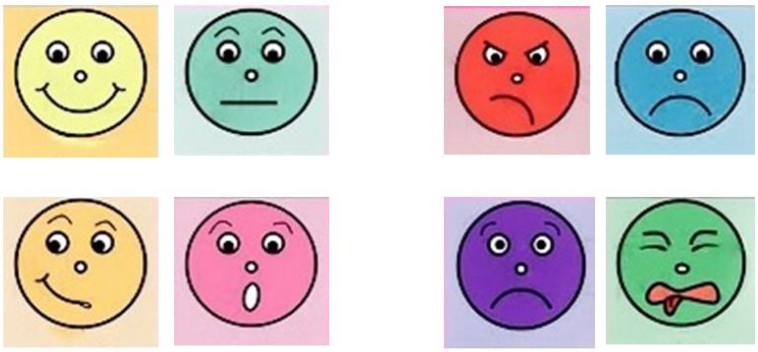
Language scaffold

- I think _____is negative/positive, because it means_____.

I think red colour is negative, because it means angry.



Can you name their emotions?



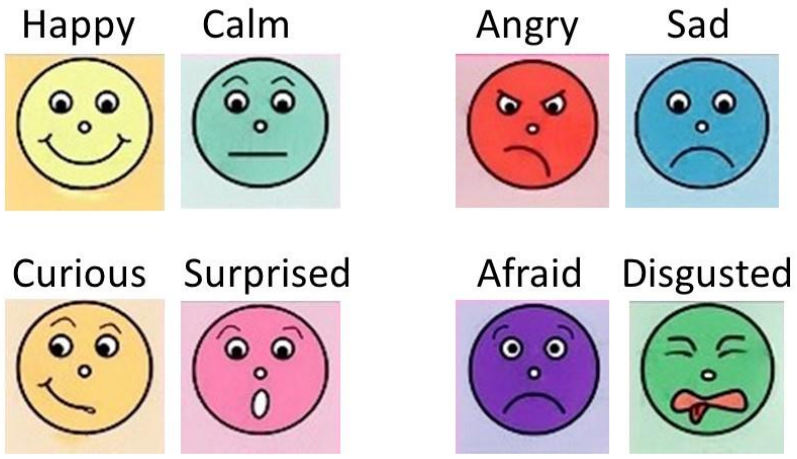
Language scaffold

- The _____ face is _____.

The yellow face is glad.

The red face is furious.

Do you agree?



Language scaffold

- I agree/ disagree, because I think ____ means/ represents_____.

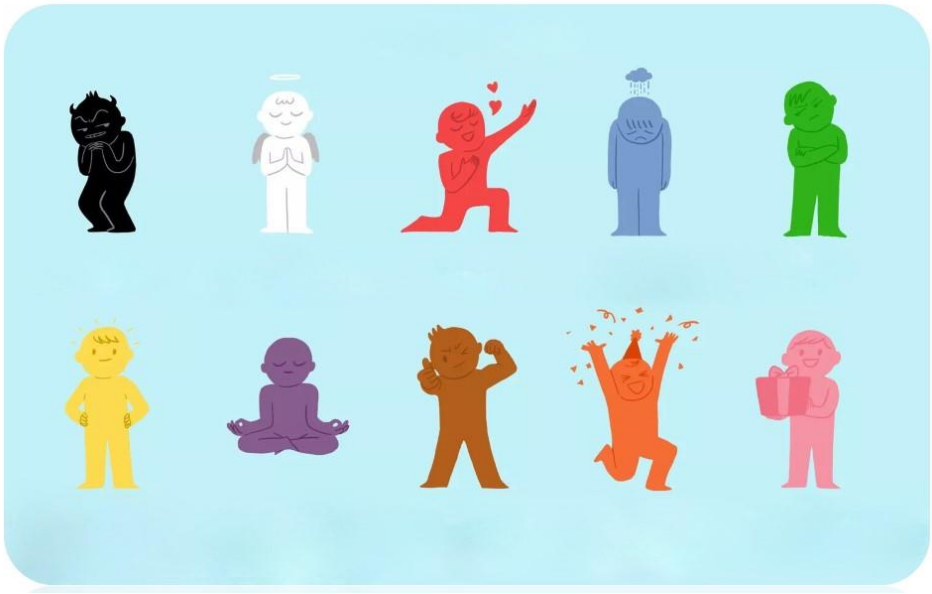
I disagree because I think red means luck in Chinese culture.

Positive and negative emotions

Happy... ...
Calm... ...
Curious... ...
Surprised... ...

Sad... ...
Angry... ...
Afraid... ...
Disgusted... ...

Name their emotions



Language scaffold

- I think the person in _____ is_____.

I think the person in orange is cheerful.

I think the person in white is peaceful.

There you go! Now let's compare!

Colours and art

Theme 1

Theme 2

Which one do you prefer, why?

Language scaffold

- I prefer the left/right one, because I like_____.

I prefer the right one, because I like rabbits.

I prefer the right one, because I like the story.

Homework

1. Prepare a visual slide about yourself

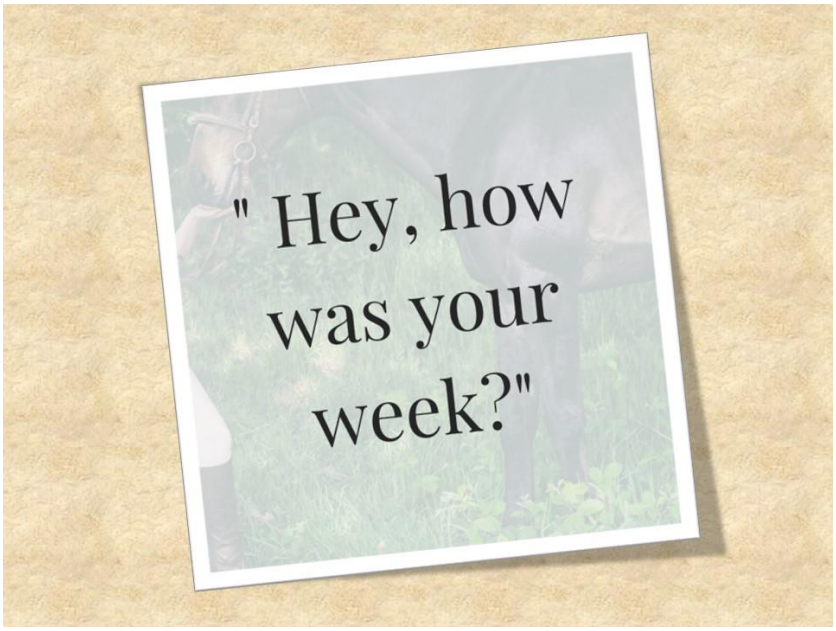
2. Present visuals to describe a colour topic you like in a slide

Good work
&
Thank you!

Lesson 2

Colours in my life

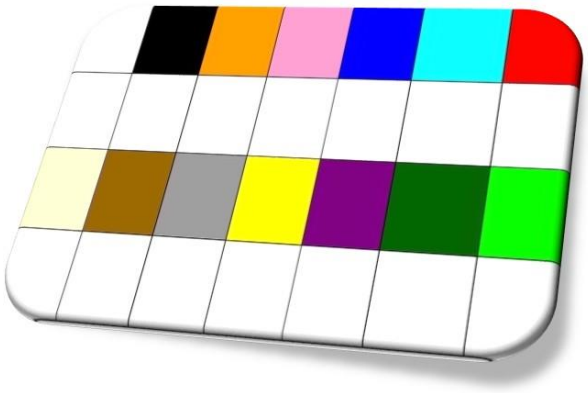
Visual presentation

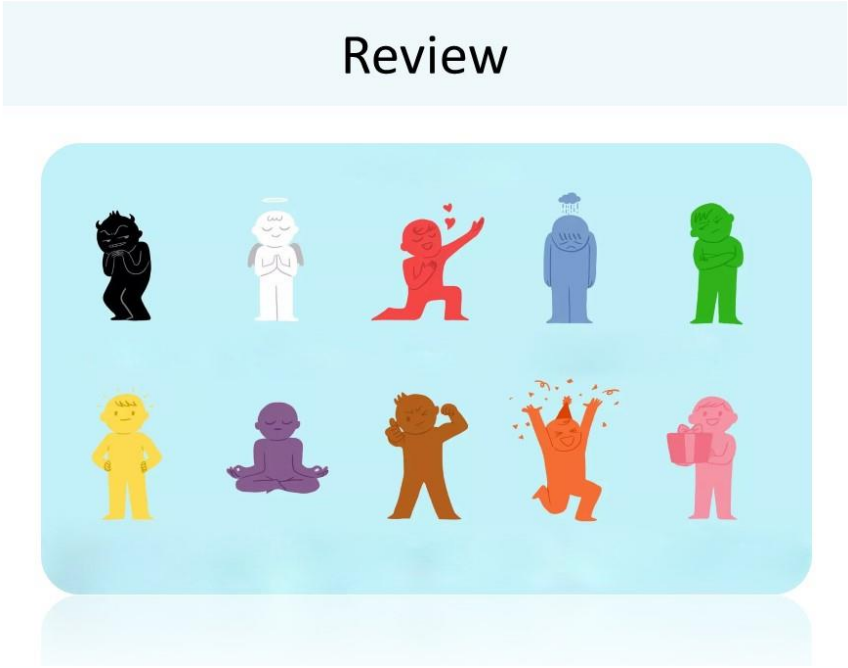


Language scaffold

- I was/felt _____, because _____.

Review




Review


Review
Black
evil, unhappiness
White
purity, innocence
Red
love, excitement
Blue
calmness, sadness
Green
envy
Yellow
warmth, energy
Purple
wealth, mystery,
wisdom
Brown
reliability,
strength
Orange
enthusiasm,
attention
Pink
romance, kindness

Review

Beige/ Cream
Doubt, Curious, Purity, Innocence, Wealth, Mystery, Wisdom, Reliability, Enthusiasm, Attention
Should, Shouldn't, Positive, Negative, Prefer

Visual presentation

'Me and colours' by G1S3

Introduction

- As you can see, there is/are_____. (colour/objects)

Process description

- First, _____
- Second/Then, _____
- After that,_____
- Last/Finally,_____

Discussion

- I think_____
- In my perspective,_____
- In my opinion,_____
- My ideas were_____

Any comments?

- The reason I _____is because_____
- I did _____because_____
- I don't think so, because_____

Visual presentation

‘My favourite stuff’ by G1S2

Introduction

- As you can see, there is/are_____. (colour/objects)

Process description

- First, _____
- Second/Then, _____
- After that,_____
- Last/Finally,_____

Discussion

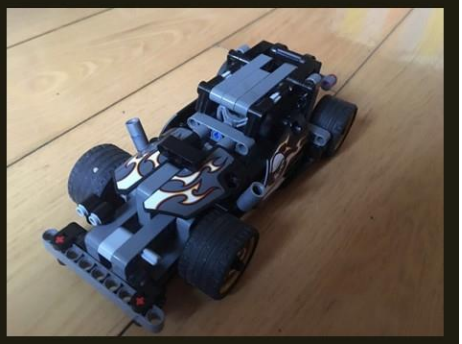
- I think_____
- In my perspective,_____
- In my opinion,_____
- My ideas were_____

Any comments?

- The reason I _____is because_____
- I did _____because_____
- I don't think so, because_____

Visual presentation

'Colours in my life' by G1S1



Introduction

- As you can see, there is/are_____. (colour/objects)

Process description

- First, _____
- Second/Then, _____
- After that,_____
- Last/Finally,_____

Discussion

- I think_____
- In my perspective,_____
- In my opinion,_____
- My ideas were_____

Any comments?

- The reason I _____is because_____
- I did _____because_____
- I don't think so, because_____

Questionnaire

1. How did you plan your visual homework?
2. What research did you do to inform your work?
3. Who or where did you get the most help from?
4. What was the most difficult part?
5. How did you feel about using visuals for learning?
6. What ideas or facts remain memorable after this study?
7. What things did you most enjoy about this study?
8. Would you like to take similar visual studies again?
9. What would you like to do or learn with visuals next time?
10. Do you have any other comments?

Good job!

Thank you ;)

The Pilot Study Researcher Notes

Lesson 1

Date: 17/04/2020 @5pm Beijing time (10 am UK time)

Participants: Six students attended lesson one: G1S1, G1S2, G1S3, G1S4, G1S5, and G1S6.

Participation: G1S6 had some sound problems, and I couldn't hear her for the entire class. G1S1 was a bit late and had some sound problems at the beginning of the class. G1S6 didn't stay till the end of the class. G1S5 had an internet problem in the middle of the class. Other than that, the rest students fully participated and actively interacted with each other.

All the tasks went well as planned as they all talked about their favourite colours, objects in these colours and their hometown. They also recognised different colours in regard to light, dark, warm, cold, colours and comprehended different emotions in terms of positive and negative ones. What's more, they were able to express feelings with sentences like 'I felt…because….'

G1S2: I feel happy, because after this class I clean my room and then play.
G1S1: I was happy today, because I can watch TV.
Julie: I feel happy today, because I have a holiday tomorrow.

Also, they were able to share their preferences and ideas by using 'I prefer, because…, I think…can mean…, …should be…, etc.

What surprised me was the way G1S2 described his feelings of the day: *"I feel grey today because I finished my homework."* before I proceed to the task about relations between colours and emotions. They also came up with new ideas of emotions that are related to different colours, for example, G1S2 said the orange face can also mean 'doubt'.

At last, they all understood the requirements of their homework with visual presentations.

I think their grammar of verb tense needs to be improved; In terms of interaction, **I need to make sure every student has a chance to speak without disturbance by others' voices by turning on one microphone at a time to avoid overlapping voices. Maybe trying to use individual-based conversations after the lesson can allow each student to express their thinking fully and freely.**

Lesson 2

Date: 24/04/2020 @5pm Beijing time (10 am UK time)

Participants: four students participated in lesson 2: G1S1, G1S2, G1S3, and G1S4

Participation: G1S6 was absent, G1S5 asked for leave as he had school classes to take, G1S1 was late, G1S4's microphone wasn't functioning, so I couldn't communicate with her, the rest students engaged fully and actively.

The first part was a review of lesson 1:

First, they used colours to describe their feelings about the past week;

G1S2: I felt yellow because I am happy every day.
G1S3: I felt yellow too because I watch TV.

Then we reviewed some keywords of colours and emotions as well as some verbs and adjectives, such as prefer, should, shouldn't, positive and negative, G1S2 was able to remember the colour cream/beige.

G1S2 and G1S3 managed to distinguish warm, cold, dark, light colours and positive and negative emotions. They also managed to share their ideas of linking colours and emotions as follows;

G1S2: Black means evil, red I think romantic and love…green…嫉妒 (envy)…purple means like I think purple means wealth, mystery.,… orange… I know how to spell a-t-t-e-n-t-i-o-n… pink…kindness.
G1S3: white means good, blue means sad, I think brown means strong.

They need to practice more on the pronunciations of some nouns, such as beige, mystery, envy, attention.

The second part was a homework discussion. I received homework from G1S1 in jpg form and G1S2 in pdf form through the *DingTalk* app and G1S3 in ppt form through the *WeChat* app.

They took some photos to introduce themselves and describe colours in their lives by presenting their favorite colours, drinks, books, and toys. They also described the content of the photos, how they planned their photos in terms of why they chose the objects in the photos to explain how colours permeate their lives during the discussion as follows;

T/R: I've noticed you uploaded some pictures of different books, what kind of books are these?
G1S3: These are what I like to read adventure.
T/R: Which one do you like to read the most?
G1S3: I like to read blue colour.
T/R: There are two blue colours, which one, dark, light?
G1S3: The both.
G1S2: I read the two blue one, I think they are good they are some graphic novels, the light blue one tells us how to survive on the island and the blue one says what happens in the deep sea.
G1S2: First I put the stuff on that little sofa, then took the pictures of them, next I make it into a pdf and next I give it to you. Well, two of them is that I found on my iPad that first one is Plants vs Zombie and the second one is Minecraft cause I sure like those two games and then my favourite colour red and my favourite drink soda…And I like history, science stuff, and science fiction books. I like to explore the earth and the last picture you can see that, I like playing Lego.

(G1S3 and G1S3 evaluate each other's pictures)
G1S3: I think it's good because he tell us his hobby and he also like to read books.
(Then G1S1 joined the class)
G1S1: My mother help me, I find them in my home, my toy is black, purple, white and my book is black, the book talk about the sky, sun, earth, moon, and UFO.
G1S2: I think it's good, well because that when you see it, you really know he like reading adventure books and what are those, what adventure books"

G1S3: Any adventure books.

We learned some new words such as funeral, visible, sci-fi (science fiction), wall, Milky Way, efficient.

Students need to pay attention to grammar in terms of verb tense.

I need to give students more time to speak (waiting time).

Give clear directions on ppt visuals to help them do tasks. For example, in lesson 1 ppt, for the task of 'choose a face that matches your feelings, I should have given students the slide of faces marked with numbers first instead of the slide with random faces which brought difficulties for them to label and talk about the chosen ones.

Interview

Date:

26/04/2020: G1S1@ 6 pm Beijing time (11 am UK time)

27/04/2020: G1S2 @ 5 pm Beijing time (10 am UK time), G1S3 @ 5:30 pm Beijing time (10:30 am UK time)

Interviewees: G1S1, G1S2, and G1S3 are 8 to 10-year-old ESL pupils in Wuhan, China.

Language: G1S1 responded mainly in Mandarin, G1S2 and G1S3 responded in English.

Transcriptions: their responses in Mandarin were translated into English in the brackets by the researcher.

Remark:

All three students were able to employ external cultural artifacts (the books they like to read, the toys they like to play with) that were invested with meaning and became mediating signs that enabled them to control their behavior from the outside (i.e., enable themselves to use those books and toys for supporting their understanding of visualisation and visual production).

This agentive (intentional) action is the mechanism of Vygotsky's double stimulation (Vygotsky, 1987) that consists of two stages of stimuli: the initial problem situation (first stimulus) and the mediating conceptual tool (second stimulus). His principle of double stimulation is not only a way to enhance performance in learning and problem-solving tasks, but also is "essentially a mechanism of building novel concepts, agency and will" (Engeström, 2011, p. 14).

Table 5. The Pilot Study Interview Extracts

1.	Have you learned anything new from these two lessons? 1.1 If yes, what new knowledge or language have you learned? 1.2 If not, how do you feel you did in these lessons?
G1S1	G1S1: I learned the colour and expression. T/R: What expressions? G1S1: Angry, happy, smile and scared. T/R: So, you learned some emotions and colours, did you learn any sentences? G1S1: What colour is what expression. Angry is red and yellow is happy.
G1S2	G1S2: I learned a new color brige that also called cream and…different colour in different people's eyes mean different feelings. T/R: Beige. G1S2: I learned some new words that's like evin, kindness, wisdom. T/R: Envy? G1S2: Yes.
G1S3	Colours to stand for our feelings.
2.	How much did you know about the topic (colours and emotions) before the lessons?
G1S1	G1S1: Eight colour expression. T/R: What is something new about emotions you learned? G1S1: The black. T/R: What does black represent emotion? G1S1: Black is so…邪恶 (evil). T/R: 邪恶 (evil) evil.
G1S2	G1S2: You know that the emoticon pack, the angry part always the red stuff and the scary part use blue, green and plus yellow and also some yuck things they use green to do it.
G1S3	G1S3: Not many things. T/R: Can you tell me the things you know before the class? G1S3: I know colours, we can use colours to draw pictures.
3.	What visuals did you use for your homework? Where did they come from?
G1S1	T/R: 我记得上堂课你有给老师看的的照片 (I remember last class you showed me your photos) photos, your mother helped you take them? G1S1: Yes, my mother help me.
G1S2	G1S2: I use this comfortable grey, because you can see like when you taking pictures, it's all grey and like those the stuff I am taking picture with is something that have light colour like yellow, white, and those thing will make those stuff light coloured stuff more … you can see them in very quick time, grey dark colour grey plus light color. T/R: You mean there is a contrast of colours, the grey colour can make other colours stand out more. G1S2: Yes.
G1S3	G1S3: Some pictures like my book and when I read is my mom take for me, and others is I take it in our… in my mom's phone. T/R: Which ones were taken by you? I remember you sent me three pictures. G1S3: My book is taken by me.

4.	Did visuals/images help you to understand new knowledge or come up with new ideas? 4.1 If yes, how? 4.2 If not, why?
G1S1	G1S1: 比如在 QQ 和微信软件里 不是有那个表情包吗，那个表情里面几乎全部都是黄色的表情，我就认为所以的表情都是属于黄色的。然后我发现每个表情都代表每个颜色 (I used to think that all emotions are in yellow since the emojis in QQ and WeChat are in yellow, then after the lessons, I realised that emotions can be in different colours). 比如我刚才说的 (As I just mentioned) red angry and white is good means. T/R: Good meanings. G1S1: 善良 kind-hearted. 我看到课件图片之后，首先我就会有一些想法，就是觉得这些图片竟然可以这样搭配颜色和表情，然后我就还不是很肯定，后来我就会去看其他图片，其他人的想法是不是和图片上面的相符，如果有很多选择的话，我就会去查资料，去网上查，然后我在网上查或者很多想法是这个一致的话，就是说明这个选择是正确的，然后我就会有这个知识 (After I saw the visuals in the ppt, I was a bit uncertain about such matches of colours and emotions, so I searched online about this topic and learned this type of knowledge). T/R: Okay, 所以一开始你看到老师给的这些图片的时候你还不能完全确定，之后你自己有去查找一些资料，在网上去查找一些资料，然后去验证 (So you were uncertain about the visuals I showed in classes, then you searched online to verify). 其实关于颜色和情感表达没有一个标准答案，并不是红色就一定代表生气，红色在中国文化中代表运气，代表节日的喜庆(In fact, there is no standard match between colours and emotions, red not necessarily means anger, in Chinese culture, it is a holiday colour that also means luck). G1S1: 红色还代表爱情呐(Red also represents love)!
G1S2	G1S2: My learn is the dark colour will set off the white colour, the white will set up the dark colour. T/R: White and black are opposite colours. G1S2: Yes, opposite will set up each other.
G1S3	G1S3: Yes, I think we can learn some like colours new colours…use colour to stand for something like our feelings…I think it's different colours can stand for different feelings and different things. T/R: What different things? G1S3: Just learn something about science, like some experiments. T/R: How did those visuals help you learn English? G1S3: I think it can tell some about like when two person is talking use English, it can make video and it can write something about they talk.
5.	How might visuals be used in the future to help you learn?
G1S1	G1S1: 我会知道这些图片上面…仔细去看它，搜索它上面我未知的知识，可能会在验证的同时知道更多的知识 (I'll know what's in the visuals and look at it carefully, search the knowledge that I don't know, probably I'll learn more when I search and corroborate that knowledge). T/R: 嗯，那你会不会在表达的时候，以后可能也会用一些图片的形式来表达呢 (Um, what if you don't know how to verbally express yourself, would you possibly use visuals)? G1S1: 会啊 很多时候都会 (Yes, many times). 比如 today, I 学习一个三角形 triangle (For example, I learned about triangle today), my father have a question, 我不知道给他怎么解答，然后我就会用图述的形式去给他解答，让他明白这个问题是怎么回事 (I didn't know how to verbally explain, so I used visuals to answer his question). T/R: 这种情况有没有在语言学习当中遇到过 (Have you had such experience in language learning)? G1S1: 会啊，我会表达自己的意见 (Yes, I'll express my opinions). T/R: How will you explain your opinion? G1S1: I'll say 如果说不清楚的话 (if I can't articulate clearly), I'll draw 画给他们看 (and show them), 让他们知道我自己的想法 (let them know my ideas). My father say 我表达能力不行 (I am not good at expressing myself), 我总是会用画图的形式 (I often use drawings instead), 因为我非常喜欢画画 (because I love drawing).
G1S2	I like to draw and it may be help me to draw some pictures… when sometimes I talking about my friends with some game pictures and some friends like my another English teacher in America, I'll show him my draw and we are talking about it and then we have up per English learn.

G1S3	G1S3: I think I want to learn about science. T/R: How could visuals help you to learn science in your opinion? G1S3: Visuals can help us learn something like technology.
6.	What suggestion could you give me as a teacher about using visuals to help you learn?
G1S1	G1S1: 我觉得不仅是图片，文字也非常…要写一些文字然后加强理解能力 (I think not just visuals, words are also very… should write some words to enhance understanding). T/R: 文字和图片结合 (Combing words with visuals)? G1S1: Yes, yes.
G1S2	G1S2: My gestion is like that we have mouths to say and the… to think, so we can do saying, we can do writing, also write. T/R: Uh-huh, we can say and write.
G1S3	G1S3: We can search pictures on internet. T/R: You think teachers can give you some opportunities to search images on the internet? G1S3: Yeah.

Table 5. Three students' interview responses

Table 6. The Pilot Study Questionnaire

What research did you do to inform your work? (It could be consulting with teachers or peers, searching visuals online, self-creation like making a drawing, painting, etc.)	
G1S2	I don't.
G1S3	I take some pictures about my hobbies and my books.
Who or where did you get the most help from?	
G1S2	No, I don't.
G1S3	I get help from my mom.
What was the most difficult part?	
G1S2	Write homework
G1S3	The most difficult part was making power point.
How did you feel about using visuals for learning? (I felt confident, not confident, easy, difficult, etc., because…)	
G1S2	Good.
G1S3	I think using visuals for learning is very good.
What ideas or facts remain memorable after this study?	
G1S2	A new color.
G1S3	I know we can use colors to stand for our feelings.
What things did you most enjoy about this study (lesson 1+2)? (Group work/ discussion, learning to use visuals, etc.)	

G1S2	The pictures.
G1S3	I most enjoy using colors to introducing us.
Would you like to take similar visual studies again?	
G1S2	Yes, I do.
G1S3	Yes, I want to take similar visual studies again.
What would you like to do or learn with visuals next time?	
G1S2	Yes.
G1S3	I want to learn science with visuals next time.
Do you have any other comments?	
G1S2	No.
G1S3	No.

Table 6. Two students' questionnaire answers

Table 7. The Pilot Study Analytical Framework

RQs	Data sets	Themes	Categories	Excerpts (the brackets are English translations)
RQ1: In what ways might visualisation serve as an intermediary learning tool (visual languaging) that bridges conceptual knowledge construction and language learning in English language classrooms?	In-class Learning Conversations transcripts, English lessons	Concept and language development	Describing and explaining emotions	G1S1: What colour is what expression. Angry is red and yellow is happy. G1S3: I was happy today because I can watch TV. G1S4: "I feel happy today because I have a holiday tomorrow G1S2: I feel grey today…because after this class I clean my room".
				G1S2: I felt yellow because every day I am happy. G1S3: I felt happy because I watch TV. T/R: What are your favourite TV programs? G1S3: My favourite program is the news. T/R: What colour would you use to describe your happiness? G1S3: I can use yellow too. T/R: Why? G1S3: Because I am happy. T/R: Do you think yellow is a happy colour? G1S3: Yes, I think.

			Language scaffolding in the lessons	T/R: What about the left bottom? G1S2: That's cream. T/R: Yes, is there another way to say it? G1S2: Let me think something… bridge, b-e-i-g-e. T/R: You are correct in spelling, but the pronunciation is beige. 'Bridge' has an 'R'. G1S3: It like, just like ice cream. G1S2: Vanilla. T/R: Very similar, that's why we call it cream as well.
				G1S2: Black means evil, red I think romantic and love. G1S3: White means good, blue is sad. T/R: What about the person in green? G1S3: He feel 嫉妒 (envy). T/R: How to say it in English? G1S2: I think that's e-n-v-y, Envy. T/R: Yes, what about purple? G1S2: Purple means like I think purple means wealth, mystery. T/R: What about brown? G1S3: Brown is… G1S2: I think brown means strong. T/R: And orange? G1S2: I know how to spell a-t-t-e-n-t-i-o-n. T/R: Attention. T/R: The last one - pink? G1S2: Kindness.
	Interview transcripts		Language scaffolding in the interviews	T/R: What is something new about emotions you learned? G1S1: The black. T/R: What emotion does black represent? G1S1: Black is so…邪恶 (evil). T/R: 邪恶 (evil) evil.
				T/R: Have you learned anything new from the lessons? G1S2: I learned a new color brige that also called cream and…different colour in different people's eyes mean different feelings. T/R: Beige. G1S2: I learned some new words that's like evin, kindness, wisdom. T/R: Envy? G1S2: Yes.
RQ2: How can students develop their appropriate use of specific cognitive	In-class Learning Conversations, English lessons	Languaging with visuals	Describing, explaining, evaluating visuals	T/R: I've noticed you uploaded some pictures of different books, what kind of books are these? G1S3: These are what I like to read adventure. T/R: Which one do you like to read the most? G1S3: I like to read blue colour.

discourse functions through visually scaffolded languaging?	Visual artefacts (Photos, online images)			T/R: There are two blue colours, which one, dark, light? G1S3: The both. G1S2: I read the two blue one, I think they are good they are some graphic novels, the light blue one tells us how to survive on the island and the blue one says what happens in the deep sea. G1S2: "First I put the stuff on that little sofa, then took the pictures of them, next I make it into a pdf and next I give it to you. Well, two of them is that I found on my iPad that first one is Plants vs Zombie and the second one is Minecraft cause I sure like those two games and then my favourite colour red and my favourite drink soda…And I like history, science stuff, and science fiction books. I like to explore the earth and the last picture you can see that, I like playing Lego."
				G1S2: I use this comfortable grey because you can see like when you taking pictures, it's all grey and like those the stuff I am taking picture with is something that have light colour like yellow, white, and those thing will make those stuff light coloured stuff more … you can see them in very quick time, grey, dark colour, grey plus light color. T/R: You mean there is a contrast of colours, the grey colour can make other colours stand out more? G1S2: Yes.
				G1S2: I think it's good, well because that when you see it, you really know he like reading adventure books and what are those, what adventure books. G1S3: Any adventure books.
	Interview transcripts		Describing learning with visuals	T/R: How might visuals help you in the future to learn? G1S1: 我会知道这些图片上面 (I can know what's in the visuals)…仔细去看它(by carefully looking at them), 搜索它上面我未知的知识(and researching the knowledge on the visuals that I don't know), 可能会在验证的同时知道更多的知识 (I may learn more whilst verifying the new knowledge). T/R: 嗯 (Mm), 那你会不会在表达的时候, 以后可能也会用一些图片的形式来表达呢 (Would you use visuals to express your thinking when you don't know how to put it into words in the future)? G1S1: 会啊(Yes), 很多时候都会(often), 比如(for example) today, I 学习一个三角形(learned about) triangle, my father have a question, 我不知道给他怎么解答, 然后我就会用图述的形式去给他解答，让他明白这个问题是怎么回事 (I didn't know how to verbally explain, so I used visuals to answer his question).
RQ3: What are the necessary conditions for online learning experiences which encourage		Student feedback	Feedback for teaching with visuals	T/R: What suggestions could you give me? 我最为一个老师, 你对老师有什么建议吗? (Do you have any suggestions for me as a teacher?) G1S1: 我觉得不仅是图片，文字也非常…要写一些文字然后加强理解能力 (I think not just visuals, words are also very… should write some words to enhance understanding). T/R: 文字和图片结合 (Combing words with visuals)?

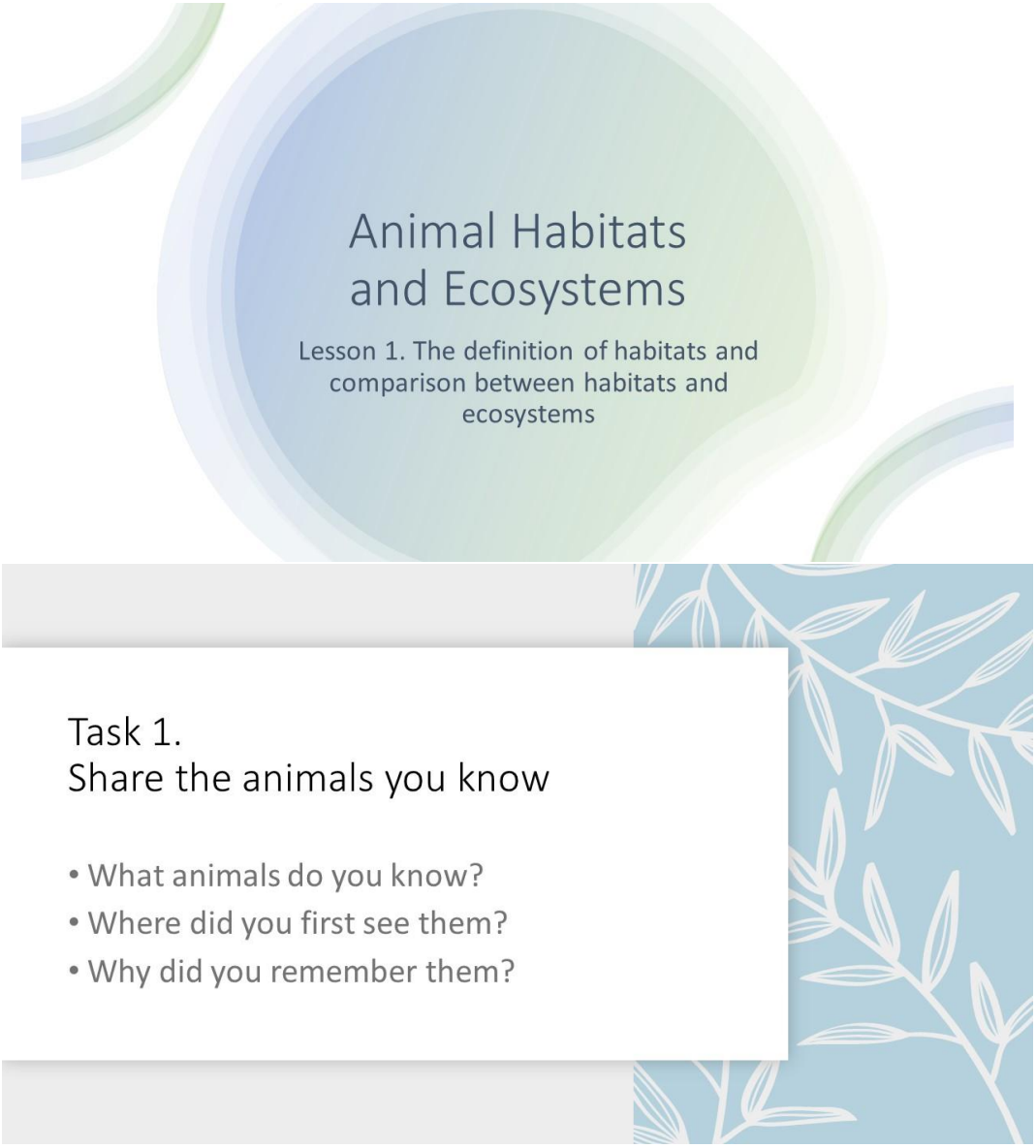
interactive development of visual languaging for pluriliteracies growth in a digital learning space? To what extent can visual languaging support teachers to adapt mentoring online? How might visual languaging foster learner agency?				G1S1: Yes, yes.
				T/R: What suggestions could you give me as a teacher using visuals to help you learn? G1S2: My gestion is like that we have mouths to say and the… to think, so we can do saying, we can do writing, also write. T/R: Uh-huh, we can say and write.
				T/R: Do you have any suggestions for me as a teacher to use visuals to help you learn? G1S3: We can search pictures on internet. T/R: You think teachers can give you some opportunities to search images on the internet? G1S3: Yeah.
			Feedback for learning with visuals	T/R: 这种情况有没有在语言学习当中遇到过(Have you had such visualisation experience in language learning)? G1S1: 会啊, 我会表达自己的意见 (Yes, I'll express my opinions). T/R: How will you explain your opinion? G1S1: I'll say 如果说不清楚的话 (if I can't say it clearly), I'll draw 画给他们看 (and show them), 让他们知道我自己的想法 (let them know my ideas). My father say 我表达能力不行 (I am not good at expressing myself), 我总是会用画图的形式 (I often use drawings instead), 因为我非常喜欢画画 (because I love drawing).
				T/R: How might visuals help you in future learning? G1S2: I like to draw, and it may be help me to draw some pictures T/R: How could drawing help with your learning? G1S2: Well, I never give up my drawing, if my learning is not good, I cannot get much money, then I can draw pictures (to make a living). T/R: How could drawing help with your language learning? G1S2: When sometimes I talking about my friends with some game pictures and some friends like my another English teacher in America, I'll show him my draw and we are talking about it and then we have upper English learn.
				T/R: How might visuals be used in the future to help you learn? G1S3: I think I want to learn about science. T/R: How could visuals help you to learn science in your opinion? G1S3: Visuals can help us learn something like technology.

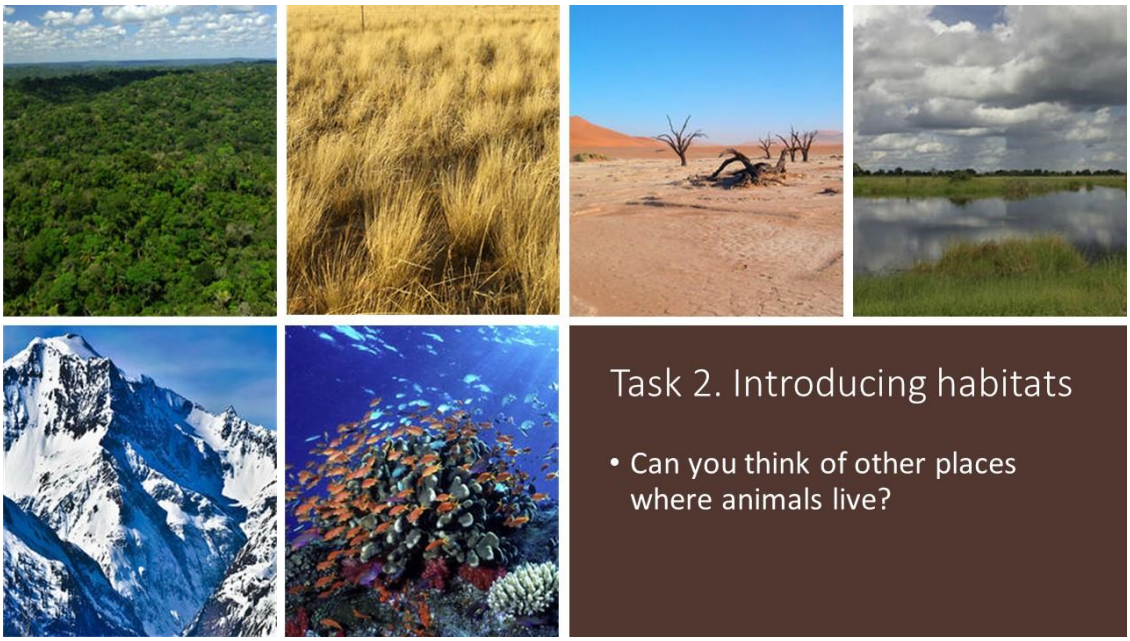
Table 7. The Pilot Study analytical framework

Appendix II: The Main Study Data

The Main Study Class PowerPoint Presentations

Lesson 1





Task 3. What are habitats?

Places:

Animals:

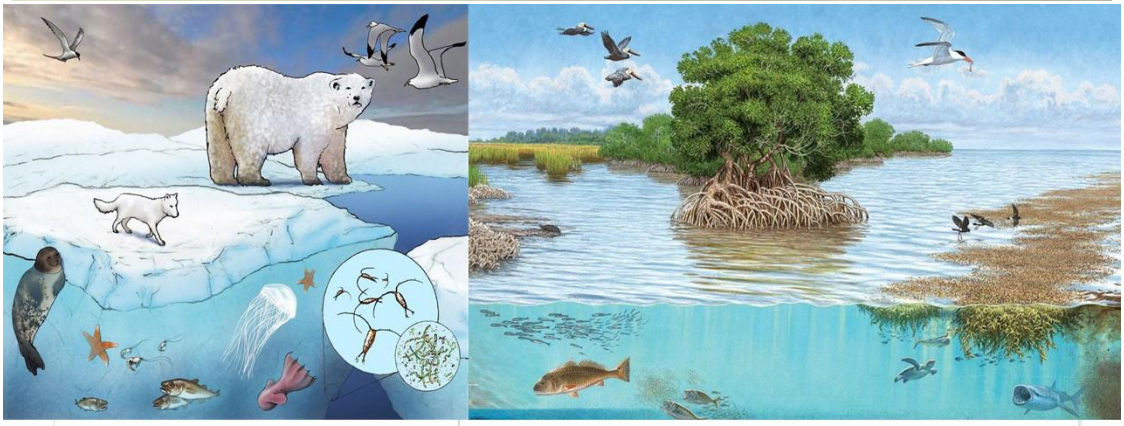
Food:

Task 4. Drawing practice 1

What's your favourite animal?

Which habitat does it live in?

Can you draw the animal in its habitat?

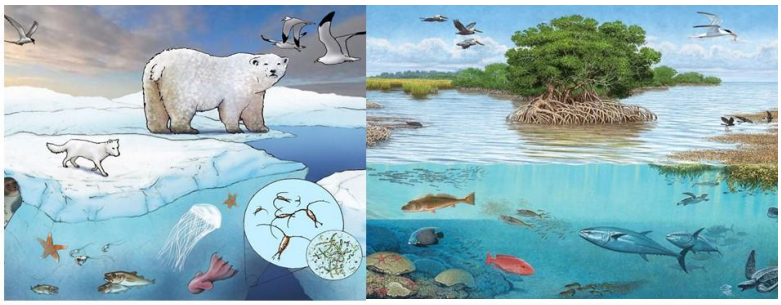


Task 5. Ecosystem

- Plants:
- Species:
- Habitats:

Task 6. Comparison (1)

- What are the differences between the top images and the bottom ones?



Drawing practice 2

- Think plants and animals that co-exist in the habitat you drew
- Draw them on your Task 3 drawing
- Share your ideas in lesson 2

Key words and expressions

- Animals: **sealion, fox, polar bear, seagull, sea star, jellyfish, crane, turtle**
- **Habitats**: the home for animals where they can live comfortably.
- Types of habitats: mountain, forest, **grassland, wetland, desert**, ocean
- **Ecosystems:** have more **diverse** animals and plants

Lesson 2

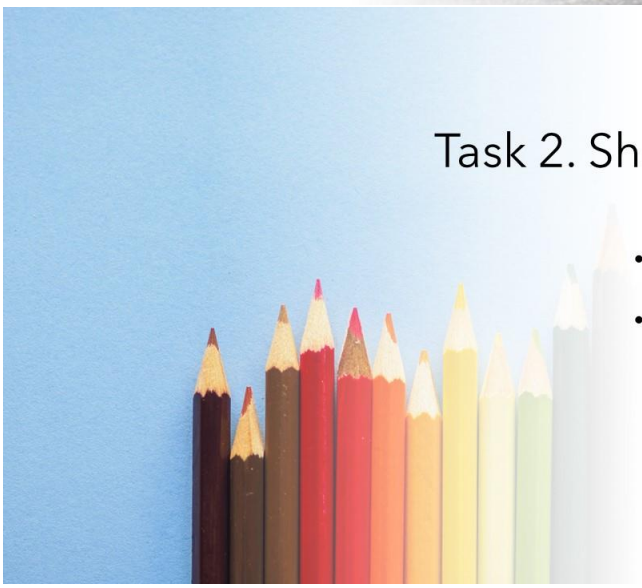
Task 1.
Review

- Recall different habitats:
- What are habitats?
- Differences between habitats and ecosystems

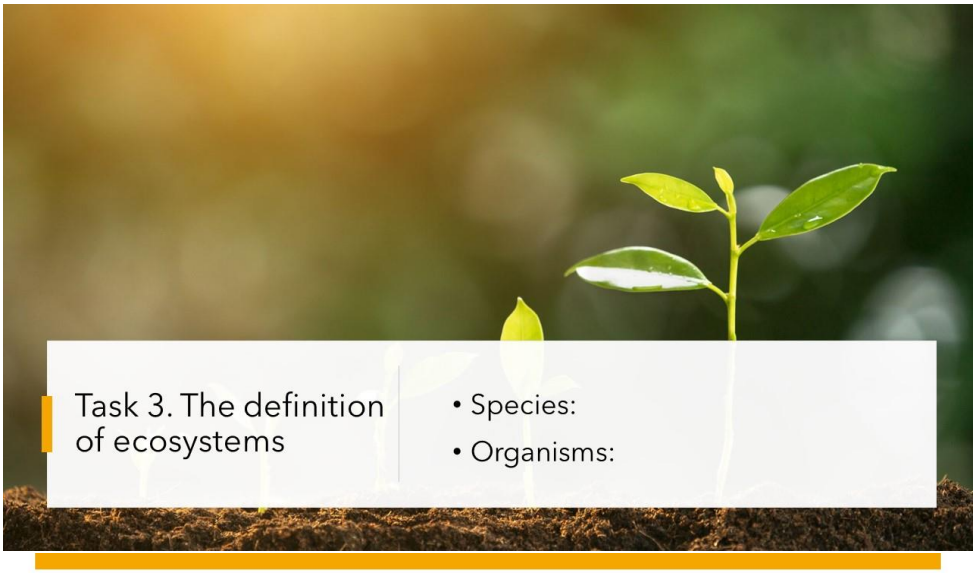
Key words and expressions from Lesson 1.

- Types of habitats: mountain, forest, **grassland, wetland, desert, marine**
- **Habitats**: animals' home where food can be found for living
- Ecosystems: **diverse** animals and plants

Task 2. Share your drawing



- What are in your drawing?
- Why did you draw them?



Task 3. The definition of ecosystems

Nouns: species, organisms
Adjectives: specific, diverse
Verb: inhabit = live in…

Rephrasing concepts:
Habitats are…
Ecosystems are…

Drawing practice 3. Draw in pairs

Search	Search for the relationship between habitats and ecosystems
Draw	Draw down your ideas
Send	Send to your teammate
Add	Add comments on each other's drawing
Share	Share in lesson 3 as a pair

Homework: Language practice 2

What are species?

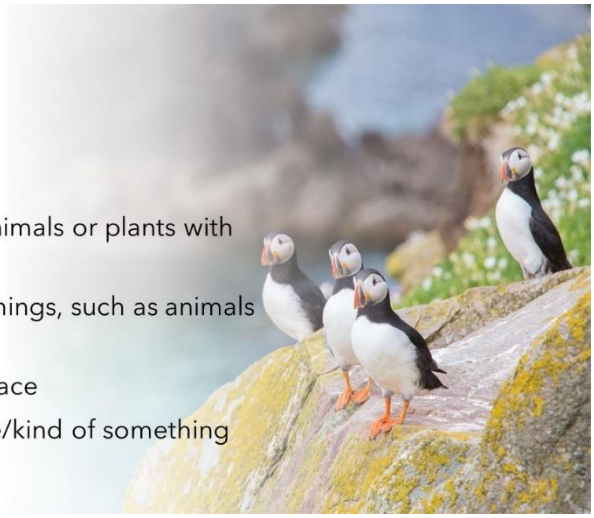
What are organisms?

What are ecosystems?

(Please write down your understanding of their meanings in English)

Key words and expressions

- **Species**: all kinds of animals or plants with the same features
- **Organisms**: all living things, such as animals and plants
- **Inhabit**: live in someplace
- **Specific**: a certain type/kind of something



Lesson 3

Task 1. Share group drawing

What did you find?
We found…

What are in your drawings?
I drew…

What are your ideas?
My ideas are…

Task 3. Similarities of habitats and ecosystems

Things you see in those images:
Biotic:
Abiotic:

Task 4. Review

- Biotic & Abiotic:
- Habitats:
- The relationships of habitats and ecosystems:

Drawing practice 4.

1. Draw an ecosystem

2. Then draw habitats of your favourite animals or plants onto the ecosystem

Homework: Language practice 3

Classify the following words,

which ones are biotic?

which ones are abiotic?

animals, plants, water, ice, climate, soil, rock, sand

Key words and expressions

- **Biotic**: any living things, such as animals and plants
- **Abiotic**: any non-living things, such as water, air, rock, ice, sand
- **Co-exist**: live together in one environment
- **Contain**: have something inside of it
- **Multiple**: more than one

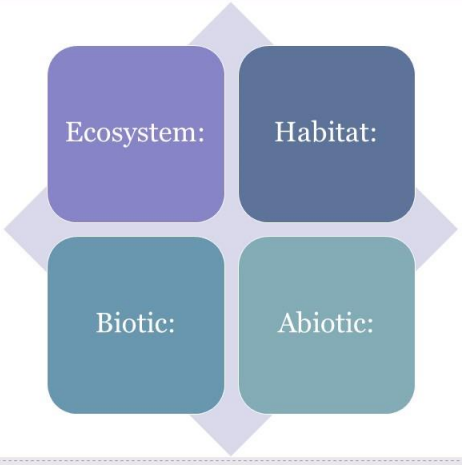
e.g., An ecosystem contains multiple habitats.

Lesson 4

Habitats and Ecosystems

Lesson 4.
Protecting habitats and ecosystems I

Task 1. Share your drawing



Task 2. Habitat destruction (1)

Existing problems:

Possible causes:

Consequences:

Task 2. Habitat destruction (2)

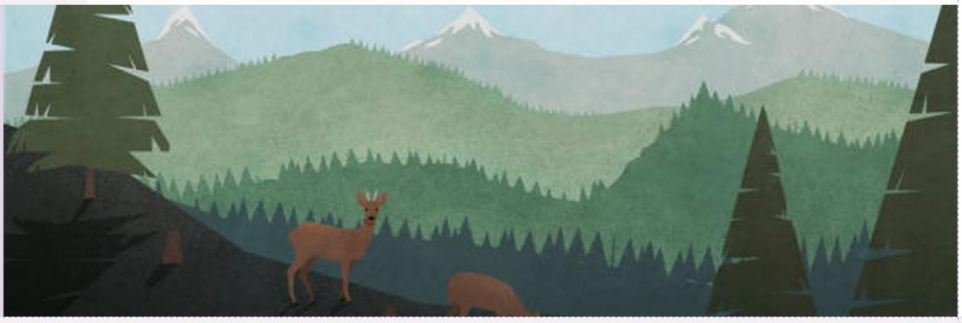
Existing problems:

Possible causes:

Consequences:

Task 3. Protecting habitats and ecosystems I

- Brainstorm ways of protection
- Share your thoughts
- What can you do?



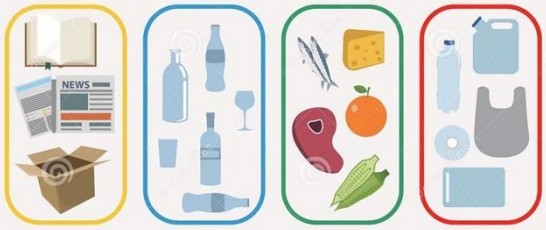
Reducing pollution

- Reducing garbage pollution
- Reducing air pollution

- Reducing garbage pollution

- Recycling garbage

- Separating garbage



Please throw the garbage into the correct bins:

- Reducing air pollution
  - Eco-friendly transportation
  - Plants

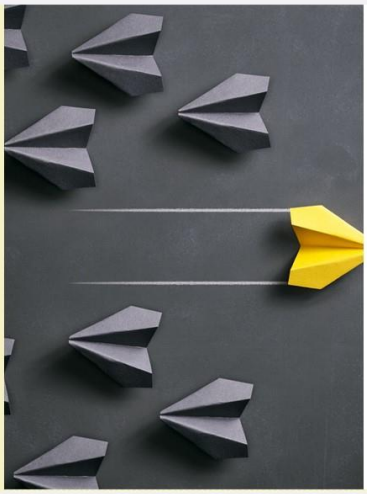
- Eco-friendly transportation:

- Plants

- What else can we do?

1. Draw the potential habitat problems on lesson 1 homework drawing
2. Then draw down your ideas of possible solutions
3. Share with us on lesson 5

Drawing practice 5

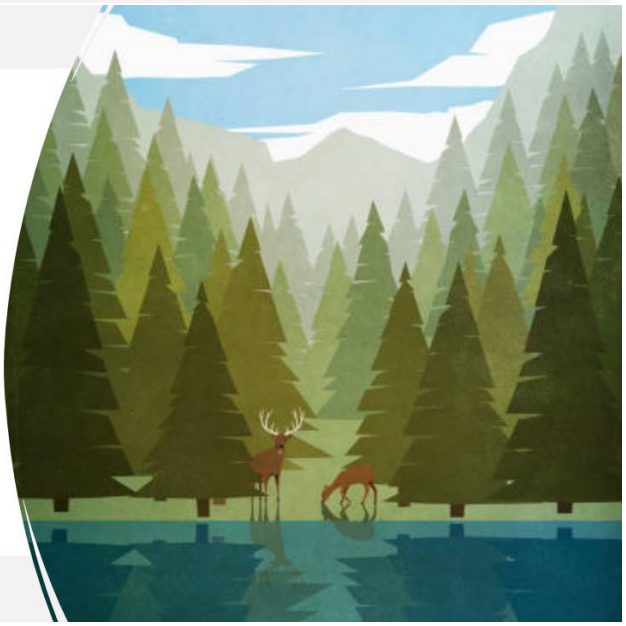


Homework
Language practice 4

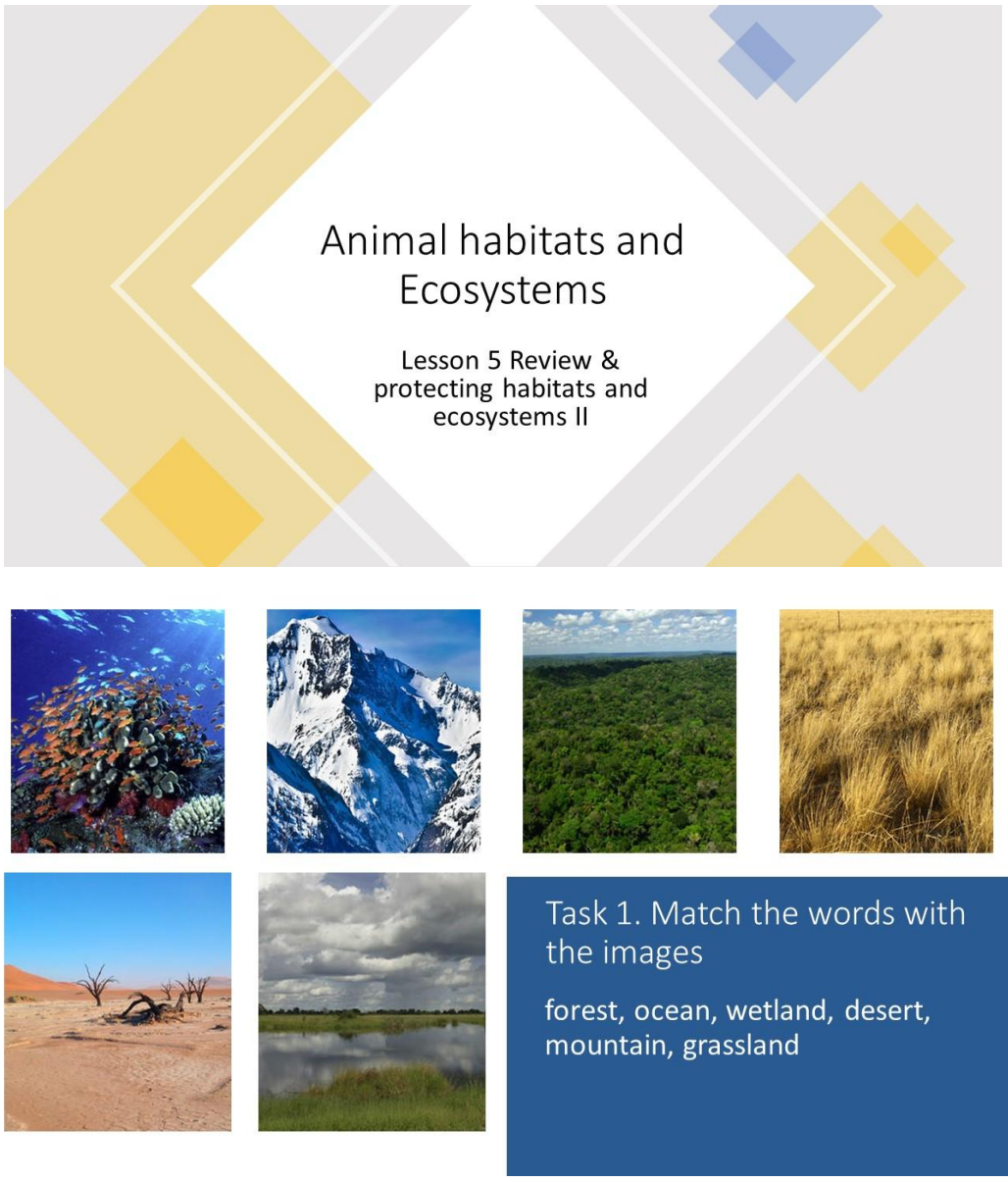
- Whare are some garbage types?
- What are some transportation modes?
- What is your way of dealing with garbage and taking transportation that protects the environment?

Key words and expressions

- **Reduce**: lessen
- **Pollution**: unclean, dirty
- **Destruction**: damage, ruin
- **Eco-friendly**: environment friendly
- **Transportation**: ways or tools to travel



Lesson 5

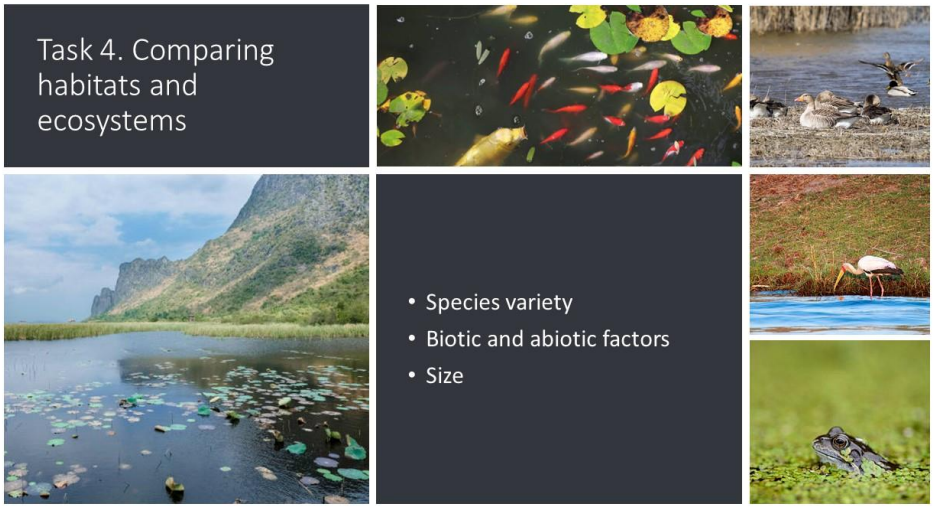

Animal habitats and Ecosystems
Lesson 5 Review & protecting habitats and ecosystems II
Task 1. Match the words with the images
forest, ocean, wetland, desert, mountain, grassland

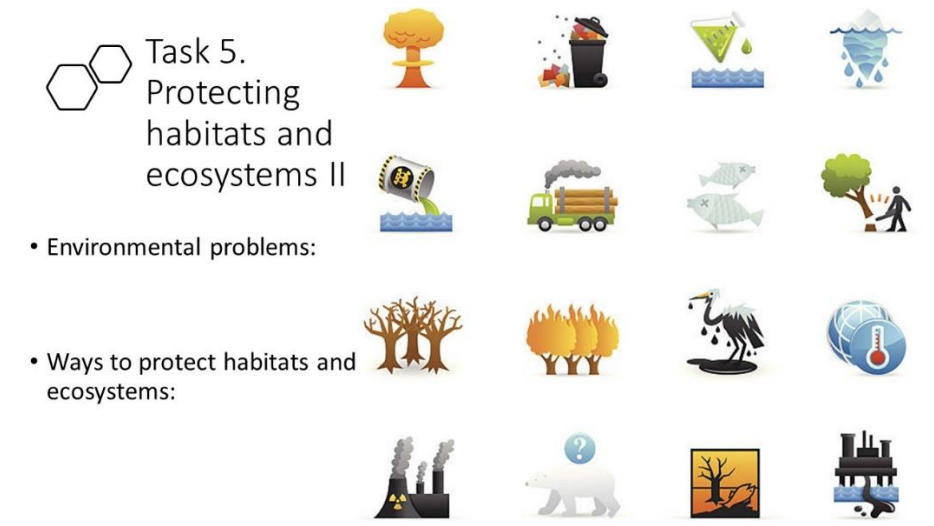
Task 2. What is a habitat?

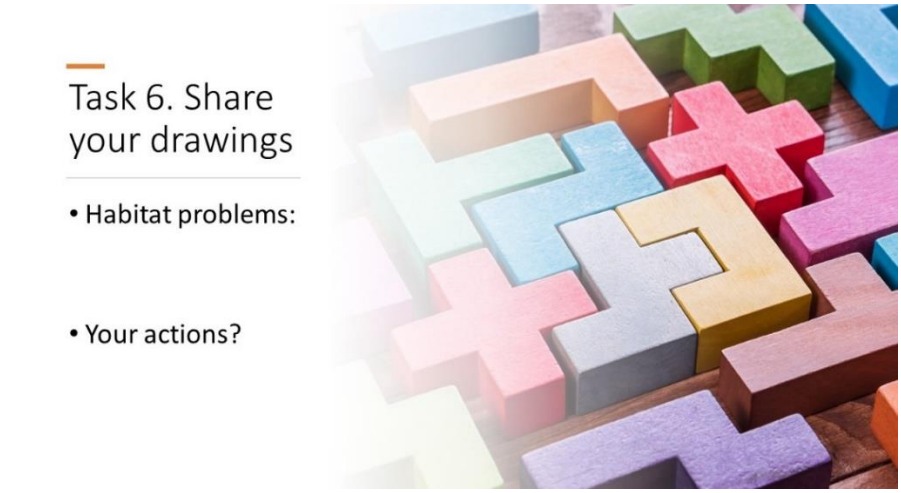
- Home
- Animal
- Food
- Live…

Task 3. What is an ecosystem?

- Biotic
- Abiotic
- Species
- Organisms


Task 4. Comparing habitats and ecosystems
• Species variety
• Biotic and abiotic factors
• Size


Task 5. Protecting habitats and ecosystems II
• Environmental problems:
• Ways to protect habitats and ecosystems:


Task 6. Share your drawings
• Habitat problems:
• Your actions?

The Main Study Researcher's Notes – Lesson plan

<table>
<tr><th colspan="4">Case study of visual languaging for deeper learning in online primary English language classrooms</th></tr>
<tr><th colspan="4">Lesson plan of habitats and ecosystems</th></tr>
<tr><td>Participants: 2 groups of Chinese pupils with up to 8 students per group</td><td>Design rationales that are in line with the Pluriliteracies model</td><td>Genres of science discourse needed</td><td>Corresponding with the research questions</td></tr>
<tr><td>Duration: 3 months, 10 classes
(five lessons each group, two class a month with one week in between for homework)</td><td rowspan="2">Conceptualising:
• Construct knowledge by learning facts, concepts of habitats and ecosystems.
Citizenship:
• Preserving habitats and ecosystems by adopting proper procedures</td><td rowspan="2">Organise scientific information about habits, ecosystems regarding their different physical features.

Describe different types of habitats and animals that live within

Explain the multiple factors that cause disruption of habits.</td><td rowspan="2">Cognition development:
Be able to understand the definitions of habitats and ecosystems, their differences, and relationships, and have the awareness of conserving habitats with empathy.</td></tr>
<tr><td>Theme: Habitats and ecosystems
Teaching Aims:
To enable learners to understand different animals' habitats; to develop learner' knowledge of the link between a habitat and an ecosystem; to raise learners' awareness of sustainable procedures to preserve ecosystems.</td></tr>
<tr><td>Language Objectives:
Different types of habitats:
General nouns: land (forest, desert, grassland, mountain, polar), water (ocean, lake, river)
Technical vocabulary:
Organisms (e.g., animals, plants), species, biotic abiotic (e.g., water, climate, soil),
Present tense verbs: lives, inhabits.
Third person singular form: … (animal) lives in …
Define habitat and ecosystem:
A habitat is an animal's home.
An ecosystem is the environment surrounding an animal's home.</td><td rowspan="3">In line with cognitive discourse functions that links language and cognition:
• Classifying types of habitats
• Describing habitats for different animals with third person singular form
• Defining habitats and ecosystems
• Explaining differences and relationships of habitats and ecosystems
• Exploring ways of preserving habitats</td><td rowspan="4">Discuss their point of views about preservation of habitats</td><td>Linguistic progression:
Know the names of different habitats.
Be able to use appropriate language to classify, describe and define habitats and ecosystems.</td></tr>
<tr><td>Cognition:
• Concepts of habitats and ecosystems
• Different types of habitats
• The relationships and differences of habitats and ecosystems
• Ways of habitats preservation</td><td>Cognition development:
Be aware of a habitat is within an ecosystem and they affect each other.
The realisation of habitat conservation</td></tr>
<tr><td>Pedagogies:
• Learning conversations (verbal stimuli)
• Guiding through visuals (visual perception)
• Visual languaging
a) Visual representation (learner generated drawings)
b) Visual communication (drawing articulation)</td><td>Mentoring learning:
• Use learning conversations to scaffold, guide and facilitate understanding.
Demonstrating/Communicating understanding:
Mode: use visuals to represent understanding when students have language barriers to articulate directly.</td><td>Visual languaging use visual representations to aid languaging that reflect their understanding</td></tr>
<tr><td>Assessment:
Teacher checks on students' understanding by answering the following questions:
Can students…</td><td>Mentoring learning:
Formative Assessment</td><td>Online EFL classrooms as digital shared learning spaces that</td></tr>
</table>

• name different habitats? • identify the concepts of habitat and ecosystem? • recognise the differences and relationships between them?		• Teacher provides on-going feedback and revises teaching strategies during teaching and interviews. • No grades or scores are given		integrate multiple communication modes for meaning making
Teaching materials and tools: Lessons with images of animals, habitats, and ecosystems as visual prompt and elicitation; written texts for image annotations to support understanding and articulation; laptop and iPhone as teaching and communication tool		Context: • online classrooms Modes of communication: • Visual and written texts Verbal learning conversations		
WEEK 1– LESSON 1: The definition of habitats and comparison between habitats and ecosystems				
Lesson 1 procedures:		Task design rationales	Language scaffolding	
Stages and Time	Learning activities	Justification for learning activities	Science language input	Driving questions to guide comprehension
Task 1: Warm-up 5min Whole class	Students brainstorm and name different animals they know.	The purpose of this activity is to lead in the topic of the lesson by activating students' prior knowledge about animals.	Describing: Based on what I have seen in books/TV, I realised that there are…	What animals do know?
Task 2: Visual prompt & Matching 10min Teacher and individual students	Teacher presents images of habitats and ask students to match the animals they named to these habitats.	Cognition via visual aids: The purpose of this activity is to facilitate understanding of the concept of habitats by linking with animals via images.	Hypothesizing and explaining: I expect that… (animal) lives in…(habitat), because…	Here are some places for animals to live, can you find homes for those animals?
Task 3: Summary 10min Whole class	Teacher guides students to summarise the concept of habitats and different types of habitats based on the former discussion.	Cognition: The purpose of this activity is to introduce key words and concepts of the academic content.	Describing: Based on the visual data showed before, there are…(habitats), they are animals' home. To be more specific: Habitats are animals' home where food can be found for living.	Let's sum up the places, animals, and food we discussed. How about using "A/an…. (animal) lives in… (place)" to describe their homes? This place is called a habitat, so can you tell me what a habitat is? How many habitats did we mention? What are they?
Task 4: Drawing practice 1- visual presentation 15 min Individual students	Students draw the habitats of their favourite animals and articulate their drawings.	*Visual languaging*: The purpose of this activity is to deepen the concept of habitats by articulating their understanding of habitats through drawings	Describing: The ideas I used in my drawing are…	Can you draw out your favourite animal and its habitat? What is in your drawing? What is the idea in the drawing?
Task 5: Visual prompt- visual perception 10min Whole class	Teacher presenting the images of ecosystems where habitats are depicted within and ask students to talk about what they can see.	The purpose of this activity is to raise students' awareness on the concept of ecosystems which prepares them for the content of lesson 2.	Describing: I observed that there are trees, rivers, sky, different animals, which are all included in the ecosystem.	What can you see in these images?

Task6: Visual prompt-visual perception & Comparison 10min Whole class	Teacher adds the images of habitats from task 2 and ask students to compare the differences between them	The purpose of this activity is to deepen students understanding by articulating the differences of habitats and ecosystems.	Comparing: The differences between habitat and ecosystem are…	Can you notice any changes between these images? What are the differences?
WEEK 2 – LESSON 1 HOMEWORK				
Homework: Drawing practice 2 and language practice 1 Individual students	Students draw factors of ecosystems and add them to the drawings from task 4 and answer the language related questions.	The purpose of this activity is to evaluate students' understanding on the relationships and differences between habitats and ecosystems. Also, the drawings can act as a trigger for next lesson's languaging.	Can you add some animals and plants on your last piece of drawing? For next lesson articulation: Can you tell us how you made it? Why?	
		By using corresponding English vocabulary to name the habitats in the pictures, learners' understanding of habitats in different forms acting as the home for certain animals can be reinforced with appropriate language use. Also, their answers may show a different angle of portraying the pictures that differ from the given words in the next slide. For example, they may be more descriptive by using 'snow mountain' instead of 'mountain' or 'coral reef' instead of 'ocean' to name the habitats, which to some extent encourage their thinking and learning with more individuality and creativity in a self-directed way.	• What is a habitat? • Name the habitats in the pictures	
WEEK 3 – LESSON 2: The definition of ecosystems				
Lesson 2 procedures:		Task design rationales	Language scaffolding	
Stages and Time	Learning activities	Justification for learning activities	Science language input	Driving questions to guide comprehension
Task 1: Review lesson 1 5min Whole class	Teacher guides students to recall concepts of habitats and ecosystems and different types of habitats.	The purpose of this activity is to prepare students to articulate the content of their drawings with the necessary language and concepts.	Describing: Based on lesson 1, I can conclude that a habitat is a type of animals' home. Comparing: Ecosystems have more diverse animals and plants than habitats.	What did we learn in lesson 1? How many habitats do you know? Can you tell me what is a habitat? What differentiate habitats from ecosystems?
Task2: Drawing articulation-visual representation 30min Teacher and individual students	Teacher asks each student to describe his/her drawing regarding the process of making, the links with the content of lesson 1 and offers formative feedback if necessary.	The purpose of this activity is to access whether students can understand the concepts of habitats and ecosystems, identify their differences, classify different habitats through *visual languaging*.	Describing: My drawing shows that there are… The animal/ habitat I used was based on…	Can you tell us what are in your drawing? Why did you draw them?
Task3: The definition of ecosystems 15 min	Based on their drawings from Task 2, teacher scaffolds students to link the content of	The purpose of this activity is to facilitate students to use appropriate science language to build concepts habitats and ecosystems.	Defining: An ecosystem refers to an environment where organisms living together.	Let us try to summarize what we learned in lesson 1,

Whole class	lesson 1 with appropriate science language (e.g., species and organisms).		A habitat is where a specific species inhabits.	can you give me some ideas? The animals and plants in your drawing are called 'species'. They are all alive, so we can call them 'organisms.'
WEEK 4 – LESSON 2 HOMEWORK				
Homework: Drawing practice 3 Groups and language practice 2 individual students	Teacher asks students to brainstorm the relationships of habitats and ecosystems in pairs and draw out their ideas, then answer the language related questions.	The purpose of this activity is to activate students' ability of searching and organising information about the relationships of habitats and ecosystems by working as a group.	Now we know the differences between habitats and ecosystems, but do they have any relationships? Can you search for it and draw down what you will find?	
		The learners can either review this class ppt or video recording to help them summarise the concepts of species and organisms or search online for relevant sources and describe them in their own way. The purpose of these alternatives is to encourage learners to search and gather useful information and synthesise them in their own language, thereby practising their linguistic skills and deepening their understanding of the concepts.	What are species? What are organisms? What are ecosystems? (Please write down your understanding of their meanings in English)	
WEEK 5 – LESSON 3: The relationships of habitats and ecosystems				
Lesson 3 procedures		Task design rationales	Language scaffolding	
Stages and Time	Learning activities	Justification for learning activities	Science language needed	Driving questions to guide comprehension
Task 1: Group drawing articulation 10min Whole class	Teacher asks each group to talk about their findings basing on their drawings.	The purpose of this activity is to lead in the content via students' oral presentation of their drawings.	Describing and explaining: Based on my drawing, I added…because… / I designed it in a way that…	Can you introduce the things in your drawings? Why do you draw them?
Task 2: Visual lead-in 10min Whole class	Teacher shows images of habitats and ecosystems from task 6 of lesson 1 and ask students to rank each according to their relative size.	The purpose of this activity is to raise students' awareness that a habitat is smaller than an ecosystem and it is within an ecosystem.	Evaluating: Based on the images, one difference between habitat and ecosystem is the size, another is the variety of animals and plants.	Which is bigger in size? A habitat or an ecosystem?
Task 3: Visual prompt 20min Whole class	Teacher asks the students to describe things they can see in both images, thereby guiding students to use 'biotic' and 'abiotic' to classify living and non-living things.	The purpose of this activity is to guide students to use appropriate language to classify living and non-living things in the habitat and the ecosystem, thereby deepening their understanding of the similarities between a habitat and an ecosystem.	Classifying: Living things such as animals and plants are biotic. Non-living things such as water, climate and soil are abiotic. They all co-exist within a habit and an ecosystem.	What can you see in the ecosystem? What about the things in the habitat? Is the habitat within the ecosystem?
Task 4: Review 15min Whole class	Teacher asks the students to name other habitats they can see in the ecosystem as depicted in the images.	The purpose of this activity is to enable students to review different types of habitats and link them with the ecosystem by realising that an ecosystem contains multiple habitats. Also, students can practise using new words: biotic, abiotic.	Describing: I observed that the bees live in the flower field, the spider lives on the web, the mushrooms live on the tree bark, the cow live by the river.	Based on the images, what things can you see are biotic and abiotic? Where do they usually live?

			There are four different habits that co-exist in one ecosystem.	Can they share the same ecosystem?
WEEK 6 – LESSON 3 HOMEWORK				
Homework: Drawing practice 4 and language practice 3 Individual students	Students make a similar drawing that depicts different habitats within one ecosystem and answer the language related questions.	The purpose of this activity is to practice and deepen students' understanding about the relationships of a habitat and an ecosystem.	Can you make a similar drawing to the last image we saw? How about drawing an ecosystem and add habitats of your favourite animals?	
		The purpose of this activity to reinforce learners' understanding of the concepts of biotic and abiotic which can be linked to the relationship between habitats and ecosystems that they both comprise biotic and abiotic factors and extended to the fact that an ecosystem can support multiple habitats.	Classify the following words, which ones are biotic? which ones are abiotic? animals, plants, water, ice, climate, soil, rock, sand	
WEEK 7 – LESSON 4: Protecting habitats and ecosystems I				
Lesson 4 procedures		Task design rationales	Language scaffolding	
Stages and Time	Learning activities	Justification for learning activities	Science language input	Driving questions to guide comprehension
Task 1: Drawing articulation 15min Teacher and individual students	Each student talks about his/her drawing regarding the habitat, biotic and abiotic factors depicted in the drawing.	The purpose of this activity is to check students' understanding of biotic and abiotic factors in a habitat and provide linguistic scaffolding during their languaging processes.	Classifying: Based on my drawing, the habitat I depicted is a … (e.g., river) with…(animal) living, the… (e.g., river) is abiotic, the…(animal) is biotic	Can you tell us what is your drawing? What things are biotic and abiotic? How many habitats are there? What are they?
Task 2: Introduction 15min Whole class	Basing on the habitats that students depicted in their drawings, teacher introduces the concept of preserving habitats by showing them images of habitats that are endangered.	The purpose of this activity is to raise students' awareness of preserving habitats that are under threat and guide them to evaluate the possible reasons of habitats destruction, such as human consumption and industrial development.	Describing, explaining, evaluating: Existing problems: Based on the images, I observed… (e.g., forest fire, deforestation, drought) Possible causes: I think it may be caused by (e.g., over-lumbering, dry air, global warming) Consequences: The animals may lose their habitats or be hurt and possibly die and become extinct (i.e., die out); the ecosystem in this region will be interrupted and destructed.	What can you see in the images? What happened to the habitats and animals? What might have caused these problems? How may it affect the animals living there?
			Existing problems: According to the images, I observed that (e.g., the melting ice; the garbage in the ocean and the beach; oil leaking in the ocean) Possible causes: The problems may be caused by (e.g., raising temperature in the North Pole/Arctic; garbage mishandling;	How about the problems in these images? What might be the causes?

			disoperation of offshore oil shipping) Consequences: Marine environment will be polluted, and sea creatures may hurt or die.	
Task 3: Brainstorm 10min Whole class	Teacher asks students to brainstorm ways to preserve habitats and guide them to discuss what they can do to contribute.	The purpose of this activity is to enable students to explore ways of preserving habitats from their perspectives and the accessible ways they can do to contribute, thereby cultivating their environmental responsibility for becoming good global citizens.	Exploring: Preserving habitats is not only the government's obligation but also each citizens' responsibility. We can … (e.g., provide a clean water source). Besides, we can… (use eco-friendly products). In addition, we should… (e.g., plant more trees, keep pets indoors).	Can you think of some ways to preserve these animals? What can you do to preserve their living places?
Reducing pollution 15min Whole class	The teacher presents some examples of protecting habitats and ecosystems, such as reducing pollution including air and garbage pollution to inspire students to come up with their ways of reducing such pollution and other environmental problems.	The purpose of this activity is to bring environment protection to students' daily lives and encourage them to take actions in their lives.	Classifying: We can sperate garbage by their categories, such as… (e.g., metal, plastic, paper, electronics, kitchen waste, etc.) should be placed in different garbage bins.	How shall we recycle garbage properly?
			Classifying different kinds of garbage: Paper Glass Organic Plastic Exploring: The … (paper) garbage should be thrown into the …. (yellow) bin	Can you throw the garbage into the right bin?
			Exploring: In my perspective, we can… (e.g., plant more trees). I think we can… (e.g., use eco-friendly transportation).	How to reduce air pollution?
			Describing and exploring: By observing the images, riding a bike, or walking can reduce air pollution. Moreover, we can take public transportation like bus, subway, and train to reduce individual air pollution.	What are some environmental-friendly ways to travel from the images? Are there any other ways of transportation that can help reduce air pollution?
			We can… (plant more trees and avoid cutting down too many trees at once).	What else can we do?
WEEK 8 – LESSON 4 HOMEWORK				
Homework: Drawing practice 5 and language practice 4	Students draw the problems of habits onto the drawings of Lesson 3 homework and depict their ideas of solution	The purpose of this activity is to enable students realise the existing problems of habitats with the ones they know or care of and explore the possible ways that they are able to do for habitats protection.	Based on your lesson 3 homework, are there any habitat problems? What can you do to help solve the problem?	

Individual students	by drawing, then answer the language related questions.	The purpose of this practice is to test learners' lexical ability in describing different types of garbage and transportation which prepares them to answer the third question aiming on encouraging learners to use garbage classification and eco-friendly transportation in their daily lives.	• What are some garbage types? • What are some transportation modes? • What is your way of dealing with garbage and taking transportation that protects the environment?	
WEEK 9 – LESSON 5: Review & protecting habitats and ecosystems II				
Lesson 5 procedures		Task design rationales	Language scaffolding	
Stages and Time	Learning activities	Justifications for learning activities	Science language input	Driving questions to guide comprehension
Task 1. Review different habitats. 10min Teachers and groups	Teachers divides maximum 8 student into 3 groups and asks each group to match two images with the given words and discuss the animals that live in the habitats of their images and explain why in their own words.	The purpose of this activity is to review and evaluate students understanding of different habitats as introduced in lesson 1. Moreover, students can practice describing the positions of images with ordinal numbers and locative adjectives, such as top and bottom, left and right. In addition, students need to discuss and explain what animals may live in these habitats and why in order to lead in task 2 – review the concept of habitats.	Classifying: The top first/second/third/fourth picture is … The bottom left/right picture is… Totally, there are six habitats which are… (ocean, mountain, forest, grassland, desert, and wetland) Explaining: I think … (animal) lives in the… (habitat). Because… (this place provides them the living conditions like the food they need to survive/live.)	Here are some images of different habitats, can you match them with the correct words? What animals may live in these habitats? Why do they live there?
Task 2. Review concept of habitats 5 min Whole class	Based on the discussion of task 1, teacher first guides the students to summarise the key factors of a habitat (home, animal food, live), then reinforces these factors with the image of a frog in a pond to elicit students to define habitats in their own words.	The purpose of this activity is to scaffold students to understand what a habitat means to certain animals, thereby enabling them to define habitats by themselves. Teacher can evaluate the extent of students understanding of habitats based on their own definitions and guide them to differentiate habitats from the concept of ecosystems in task 3.	Describing and explaining: e.g., The frog lives in a pond. Because frogs prefer still water to lay their eggs to avoid being washed away. Also, they need to keep their skin wet/moisturised, otherwise, they will die, because they soak the moisture into their body through their skin instead of drinking water. Defining: A habitat is … (e.g., the home for animals where they can find food, breed and live.)	Look at this image, what is this animal? Where does it live? Why? Can you try to define what a habitat is? You can use the words on the slide.
Task 3. Review the concept of ecosystems. 5min Whole class	Teachers asks students to describe the habitats that they can see in the give image.	The purpose of this activity is to review some new words that were introduced in lesson 2 and 3 (species, organisms, biotic, abiotic), thereby linguistically scaffold students to define the concepts of an ecosystem and a habitat with appropriate science language.	Describing: From my observation, there are… (meadows, bushes, mountains.) Defining: Plants and animals are biotic. Air, water, and sunlight are abiotic. Species means different plants and animals which are organisms. Light, air or water is not alive, so they are not organisms.	What are some habitats near the pond in the image? The animals living in these habitats are sharing the same environment, such as sunlight, air, water, climate, soil. Such inclusive environment is the ecosystem. Among animals, plants, air, water sunlight,

			An ecosystem is where diverse organisms/species inhabit. A habitat is where a specific species inhabits.	which are biotic? Which are abiotic? Which are organisms? What is species?
Task 4. Review the relationship between habitats and ecosystems. 5 min Whole class	Based on the giving images, teacher guides students to summarize the differences between a habitat and an ecosystem, thereby raising their awareness of the fact that an ecosystem is inclusive with multiple habitats.	The purpose of this activity is to review the relationship between habitats and ecosystems and enable students to realise the fact that protecting habitats is also protecting ecosystems.	Describing: 1. Species diversity: An ecosystem has diverse plants and animals living together. 2. Biotic and abiotic factors: An ecosystem encompasses both biotic and abiotic factors, such as sunlight, air, water, climate, soil. Whereas a habitat is specific to species or organisms. 3. Size: An ecosystem may contain multiple habitats, so it is larger than a habitat.	What are the differences between a habitat and an ecosystem? Do they have any relation?
Task 5. Protecting habitats and ecosystems II 5 min Whole class	Teacher asks students to describe the problems they can see in the image, then guide them to review some ways to protect habitats and ecosystems as discussed lesson 4.	The purpose of this activity is to review lesson 4 and enable students to reflect on the accessible ways that they can do to protect habitats by languaging their own drawings of lesson 4.	Describing: I observed some problems such as… The possible ways to …. (reduce pollution including garbage and air pollution) are… (e.g., separating and recycling garbage, planting more trees, taking eco-friendly transportation, etc.)	What are some problems shown in the image? How can we solve these problems?
Task 6. Drawing articulation 20min Teacher and individual students	Individual students describe their drawings regarding the habitat problems that they visually depicted and explain why their ideas of protecting habitats may help reducing the harm to the minimum or prevent such problems from happening.	The purpose of this activity is to encourage and enable students to combine their own after-class research of habitat problems and protective ways with the content of lesson 4. By verbally languaging their own drawings regarding their perspectives and understanding of this world issue, the awareness of preserving habitats as part of the responsibilities of global citizens may be raised and realised in their everyday life.	Exploring and explaining: Based on my research from… (different resources, e.g., the internet, books, teachers, classes, etc.), I found/noticed/observed that the… (the possible or existing problems) may threaten/harm… (the name of a specific habitat), because… Exploring and describing: I can… (e.g., classify and recycle the garbage, grow plants, such as trees and flowers, use environmental-friendly transportation, such as electric bike, etc.)	What are problems that may harm the habitat you drew in lesson 1? Why? What can you do to solve the problem or protect the habitat?
WEEK 9 – WEEK 11: INTERVIEW				
Semi-structured interview with visual elicitation 20-30min Teacher and individual students	Teacher holds informal learning conversations with students and asks open-ended questions basing on the content of all the lessons and their drawings.	The purpose of this activity is to assess students' understanding of habitats and ecosystems regarding their concepts, differences, relationships and preservation through learning conservations and visualisations, offering an overall review and feedback on their learning and revising teaching strategies.	• What can you remember after all the lessons? • What are a habitat and an ecosystem? • Can you summarize their differences and relationships? • What can we do to protect habitats?	

The Main Study Analytical Frameworks (see the forms of group 2 and group 3 below)

Group 2			
Themes	Categories	Quotations (the texts in brackets are translations)	
		Interview	Learning Conversation
Concept learning	Concept description	T/R: So how as your day? G2S1: Today I am fine. T/R: What did you do? Did you just come back from school? G2S1: No, today I came back from school, and do my homework and ride my bicycle. T/R: Okay, so you did some exercise. We are just going to have a short interview, just ask you a few questions, you can either answer in English or Chinese, both are alright. G2S1: Ok. T/R: So, my first question is what have you learned or remembered from all the lessons? G2S1: Mm, I remembered what is habitat, what is ecosystem. Habitat are are are the animal are the places that animal live. And ecosystem is some of the habitat and they have some have some have many habitat. Um, habitats is a small place that animal can live, but ecosystem is a place, it's a big place that so many animals can live, like birds, it is an ecosystem.	G2S1: And, and habitat is a a place that full of animal and plant species. T/R: Can you tell me what do you think you have learned from these two classes? G2S1: I learned from these two classes is what is habitat and what is e… T/R: E… S1: E…eco, um, ecosystems. T: Yes, ecosystems, anymore? Anything else you have learned? G2S1: I know ecosystems are the places that have deverse habitats. T/R: Diverse, diverse.
		G2S5: I learn, I learn some, I learn what is biotic what is abiotic. G2S5: And, and, and I know what is a habitat.	G2S3: Animal lives plan… place. 等一下我快写完了, (wait a second I am almost done writing it) Habitat, habitat is animal lives place. T/R: Ok, A habitat is animals' living place. 注意这个语法表达 (be careful with the grammar.)
			G2S4: Habitats is…动物的栖息地. (animals' living place.)
	Concept review		T/R: Human misbehaviour 人类的一些不好的行为 (some bad behaviours of human), 那有没有其他原因? (Any other causes?) G2S3: 空气污染. (Air pollution.) T/R: 空气污染应该是这里面会导致的. (Air pollution is the consequence.) G2S3: 哦我觉得这应该是全球天气变暖，有人在海里投放垃圾，或者是脏水 (Oh I think it's global warming, some people litter in the ocean or wasted water.)
			G2S4: What is speechit? T/R: What is species 物种是任何 (species are any kinds of) animals and plants. G2S4: 什么是生态系统? 用英语怎么解释 (What is ecosystem? How to define it in English?) T/R: Ok, an ecosystem is a place with different habitats and has diverse organisms 或者是(or) diverse species.

	Deepening understanding	T/R: What have you learned or remembered from all the lessons? G2S3: And I learn many 一些我没，一些我之前不怎么那个的不清楚然后不怎么知道的一些保护动物和(some I didn't, some I didn't quite know about animals' protection and) help the habitat. T: Ok, so what do you think has helped you learn? S3: PPT. T: Oh, the ppt. S3: Mm…或者是更多的拓展(or more content extension).	G2S3: 嗯…动物的平均寿命是多少啊? (Mm, what is the average life span of animals?) T/R: 动物的评价寿命，这要看动物，各种不同的动物，它的寿命都不一样，比如说蚊子，它可能一季就死了，one summer, 像猫或者狗，它可能会活到十几年. (It depends on the animals. For example, most mosquitos usually die after a summer, like cats and dogs can live more than 10 years.)
		T/R: What have you learned or remembered from our lessons? G2S4: 保护环境我学到了用步行或者骑自行车, 还有不砍树, 不乱丢垃圾. (I learned some ways of protecting the environment, such as walking, riding a bike, don't cut down trees, don't throw trash anywhere.)	
Language learning	Building linguistic forms	T/R: Anything else you have learned? G2S1: And I learned…six habitats in our earth, there are grassland, uh, glacier, ar, umm, I think it's seven, grassland, glacier, Arctic, forest, swamp, and umm and ocean, and this is umm… T/R: Yea, there is the Arctic, there's the Antarctic. Antarctic means the south pole continent, and Arctic means the north pole continent. G2S1: Oh, ok…I learned how to protect the ecosystem and what is the eco-friendly transportation.	G2S1: I learned from these two classes is what is habitat and what is e… T/R: E… G2S1: E…eco, um, ecosystems. G2S1: I learned there are six habitats in our earth, there are grassland, uh, glacier, ar, umm, I think it's seven, grassland, glacier, artic, forest, swamp, and umm and ocean. T/R: Yea, there is Arctic.
		T/R: 你说到了 (You mentioned) spelling 拼写新的单词 (spelling new words), 这些新单词你指的是哪些 (what are those new words)? G2S2: I know the new words. T/R: 比如哪些呢 (for example)? G1S2: Diverse, um, wetland, uh, o, organisms, and uh, oil leak. T/R: Oil leak, ok.	T/R: Could you please tell me what you have learned from our classes? G2S2: Today I learned ecosystems and habitat…and some words. T/R: Words, for example? G2S2: Like inhabit…uh, ecofriendly. T/R: 这个 eco 代表什么呀? (What does eco stand for?) G2S2: Ecosystems 的缩写. (It's the abbreviation of ecosystems.)
			T/R: Hello, 我们上的 4 节课有什么问题吗? (Do you have any questions about the four classes we had?) G2S5: 这节课有一些单词还是有点不懂 (There are some words in this class I don't quite understand.) T/R: 哪些单词你告诉老师? (What words? You can tell me.) G2S5: Transportation. T/R: 它表示交通工具 (It means different tools for traveling). 还有哪些单词呀? (Any other words?) G2S5: Protecting and what? T/R: Environment 环境 en-vi-ron-ment. G2S5: Environment. T/R: 保护环境 (protect environment) protect environment.

		T/R: What have you learned or remembered from all the lessons? G2S5: I learn, I learn some, I learn what is biotic what is abiotic. T/R: Anymore? G2S5: And, and, and I know what is a habitat. T/R: That's all? S5: And what is an organ… how to say this word? T/R: Organisms. G2S5: Organism. T/R: Organism 是原型(is the original form), 加了(add)s 是它的复数形态 (is its plural form).	G2S1: Transportation…bus, bicycle, 还有(and) metro, 还有(and)…嗯(mm)…哦(oh), plane, 嗯(mm)…还有那个高铁? (and high-speed train) T/R: 高铁 yes, high-speed train. G2S1: High-speed train.
			G2S2: Organyesms. T/R: Organisms. G2S2: Divers. T/R: Diverse. G2S3: I think I know…今天学的 eco… T/R: Ecosystem.
			G2S3: Ride a bike, 坐地铁。 T/R: 坐地铁怎么说? (How to say it in English?) G2S3: I don't know. T/R: Take subway 或者是(or) metro G2S3: Take subway, take subway, me…and walk walk. G2S3: Make more trees. T/R: Make 我们最好用 (it would be better to use) plant. T/R: 对, 最后一个呢? (Yes, how about the last one?) G2S3: Mm…塑料 T/R: 对塑料 (Yes, it's) plastic. G2S3: I don't know how to say in English. T/R: Plastic, 老师写了. (I wrote it down.) G2S3: Plastic.
	Applying thematic language in another context	T/R: What do you think has helped you learn? G2S1: Um, it helped me um about, our … (name of the school), it has a PBL (project-based learning) lesson, it is about protect animal. And this lesson help um um do the project… when in … (name of the school) class, the teacher just say some of the ecosystem and habitat, we learned in our class I can understand better… We learned what is habitat and ecosystem in … (name of the school), that's one, and now we learned how to protect the animals and their habitats I think it is deeply. T/R: It is… what did you say? Did you say deeply? G2S1: Yea. T/R: Oh, you mean you learned how to protect habitats and ecosystems deeper. G2S1: Yea. T/R: What do you think has helped you learn?	

		S5: A lot. T/R: For example? G2S5: Can uh help me during the school class. T/R: What helped you during the class? G2S5: Uh, biotic and abiotic.	
	Language strategies		T/R: Do you have any questions about all those four classes we have had? 比如我们今天说的一些新词 (such as the new words we talked about today) G2S2: Uh, yes, I have. G2S2: Uh, 我记得住它们的意思，记不住它们的拼写。(I can remember their meanings, but not spelling.) 就是那个就是出行方式有利于这个森林环保的那个单词记不住. (I can't remember the word about modes of travel that is good for forest environment protection.) T/R: 出行方式哦对那个确实很长是的 (modes of travelling, yeah, that's a bit long) trans-por-ta-tion, transportation.
Concept exploration	Pictural representations		G2S1: I draw a peacock that is male, it will dance and attract the female peacock.
	Mindmaps		G2S1: I used a mindmap because I don't know how to draw a picture of a very big ecosystem. G2S3: 因为我觉得这样画画可以更简便一些，不会多花一些时间" (Because I think it can be easier to draw like this and it won't take much time). G2S5: I think she (G2S1) can make draw a picture that can shows what's the difference between them, I think she can make her work better because picture can shows what do you thinking.

Visualisation	Visual understanding	G2S1: I think picture in our lesson is um, it is, it is, some of it's the photos and some of it's just like picture, I think it reflect the problems. G2S1: Uh, like lesson 5, there is some picture about the problems, about animals their habitat is, some of the people, they are destroying their habitat, and animal will didn't have place to live, so they will be extinct. G2S3: 我看见了他们画的一些人类不好的现象，我也看见了他们画的一些 habitat. (I saw them drew some bad phenomena caused by humans, I also saw them drew some habitats.)	T/R: 这些图所出现的问题会有什么影响? (What are the consequences caused by the problems as shown in these pictures?) consequences? G2S3: The animal will be extincts. T/R: Mm, yea, maybe become extinct, that's why we need to protect habitats and ecosystems. So, what you can do to protect it? G2S3: We can give the ecosystem money to help these animal. T/R: Give ecosystems money? 你是想说给生态环境保护组织吗? G2S3: Yes. T/R: 还有什么方式吗 (any other ways)? G2S3: Say to anyone don't use don't 将垃圾放到海里面 (throw garbage into the ocean) 或者是沙滩上 (or on the beach), 因为潮来了也可能将那些垃圾给卷走 (because the tide may also sweep away the garbage into the ocean). T/R: Mm, 对(yes) so, we should tell us not to throw garbage anywhere. T/R: 那我们图片当中你可以看到有哪些垃圾呀? (What garbage types can you see in the pictures?) G2S3: Ok, book, newspaper and… G2S3: Yes. And number two is glass, number three is food, number four is plastic. T/R: 它们都是纸类的对不对 (they are all paper, right)? S3: Yea. T/R: 都是纸类的叫 (all paper types can be called) paper. G2S3: Paper. T/R: 旁边的第二个 (what about the next to it)? G2S3: 嗯(Um) I don't know. T/R: 这是玻璃瓶 (they are glass bottles), glass 玻璃类的(glass). G2S3: Oh glass…and then it's food. T/R: 对这个都是我们不需要的食物 (Yes, they are the food we don't need), 厨余垃圾 (kitchen waste). G2S3: Yes…kitchen waste. T/R: 对，最后一个呢 (Yes, what about the last one)? G2S3: Mm…塑料 (plastic) T/R: 对塑料 (Yes, plastic) plastic, G2S3: I don't know how to say in English. T/R: Plastic, 老师写了 (I wrote it down). G2S3: Plastic. T/R: 所以这四种垃圾要放在上面哪几个桶 (so which bins above should we throw these four types of garbage into)? 像第一个黄色桶放了(For example, the first yellow bin has) newspaper, 所以纸应该是倒在这里的 (so the paper should be thrown here).

			G2S3: Yes. And number two is glass, number three is food, number four is plastic. G2S3: I know number two, number two is ice, ice, ice... T/R: 这是个雪山 (this is a snow mountain), 不是冰山哦 (not an iceberg), 冰山 (Bingshan)是(is) iceberg, 雪山 (Xueshan) 是(is) snow mountain. G2S3: Oh, snow mountain. Number three is uh...o...o... T/R: Ocean. G2S3: Ocean, number four is desert. T/R: 对 (Yes)! G2S3: Number five I don't know. Number six is mountain. T/R: Number five is 湿地 wetland. G2S3: Wetland.

	Visual languaging	G2S1: Uh, when we practise, when we do the homework, we just know the, what's we don't understand because we didn't know like these questions how to answer, and, um, we finish the drawing homework and on lesson we talk about it and we share our ideas.	T/R: What are in your drawing? G2S3: 就是一个生态环境系统里面有很多濒临灭绝的动物. (It is an ecosystem with many endangered animals.) T/R: 有哪些濒临灭绝的动物啊? (What endangered animals?) G2S3: 有些我没画出来 (some I didn't draw), 有 (which are) monkey, bird, 鹿 (deer), panda, dolphin, whale. G2S3: Deer… and have the turtle. T/R: Turtle 在哪里呀 (Where's the turtle)? 我没有看到耶 (I don't see it). G2S3: Turtle is in the water. T/R: Oh, in the water, 那你可以下一次把 (then next time you can draw the) turtle 画在水里 (in the water). G2S3: Ok no problem. T/R: 那么这里面哪些是 (In your drawing, which ones are) biotic, 哪些是 (what are abiotic? G2S3: The…water, 竹子 (bamboo). T/R: Bamboo 竹子(bamboo). G2S3: And 竹子(bamboo), 其他的都是有生命的 (the rest are biotic), 鱼也是有生命的 (the fish is biotic). T/R: Bamboo 没有生命吗 (is abiotic)? G2S3: 竹子没有生命 (bamboo is abiotic), 哦(oh)! 竹子有 (bamboo is biotic)!竹子有 (Bamboo is biotic)!
	Prior visual experiences		T/R: Have you done some similar drawing practices before? G2S1: Um, yeah. T/R: For example? G2S1: Um, for example, um, in this week, our…(name of the sample school) homework that has one is to um write um draw some image that um and tell the article. T/R: Tell the article, can you be clearer? Tell what article? G2S1: The article that is called 'Slip of the tongue' G2S1: What did you draw for this topic, for this article? G2S1: For this article, I draw six picture because there have six um six signs T/R: Six pictures for six signs? G2S1: Umm because it is a reader centre. T/R: It is reader centre? G2S1: Theatre, um…it is a kind of play.
			T/R: How do you think about this drawing practice? Have you had similar experiences before? G2S2: Umm, yes. 就是在课上可以画海报, 然后呢后面就是自己来演讲. (It's about drawing posters and talking about it in class.)

			T/R: 海报的内容有没有老师规定画什么内容? (Is the content of the posters assigned by the teacher?) 还是你们自己自由发挥? (or depends on you?) G2S2: 老师规定 (Assigned by the teacher). T/R: 老师规定的内容, 然后你自由发挥画什么, 然后上去演讲. (The teacher specifies the content or topic of the posters, then you can draw anything within this range and talk about it in front of the class.) G2S2: 对. (Yes.) T/R: 是你一个人画吗? (Did you draw alone?) 还是和其他同学一起? (Or with other classmates?) G2S3: 是每个人分成每个小组, 然后每个小组自己合作来画的. (We were divided into groups and each group drew the posters together.)
Student feedback on tasks		G2S1: Yeah, the drawing homework and the writing homework help us to understand better of the class.	G2S2: My pictures help me to learn the habitat and ecosystems. T/R: Your pictures, do you mean the pictures you drew? G2S1: Yes.
		T/R: How do you think about the drawing and writing homework? G2S2: I think it's great. Because it can let me, uh, uh, it good for me to learn today, it can good for me to learn the knowledge. T/R: What knowledge? G2S2: Uh, like habitat and ecosystems.	
		T/R: Ok, so how do you think about the images, pictures used in class? G2S5: It's very good. T/R: Why you think it's good? G2S5: Because can help me learn.	
	Visual approach	T/R: What has helped you learn about our project? G2S1: the drawing homework and the writing homework help us to understand better of the class. T/R: Oh, why do you think they helped you understand better? G1S1: Uh, when we practise, when we do the homework, we just know the, what's we don't understand because we didn't know like these questions how to answer, and, um, we finish the drawing homework and on lesson we talk about it and we share our ideas. T/R: I see, so when you finish the drawing homework, we share the drawing homework in our lessons and talk about your ideas, is that what you mean? G2S1: Yeah, I think the drawing homework we can just let student they write the ideas under the picture…Because like you draw this picture and you write your idea and in the lesson we share the idea some of the students they forget what the idea of them. T/R: I see, okay, so these ideas they wrote down can help them remind themselves of what they were thinking… G2S1: Yea.	T/R: Ok, so what helped you learn these things? G2S1: Umm, we…, umm, I think it's the practice. T/R: Yeah, what practice? G2S1: The drawing practice and the writing practice. T/R: Do you like drawing? G2S1: Mm, Yea.

		T/R: How do you think about the visual and written homework? 你觉得我们的作业有视觉的表达怎么样? (How do you think about the homework with visual representations?) G2S3: 我觉得他们是画的很好... 就是他们画的很细致，旁边也有文字标注 (I think they drew quite well...they also drew in details with annotations aside.)	
	Other learning resources	T/R: What support or help have you received form our classes? G2S1: I think I support from our learning machine, our school there is in 2012 there is an epidemic, our school all use QQ to have lesson, but now we use DingDing (DingTalk) to have lesson. T/R: Ah, you think it's the app helped you to learn the class. G2S1: Yea.	T/R: 你觉得这个课堂进行的怎么样? (How do you think about the class?) G2S3: 我觉得这个课堂进行的挺和谐的, ...也很少，不像有些其他的网课. (I think the class went well with very little...unlike other online classes) T/R: 什么很少 (What's very little)? G2S3: 噪音 (noise).
		T/R: What do you think has helped you learn? G2S2: The ppt helps me to learn. T/R: Okay, and what do you think about the images or pictures we used in the class? G2S2: I think it's good. T/R: Why do you it's good? G2S2: Because I think it can tell me this class is tell me today I will learn what. T/R: How do you feel about the lessons overall? G2S2: Uh, uh, I feel the, I feel very good. T/R: Okay, you said you felt good, 你觉得是哪一方面让你这么觉得? (which aspect of the lessons made you think so?) G2S2: 就是这个内容 (It's the content). T/R: Oh, the content, 还有吗 (anymore)? G2S2: 还有那个, 就是那个绘画的作业 (And the drawing homework). T/R: Ah, the drawing homework. 还有吗 Anymore? G2S2: Ah, I think that is.	
		G2S3: PPT.	G2S2: 还有那个上课的 ppt. (And the class ppt.)
		G2S4: 作业, 课件 (The homework and ppt.)	
Student Course evaluation	Conceptual development	G2S1: I think it helps me just like mm...when in ...(name of the school) class, the teacher just say some of the ecosystem and habitat, we learned in our class I can understand better. G2S1: Mm...I think it help me learn about the habitat and ecosystem, it help me do the project in Rise. Our Rise, it has a PBL lesson, it is about protect animal. And this lesson help um um do the project. G2S1: We learned what is habitat and ecosystem in Rise, that's one, and now we learned how to protect the animals and their habitats I think it is deeply.	T/R: Ok, 那你觉得我们这两堂课进行的怎么样啊 (Then how do you think our two classes went?) G2S2: 我觉得进行的很好, 我学到了很多新的知识. (I think the classes went well; I learned a lot of new knowledge.) T/R: Okay. G2S2: 也都听得懂 (And I can understand all.)

		T/R: How do you feel about the lessons overall? 整体上你觉得我们这个课怎么样呢? (What do you think of our lessons overall?) G2S3: 还可以, 就像一个人拿了一个大麻袋, 感觉满载而归, 对我们... (name of the sample school) 的 PBL 也很有帮助. (It's pretty good, like someone carrying a big sack loaded with stuff back home, it's also very helpful to our PBL course in... (name of the sample school)). T/R: 什么 PBL 呀? (What is the PBL about?) G2S3: PBL 就是给我们讲一些有关于动物保护啊，然后的话，一些帮助穷苦的人民啊，一些海报演讲啊. (PBL is about animal protection, helping the poor and poster presentation.) T/R: Oh, 所以对于你们自己学校的课程有帮助. (so, it's helpful for the courses in your own school). G2S3: Yes.	
	Language progression	T/R: Can you give some examples of what help you received in the class? G2S2: Like some like some how to spell the words, I learned many more new words, uh, and how to spell sentence. T/R: Oh, how to say a sentence, spell 一般指拼写单词(usually refers to words spelling)，你说的 spell a sentence 你指的是什么含义? (what do you mean by spelling a sentence?) G2S2: …… T/R: 你觉得是写一个句子吗，组织一个句子? (Do you mean to write or construct a sentence?) G2S2: Um, 我觉得是语法.(I think grammar.) T/R: Oh, 语法 (grammar), 句子里的语法(syntax) the grammar of the sentence.	
		G2S2: Um, 我觉得是语法。(I think it's grammar.)	
		G2S2: I know the new words. G2S5: 就是那种单词方面的。(It's about vocabulary.)	
	Peer scaffolding		G2S5: I think she can make draw a picture that can shows what's the difference between them, I think she can make her work better because picture can shows what do you thinking.
	Mentoring learning	G2S1: 不是那么随便, 然后的话不是随便讲一下就过" (It's not so casual, and then the teacher just doesn't talk about the content casually and move on to the next part without clear explanation).	
		T/R: 那有什么帮助你去学呢? (What helped you learn this project?)	

		G2S1: We have some questions and it help us to learn, we find the answer of the questions and we we learn from this…uh, I think we can add more questions. T/R: May I ask what questions? Is it questions in our class or questions from somewhere else? G2S1: Question in our class.	
		T/R: 那你觉得在学习中有没有什么方面需要提高? (What aspects of your learning do you think need improving?) G2S4: 在课堂当中回答问题多一点. (Answer more questions during the class.)	
Student future recommendations	Deeper learning	T/R: What areas of learning do you want to improve? G2S1: I want to improve about just I think like the like the the ecosystems there are expects animal and some water, mountain, they are abiotic and what else it is in. T/R: And what else it is…? G2S1: What in the ecosystem T/R: So how do you think what is going to help you learn this part of learning? G2S1: This part of learning, I just I improve my mm… ex. T/R: Improve your what? G2S1: Express of English.	
	Language practice	T/R: What areas of your learning do you want to improve? G2S5: 就是单词的拼写 (Vocabulary spelling). T/R: What is going to help you improve spelling? G2S5: 就是那种遇见的那种拼错的单词, 写完单词后可以让别人来帮你来检查单词有没有拼错 (I can find others to check my spelling after I finish writing the words that are easy to be misspelled). T/R: 你指的别人是谁啊，同学老师还是爸爸妈妈？(Who are the others, your classmates, teachers, or parents?) G2S5: 指的是那种别人，别人会帮助你的那种，比如老师可以帮到 (I mean people who can help you, like teachers). T/R: 那像同学有的时候帮你查看吗 (Do your classmates sometimes check for you)? G2S5: 可以 (Yes).	
		T/R: What areas of learning do you want to improve? G2S2: 就是那个语法. (It's grammar.) T/R: What is going to help you improve grammar? G2S2: Grammar book. And some grammars questions. T/R: Oh, 还有什么可以帮到你提升语法吗? (Any other ways that can help you improve grammar?)	

		G2S2: Use English to talk with my parents. T/R: Oh, use English to talk with them, 还有么 (anymore)? G2S2: Look some video. T/R: Oh, watch some videos. What kind of videos? G2S2: Grammar.	
Visual Narrative with Creativity	Learners' Affective and Cognitive Representations		G2S2: The dolphin is catch the fish and this man is on the dolphin to play, they is living in ocean, he can catch the fish to eat. G2S5: I think crab can eat and the crab is delicious… eat by me…because I think the jellyfish is cute, that two fish is goldfish because I think goldfish live in the sea. G2S5: I thought draw a jellyfish fly in the sea and this jellyfish is…is white, T/R: Why did you draw the jellyfish white and fly in the sea? G2S5: Because I just like jellyfish, because jellyfish fly in the sea that is very beautiful.
	Connectivity of Life Experiences		

Group 3			
Themes	Categories	Quotations (the texts in brackets are translations)	
		Interviews (after lesson 5)	Learning conversations (after lessons 2 and 4)
Concept learning	Concept description	G3S5: I think the ecosystem is like the place of the habitats and animals, plants, and the habitats is like a little place that only one or two animals, plants make the habitat. T/R: So, what have you learned from our lessons? G3S6: I think from the last lesson I learned about protect animals, and from the second class, I learned about 生态链 (ecological chain). T/R: Ecosystem, food chain? G3S6: Yes. G3S1: The habitat is a places animals live, the habitats um, animal can find food, and ecosystems maybe many habitats um like…and in a ecosystem have many animals to make the…	T/R: Can you tell me what is habitat? G3S1: The habitat is mm…I think are the species inha… T/R: Go ahead, habitats are the species? G3S1: Inhab… T/R: Inhabit, do you mean this word? G3S1: Inhabit, yes. T/R: And how about ecosystems? G3S1: I think ecosystem is making the…um…I don't know how to said. T/R: Say it in English? G3S1: Yea. T/R: Do you know how to say it in Chinese? G3S1: Yea, mm, 就是有非常多的动物在这个地方 (there are many animals here), 这个有非常多的 (it has many) many habitats, 形成了一个平衡 (that form a balance). T/R: 什么平衡 (What balance)? G3S1: 生态系统平衡. (Ecosystem balance.) T/R: Oh, ok, so in your opinion, you can say ecosystems have multiple 多个的(multiple) many habitats G3S1: Multiple habitats. T/R: Yeah and have more or diverse animals or 像我们今天学到 (like what we learned today) diverse species or organisms inhabit. G3S1: Yes. T/R: Okay, and what are species and organisms? G3S1: I think species is the animal um, is the animals, species means the animals and there mm, can I say it in the Chinese? T/R: Yeah. G3S1: 物种 (species). T/R: Yea, can you explain what is species in English? G3S1: The species is the animals, and it means… I think it's the kind of animals. T/R: Mm, how about plants? G3S1: The plant also can, also can… I think species is the kind of the… T/R: Do you think plants can also be a kind of species?

			G3S1: Also, can. T/R: So, can you sum up? G3S1: I think the species is the kind of animals and plant. T/R: Species means the kind of animals and plants, ok, and how about organisms? G3S1: Organism means every every um the things have have the life, there can called mm organism. T/R: Ok, organisms are any living things. G3S1: Yes.
		G3S3: Habitats is a just place that people and plants and animals are living, the ecosystem also have the people, or the plants and animal.	G3S3: Understanding, uh, I think habits are just where, it's just a place that animals live, live in, but ecosystem is that place, in the place there have living things. G3S3: Species in my understand I think just living things, just like plants, animals and human. T/R: Can you describe it again, 'specific'? G3S3: It's a certain tain type of something. T/R: Yea, certain type 特定的一种类型(a certain type). G3S3: Yes, I knew it in Chinese, I just don't knew how to describe in English.
			G3S4: Organisms is a life thing and it can be fire. T/R: It can be fire? G3S4: I think the organisms can, the fire can fire them. T/R: You mean the fire can burn the organisms? G3S4: It's like some plants can be fire and they are organisms. T/R: Some plants can be burnt by fire, so the plants are organisms? G3S4: Yeah. G3S4: The ecosystems is a place and there is many animals, it's also like a food chain, and the habitats is just a place and animals can live in there. G3S4: Species is a kind of animals, it's like a cat is a species. It's a kind of animal. T/R: Mm, it's a kind of animal with the same features, like cats have point ears, big eyes, tail, fur, some cats don't have fur. G3S4: Mm. G3S4: Inhabit is like uh I live in somewhere and inhabit is mean live.

			G3S4: Specific is like the fish it can swim in the sea, this is a specific that it can swim, but the cat can't, cat can climb on a tree. T/R: Mm, so you are talking about the specific feature of fish and cats. I think cats can swim as well, but fish can't climb trees, that's for sure, so specific means a certain type of something. G3S4: Mm.
			T/R: How about the lessons, do you have questions? G3S5: Oh, oh, oh, I think I I I don't have any question. T/R: Okay, then I have some questions for you, could you please tell me what are habitats and ecosystems? G3S5: Uh, habitats is the place animal live. T/R: And ecosystems? G3S5: I forget it. I try to think. I think ecosystem is a place that have more habitats. T/R: Yeah, and ecosystems would have diverse, many kinds of species. G3S5: Oh.
			G3S6: I think species and organisms the same thing of them is that they are all living things, like the species animal, it is a living thing and organisms is the meaning of living things. And I think habitat is that where species and organisms live, and ecosystem are places that many species of animals live.
	Concept review		G3S2: I am still don't know what is habitat and what is ecosystem. I think habit is a little place and it live one kind of animals, and ecosystems is one place and have many kinds of animals. T/R: Ok, for example, habitat let's see a tree is a habitat for squirrels, also for birds, maybe also for some plants like mushrooms, so a habitat is not just a place with one kind of animal, it's a place where specific animals live, versus an ecosystem has multiple habitats, so it will have diverse animals living there. G2S2: Ok, I think like worm or some bug, bird will eat them, so what are they doing when they on life? T/R: What do you mean? G2S2: I mean what do they do some good things about humans? T/R: Maybe worms can feed the birds and worms can help loose the earth.

			G2S2: Okay, so they are not all bad. T/R: No, they are not all bad, like earthworm, some people would put earthworm in their field to make the soil loose for growing plants. G2S2: Ok.
			T/R: Mm, habitats also have living things, right? G3S3: So, what's the different of these two? T/R: Okay, yea, let's talk about the difference, habitats as you said, it's a place where some animals live and an ecosystem has more than one habitats, ecosystems include many habitats. That's one relation. G3S3: Alright. T/R: And within these multiple habitats there are more animals live in, diverse animals, diverse species and organisms live in one ecosystem. For example, earth could be an ecosystem where there are so many different habitats, like ocean habitat, like arctic, the arctic habitat you drew and forest habitat. That's their difference. G3S3: Alright, understanded. G3S3: Organisms I think it's similar to habitats. T/R: Similar to habitats? G3S3: Habitats. T/R: Organisms is not a place. G3S3: It's not a place, so what? T/R: Organisms mean any living things. G3S3: Alright, any living things.
			T/R: Are there any differences between ecosystems and habitats? G3S4: Yes, habitats is just a place that animals can live and ecosystems there is a place, there is many animals and there is a food chain. T/R: Okay, habitats may have a small food chain, for example, maybe in a pond, in a river, there are some fish and snakes, the snakes may eat those fish, and people who live near can hunt the fish and the snake. But an ecosystem is a big environment with many habitats, so it has a bigger food chain. G3S4: Okay.
			T/R: How about specific, it's an adjective we learned today. G3S5: I forget, uh…

			T/R: It means certain kinds, certain types. 具体的 (specific) specific.
	Deepening understanding (with prior knowledge)	T/R: What did you know about habitats, ecosystems, or their protection before? G3S2: Before, at before, I think habitat is just a place, and no animal, just a place, like forest and wetland, it's just a place have no animal. And now I know about it, habitat is a place and have least animal in it. T/R: Have least? G3S2: Um, no, just that animal is small than ecosystem. T/R: Ah, you mean the amount of animals in a habitat is smaller than in an ecosystem. G3S2: Mm!	
		T/R: Do you know anything about habitats and ecosystems before? G3S5: Before I think the habitats is like the food wheel, food chain, like the animals and plants have a place, but now…and before I don't know ecosystem this words. T/R: Ah, ok, so you learned something new about ecosystems and you also learned what is a habitat, it's not just a food chain. G3S5: Yea.	
		T/R: Do you know anything about habitats, ecosystems, and their protection before our class? G3S6: Maybe a little, but not very well, maybe I only know a little like how to protect the animals, we can take out, when we go to the park, we can take out our trash, and the ecosystem I think it's like a food chain, like the bird eat the bug and the bug eat the grass. Only a little bit, not very well. T/R: Did our class help you in your own school? G3S6: Like the ecosystem, our school maybe sometimes 提到了一丁点 (mentioned a little bit), 然后这个课就是加深了那个印象 (then this class deepened my impression).	T/R: What are some types of garbage or trash we discussed today? G3S2: Oil and some plastic, and some air, maybe? T/R: Air is not a type of pf trash. G3S2: Oh, oh, yes trash and maybe some glass and some so many metal, uh, yes, maybe. T/R: Maybe paper? G3S2: Oh, yes, paper, and some also we like stone, oh, no, no, no, no, no. Maybe we eat something that we eat, like fish boon. T/R: Fish bone, fish bone. G3S2: Mm! T/R: We don't eat fish bone, so we will throw them away. G3S2: And some old clothes. T/R: Oh, yea, used clothes. Can used clothes be recycled? G3S2: Yes, we also have some bin that is about old clothes, we can put old clothes in that bin and some people will took it away to help that people that no clothes. T/R: Yes, to help people who need clothes to wear, people who maybe are too poor to buy new clothes. And what are some transportation modes we discussed today? G3S2: Mm, maybe transportation, um, that…

			T/R: I remember you talked about underground train; do you remember? G3S2: Oh, yes, and bus, and taxi, and we ride bike and we can maybe go some place on foot. T/R: So those are some ways we can do to protect the environment, to reduce air pollution. G3S2: Mm. T/R: So, in your daily life, how do you protect our environment, the habitat, or the ecosystem? G3S2: On life, I just put trash in the correct trash bin, and I also go to school or go home by bike, and sometime, I will plant some trees in some place, yes, that place is need me to plant tree. T/R: Oh, yes, just as you said places with a lot of sand, they need trees. G3S2: Yes!
		T/R: Do you know anything about habitats, ecosystems or their protection before our classes? G3S3: I don't know anything about habitats in my science class., I hear it in my English class. T/R: How about ecosystems, have you heard of them before? G3S3: I never heard this English word before, but I know the Chinese meaning of this before. T/R: How about protecting habitats and ecosystems, did you learn something about it before? G3S3: Yes, I learned. Just some habitat is just protect it very well, like desert, desert is grassland before, because we don't protect it very well, so it change into sand and become desert. T/R: What are some new things you learned in our classes? G3S3: There are so many plants, animals, living things in different habitats, we should protect the habitat, so we can protect them, protect them is also protect us.	T/R: In your daily life, how do you protect the habitats or ecosystems? G3S6: Um, uh, well, when I am, like um when there's like a bottle, water bottles, like plastic bottles, water bottles, and we will take it to our school and there's a bag, they put all of the plastic bottles that we don't want to a bag and on Friday, there will be the people and they will get it together and take it I don't know take it to somewhere and they will, yes like recycle them.
Language learning	Building language form	T/R: What have you learned or remembered from our lessons? G3S2: First, I think I know what is habitat, what is ecosystem, and I also learned about lots of habitat, I also learned about food chain and I also…I learned about some some words like species, orga…organ… organise. T/R: Organisms. G3S2: Organisms, I also learned about ecosystem and habitat definition. And I learned about like today how can save our 环境污染 (environmental pollution.)	G3S1: The habitat is mm…I think are the species inha… T/R: Go ahead, habitats are the species? G3S1: Inhab… T/R: Inhabit, do you mean this word? G3S1: Inhabit, yes.

		T/R: Environment pollution. G3S2: Environment pollution. T/R: Environment pollution. G3S2: Environment pollution. T/R: Do you mean how can we stop or prevent pollution? G3S2: Yes, just save this problem, but I think we can't save, but we can make this problem to be better. T/R: Do you mean solve s-o-l-v-e 解决(solve) this problem? G3S2: Yes, solve.	
		T/R: Can talk about what have you learned from the first three classes? G3S5: Uh, let me think, I think the ecosystem and habitats. T/R: Mm! G3S5: And let me… and the biotic, right? T/R: Yeah, anymore? G3S5: And how to how to say it, bioctic. T/R: Yea, biotic.	G3S2: Yes, it's in the place that have some many sand, and we can plant trees. First plant trees can protects our our maybe place and also that trees can make sand to be leese. T/R: Less. T/R: That's a very good suggestion, maybe we can play Alipay ant forest. 支付宝 (Alipay) Alipay, I sent it to your chat window, can you see it? G3S2: Okay, yes I can see it, Alipay. G3S2: Maybe we eat something that we eat, like fish boon. T/R: Fish bone, fish bone.
		T/R: You talked about it helped with your science test, anything else? G3S3: I think only the ecosystem and the food chain. T/R: Helped you in what class? G3S3: In science class. T/R: How did it help in your science class? G3S3: It's just there has something I don't know and I can't write it, but after the learning, I knew how to write it. T/R: Write what? G3S3: Some…can I say in Chinese? T/R: Of course. G3S3: 题目 (exam, textbook, or practice book questions). T/R: Some questions. G3S3: I can just say it in questions? I believe it's (questions mean) just 疑问 (queries), not 题目 (exam, textbook, or practice book questions). T/R: 题目也可以用 ('题目' can also be translated as) questions, 不仅是你问的问题 (it's not just the questions you ask), 也可以是试卷或书本上的题目 (but also the questions on test papers or textbooks). G3S3: Alright.	T/R: Can you remember some other new words we learned today? G3S3: First, it's ecosystem. And what's that? Species? T/R: Yea, as you just described their meanings. G3S3: And org-zam-ni-zation? T/R: Organisms. G3S3: Organisms. T/R: Pay attention the pronunciation, aw·guh·ni·zmz. Any other new words? G2S3: I can't remember any other, sorry. T/R: How about 'inhabit'? G3S3: Alright, I remember it. T/R: Oh, what does it mean? G3S3: Is this similar to habitat? T/R: It looks similar, it's a verb, it means live in someplace. T/R: How about this one: 'diverse'? G3S3: Deverse. T/R: Di-verse. G3S3: Let me think, wait a minute, diverse, I knew, it's just like there are so many, right? T/R: Right.

			T/R: How about 'specific'? G3S3: The Pacific Ocean? Is that? T/R: Not Pacific. G3S3: Oh, this one, this one I knew it, it's just like this specials, someone say it's him, he or she must to do it, just like this. T/R: He or she must do it? Specific means a certain type of something. G3S3: A certain type of something, yes, I just mean this. T/R: Can you describe it again, 'specific'? G2S3: It's a certain tain type of something. T/R: Yea, certain type 特定的一种类型. G2S3: Yes, I knew it in Chinese, I just don't knew how to describe in English.
		G3S2: Mm…I think my English have big problem, that my…can I speak Chinese? T/R: Yes, sure. G3S2: 就是我觉得我的语言不太流畅，而且我的词汇量可能不太大，就是说我不知道我该如何把那个词用英文表达出来 (I think my speaking is not very fluent and my vocabulary is not enough that I don't know how to express a Chinese word in English). T/R: That's ok, you need more practice in speaking.	T/R: Do you have any questions for me? G3S4: How to read this word, it's o-r-g-a-n-i-s-m-s? T/R: aw·guh·ni·zmz, organisms. G3S4: Organisms. T/R: Do you have any other questions? G2S4: No. T/R: Ok, then I have some questions for you. Can you tell me what are organisms? G2S4: Uh, let me think, organisms is a life thing and it can be fire. T/R: It can be fire? G2S4: I think the organisms can, the fire can fire them. T/R: You mean the fire can burn the organisms? G2S4: It's like some plants can be fire and they are organisms. T/R: Some plants can be burnt by fire, so the plants are organisms? G2S4: Yeah.
			T/R: What are some garbage types we discussed today? G3S6: Um, I think there's recycle, like there are trash that can recycle. And something about the kitchen, um… T/R: Uh, kitchen waste, like some food that's not eatable, like fish bone. G3S6: Yes, and something like the things are bad to the nature, like the plastic and other human waste, like electric things. T/R: Electric things, such as?

			G3S6: Such as like our phone that we don't want anymore, and like Pied, and also our, like the light. T/R: The lights, did you say pied? What did you say before the lights? G3S6: A Pied, I Pied. T/R: Oh, iPad, okay. So, we call these - electronics 电子设备 (electronics). G3S6: Okay, electronics. T/R: What are transposition types we talked about today? G3S6: Oh, transportation types, I think like riding a bike, and walking on foot, go by a skateboard, we can also use the… I don't how to say it in English, I think that is, but I am not so sure, that the electric little bike. T/R: Do you mean electric bike, 电动车 (electric bike)? G3S6: Yes. T/R: Okay, electric bike. G3S6: Yes, I think that's it.

			G3S1: And someone throw trash in the forest, people throw the, throw the, mm… I don't remember 香烟 (cigarette), 烟头 (cigarette buds). T/R: Cigarette, cigarette buds. G3S1: Throw the cigarette in the forest they can make the forest fire. T/R: And what are some different types of trash we talked about today? G3S1: Like the paper, glass, and 塑料 (plastic). T/R: Plastic. G3S1: Plastic and I remember have another one. T/R: Yea, how about some food we don't eat, such as fish bone? G3S1: Yes, food, food, fish bone like food. G3S1: Ride a bike and on the foot to walk and I think take some… because now there have some car can use the 电 (electricity). How to say? T/R: Electric powered car.

	Applying thematic lexis in another context	T/R: Did you use what you learned in our class in some other schools or classes? G3S2: Yes. T/R: Can you give me an example? G3S2: Yes, I will also use some new word new thing in my school class and that will help me to learn about some things in school, like 这学期我们有单元叫(a learning unit of this semester is called) Arctic. T/R: Ah, did you learn something from our class and use that in the class about Arctic? G3S2: Yes, I just do my 作文 (essay), I use in my 作文(essay).	
		T/R: Did you use some of what you learned here in your school? G3S5: I think it let me learn many new words and what's meaning. T/R: Did you use those words in your school? G3S5: Yeah, yes. T/R: Can you give me one example? What did you use in your school's English class? G3S5: My English class have some…like the article, it is about habitats, it is about the forest and some words and I know, but some like difficult words, I doesn't understand, but I know this article is all about the habitats, so I used the habitats to put it in the article and I also don't that words, I can know the all article meaning.	
		T/R: Did our class help you with your own English study in your school? G3S3: Help a little bit with my science. T/R: How? G3S3: I just have my science finish test about 6 day ago, in that test, there have some questions we don't learn in the class that the science teacher teach us, but we learn it in your class, so I knew how to write it. T/R: Like what questions? G3S3: Some food chain and some habitats.	

	Language strategies	G3S2: Mm…I think my English have big problem, that my…can I speak Chinese? T/R: Yes, sure. G3S2: 就是我觉得我的语言不太流畅，而且我的词汇量可能不太大，就是说我不知道我该如何把那个词用英文表达出来 (I think my speaking is not very fluent and my vocabulary is not enough that I don't know how to express a Chinese word in English). T/R: That's ok, you need more practice in speaking.	T/R: Do you have any questions for me? It can be about our lessons; it can be about your English study. G3S5: Can I speak Chinese? T/R: Sure. G3S5: We how 在我们写首字母填空的时候是怎么搞呢? (How do we do the exercise of filling in the missing initial letters?) 有的时候不知道怎么样填, (sometimes I don't know how) 就是感觉总是填不出来 (I just feel like I can't fill it out.) T/R: 你可以按音节的方式填. (You can try the method of syllables to fill in the blanks.) G3S5: 就是比如说, (Just like,) 比如说… (for example…) T/R: 比如我们今天学的 organisms, 把它拆分开，拆分音节的方式. (For example, the word 'organisms' we learned today can be split by syllables.) G3S5: 就一节一节的写. (Just write one by one.) T/R: 对, (Yes,) 一节一节的写, (just write one syllable by one syllable,) 这个 'or'就是一个音节, ('or' is a syllable) ga 是一个, ('ga' is one), 'nism'是一个. ('nism' is another one.) 你可以音节的方式来记单词. (You can memorise words by their syllables.) 这样你的发音不会错，另外在做拼写的时候也不会漏掉某一个字母. (Through this way, you may not mispronounce or misspell words.) G3S5: Oh, 知道了, (understood,) 谢谢老师. (Thanks, teacher.)
			T/R: Do you have any other questions for me? G3S3: Yes, so can I ask some question that is not about the class, but it's about English learn? T/R: Yes, of course. G3S3: The first question is in my another English class, the teacher tell me to have 16 tenses, so what's the 16 tenses? T/R: I can summarise for you, there are simple present, simple past, simple future, simple past future and current continuous tense, past tense, future tense, past future tense, and past future perfect tense. I'll send them to you all, that would be better.

Concept exploration	Pictural representations	T/R: What did your drawing help you to learn? G3S1: My first drawing draw a pig, and 画的还是有那么一点点丑(my drawing is still a little bit ugly). T/R: 我们这个课程也不是考验你画的好不好看，所以你不用担心 (Don't worry, we won't test whether you are good at drawing or not in this course). G3S1: Ok. T/R: 那你觉得你画的画在学习方面对你有什么帮助吗 (Do you think your drawings can help you learn)? G3S1: I think don't have. 感觉画画对我学习没什么帮助 (I feel drawing doesn't help much with my study), 因为我总是画不到我想达到的效果 (because my drawings always don't meet my expectations). T/R: 你可以通过写的形式 (You can try to write), maybe write next to your drawing. G3S1: Write some words on the picture and my drawing, I think yeah it's great.	G3S2: I think habitat is just a place that animals can live, and ecosystem that are lot of animal live here, maybe the bug eat plant and bird eat bug like this. G3S4: I think habitats is just a place, it's like mountains, forest and desert and I think ecosystems is a place and there is many animals, the difference of my drawing is in habitats, this mountain, there's no animals and this is just a place that animal can live, and ecosystems there is a place and there is many animals, animals are in there and in habitats, I don't draw some animals in there. T/R: I can see a camel. G3S4: Because I think it's like a mountain, so I drew a camel and I crossed it.
	Mindmaps		
Visualisation	Visual understanding	T/R: How do you think about the pictures we used in the lessons? G3S1: Pictures in the lessons is beautiful and can tell us some many things of the classes. T/R: Many things of the classes, for example? G3S1: Like habitats pictures, I see in the picture that forest, desert, snow mountains, I know they are habitats, the habitats is the animals live.	
		T/R: How do you think about the visuals we used in the class? G3S2: Uh, visual? T/R: Visuals could be images, pictures we used in the class. G3S2: Oh, I think that pictures good for my learning, sometimes I don't what is this word means and I will look at pictures, and that pictures is also example, so that pictures good for me. T/R: So, the pictures help to understand the meaning of the words? G3S2: Yes. T/R: Did it help you in any other parts of learning? G3S2: I think it also help me to learn this class better.	
		T/R: How do you think about the pictures in the class? G3S5: It made the class be more interesting, I think have the pictures and some words, it let me like to listen and learn this ppt.	

		T/R: How do you think about the images, pictures we used in the class? G3S6: I think it's fun. T/R: Why do you think it's fun? G3S6: Because I think there's some questions and there will some pictures for us, when we look at the pictures and there's questions, we can think more like 就能帮助我们思考那个问题(can help us think about the question). T/R: Ah, help you to think about the questions. G3S6: Yes.	
		T/R: How do you think about the pictures we used in class? G3S3: I can use it to know about the meaning of the word sometime, I don't think the using of the picture is not very big. T/R: What did you use a lot when you learned in class? G3S3: The text.	
	Visual languaging	T/R: What has helped you to learn the topic, such as habitat, ecosystem? G3S6: I learned ecosystem, draw a food chain, and get a better understanding. T/R: You mean drawing? G3S6: Yes, and writing. T/R: What kind of writing? G3S6: Writing the ways like how to protect the nature and writing what's this ecosystem about like there is what and 它们的关系是什么 (what their relations are). T/R: Ah, their relation, do you think the drawing and writing helped you to learn habitats and ecosystems? G3S6: Yeah, yeah. T/R: Is it the drawing and writing in our class? G3S6: Yes.	T/R: Let's have a look at what you just drew, I'd love to hear how you are gonna describe it to me. G3S2: Ok, I drew about a forest and that trees all be cutting, and I also drew a bird, that bird lost it home, and I think solution is protect those trees or forest, don't cut them. T/R: I can see there are some tears on the bird's face. G3S2: Yes. T/R: Ok, so that's one solution to protect those trees, don't cut, c-u-t, not cute, c-u-t-e. Can you see it? G3S2: Oh, oh, ok, I fix it. T/R: Why do you choose to draw this scene, this problem? G3S2: Because I think this problem is so hard to fix it, because people need words, we need paper and we also need maybe sofa or bed or table, yes we need wood, but maybe we don't want to hurt that trees, but we need, so I draw about this problem, I think this problem is so hard to fix it. T/R: Yea, we have to use it, but we also need to protect it, so your suggestion to fix this problem is protect those trees, don't cut them, do you have any other suggestions? G3S2: Okay, and now in China we have, we can plant trees on app. T/R: Yea, what app? G3S2: That is in 支付宝 (Alipay) Ant Forest.

			T/R: Yes, Alipay 支付宝 (Alipay). So, did you plant trees in Alipay Ant Forest? G3S2: Yes, I think maybe this is also a solution of this problem. T/R: So everyone can participate, can you talk about how it works, this app? How does it work? G3S2: Ok, you will choose a kind of trees you want to plant and you plant this trees, you will…If you plant this trees online and also will have people help you to plant a real tree, and some… if we use that is… if we use 支付宝, that will be made the…made that trees to be grow up and we will also to help other people to plant trees and other people will also plant trees for us. T/R: So, you mean you cooperate to plant trees together like with your friends, can you plant trees with other people who are strangers? G3S2: No, but we can plant trees together, like two friend can plant a trees that both they can, and can water this plant every day, and you two plant the same trees and this tree will grow up. If this trees grow up, you can plant another trees. T/R: Mm, do you mean if one tree has been grown up by you or your friends or together, there will be some people in real life to help you plant a tree somewhere in China? G3S2: Yes, it's in the place that have some many sand, and we can plant trees. First plant trees can protects our our maybe place and also that trees can make sand to be leese. T/R: Less. G3S2: Yea. T/R: That's a very good suggestion.
			T/R: Can you describe what is in your drawing, why did you draw those things? G3S6: Um, well, first, I draw drew a forest, and then there's a fox that eat trash, maybe it will sick or even die. T/R: Yea, why, why the fox feels sick? G3S6: Because it eat trash and plastic. T/R: Oh, plastic trash, why would it eat plastic trash? I think foxes eat small animals, rodents. G3S6: Yes, the people throw the trash in the forest and sometimes the fox eat it when um… 可能不小心吃的

			(maybe eat it by accident), I think the fox did eat it in accident. T/R: Oh, eat it accidentally. What can we do to stop animals from eating trash? G3S6: When we go to the forest to have a trip and when we are going home, and we can pick our own trash to leave the forest and not just throw it in the forest and to protect the animals.
			T/R: Can you talk about what is in your drawing? G3S1: This people cut tree, but a policeman use the gun to stop him. T/R: So, you think the solution is to ask policemen to stop illegal lumbering? G3S1: Yes. T/R: Do you have any other solutions to help protect the trees? G3S1: Also, I think we can use some paper we can use it in more than one time. T/R: How do you use paper more than one time? G3S1: A paper have two, one side can write, have two sides can write the words, and on my drawing, there have some, there is white, we can use this kind to write the word and to do some other things. T/R: So, you mean a piece of paper has two sides, and we write or draw on one side, you can use the other side, and in your drawing, there are some white parts left on this side of the paper, so you can write on it or draw something extra on it. G3S1: Yeah. T/R: How do you protect the habitats or environment in your daily life? G3S1: I think grow some plants and don't throw the trash in the habitat and use the electric power. T/R: Do you mean electric-powered vehicle? G3S1: Yea, electric vehicle and ride the bike or on foot to go to the school.
	Prior visual experiences	T/R: Have you had similar drawing experiences before? G3S2: Maybe no, I think it's so least because other teacher they just need we to do some test paper, drawing is so least, some teacher will also let we draw, but it's just one or two. T/R: One or two drawings?	

		G3S2: Yes. T/R: What did you draw for these one and two pieces of drawing? G3S2: You mean in here or other place? T/R: In other classes, not with me. G3S2: Oh, ok, one teacher let us to draw sign that you know. And another teacher let we draw some things, that teacher is in…(name of the sample school), in her class, we will draw lots of things. T/R: What signs or things, road signs? 就是你自己设计一种标识(it's to design your own logo). T/R: Design, you design a sign. 这个设计的标识是和你们上课的内容相关吗？ G3S2: Yes … (name of the sample school) 会经常画海报 (often has posters drawing activities), 比如说救生携带的物品 (such as drawing items carried for lifesaving), 制作木筏的过程 (the process of making a raft), 野外求生的那种经历啊什么的 (the experience of survival in the wild or something). T/R: Wow, that's interesting, did you like it? G3S2: Yes, I like drawing this things, but I think I am not good at drawing. T/R: It's ok, so long as you can demonstrate what you want to say on a picture or a piece of paper.	
		T/R: Have you had similar drawing experiences before? G3S3: Yes, Arctic, once time in Rise, I draw Arctic. It's a PBL class about the nature. (PBL: project-based learning)	
		T/R: Have you had similar drawing experiences before? G3S5: Yea. T/R: Can you give me an example? G3S5: It is math class and we learned like…how to say 分数乘除法 (multiply and divide fractions) this words? T/R: 分数乘除法 - multiply and divide fractions. How did you understand this method through drawing? G3S5: I draw a square and the first one is a half and I will draw line let the square have two same rectangle, I don't know how to say it. I think I can draw it, like this picture (see the image on the right). T/R: Okay, let me see, 所以这是你画的 (you drew this)? G3S5: 嗯 (Yes) T/R: 所以这个图片是解答分数乘除法对吗？ G3S5: 嗯，比如上面这个二分之一就是现在红色的这个正方形先用蓝线分成两半，再用黄色把这个涂色, 再乘三分之二，就是把上面这个二分之一的面积分成三份，然后再取其中的两份用绿色	

		涂色，就这样的(Well, for example, the above half was divided by the blue line from the red square, then painted yellow and multiplied by two-thirds, that is the above half area that is divided into three parts, two of which were painted green, and that's it). T/R: Oh, I got it, that's interesting.	
		T/R: Have you had similar drawing experiences before? G3S6: In our own class, like in the science class, there is one about the nature, the teacher let us draw some picture like draw the animals that you think can live on the grassland or something like that, it's only one class, but I think it's gonna be a little be about ecosystem. T/R: So only one class you did a drawing? G3S6: Yes. T/R: Would you like to draw more of that topic, about science? G3S6: I think yes, and we will have more classes in our school about it, many people say our science class is about like the nature and a lot of things…I don't remember that much, but I still can think about it…sometimes we draw and sometimes we write, but I think more it's about writing and sometimes we draw too.	
Student feedback on tasks	Facilitating concept building	T/R: What did you learn by doing those drawings in class? G3S2: First, I think my drawing is not good, but I think I can use my drawing to know about things for this class, like I will draw a habitat, and I know what is habitat, also. T/R: Do you mean you learned the definition of a habitat by drawing? G3S2: Yes, and I will know this word clearly.	
		T/R: How do you think about the drawing and the writing practices we did in the class? G3S6: I think like the drawing and writing helps us to understand like what we learned, like there's a sentence like the definition, like we learned a definition, and sometimes we need draw our own thinking and it can help us to understand more about the knowledge that we learned.	
	Visual approach	T/R: How about the drawing and writing practices we did? G3S2: I think that is also good, because some teacher in China will do some practice, some test to learn, I think drawing is better than that way. T/R: Why do you think it's better? G3S2: Because I don't like to write some test, I think drawing it's a good way to learn in class.	
		T/R: How do you think about the drawing, do you like to draw?	

		G3S3: Yea, I like, but I think the drawing is a little bit of same very time. T/R: Do you mean you drew a bit similar every time? G3S3: Yes, a bit of similar. T/R: Would you make it different, how? G3S3: I think what I can do is every time draw different animals and different habitats.	
		T/R: What helped you to learn those new things? G3S5: I think this new thing can let me have more let me know the more of the world. T/R: 那什么帮助于你学到这些新的东西呢 (What helped you these new things), 我们课堂当中什么帮到你学什么是 ecosystem, 什么是 habitats (like what helped you learn habitats and ecosystem in our class)? G3S5: Drawing, drawing. T/R: Anymore? G3S5: And class, the meaning of the words. T/R: Do you mean the words in the ppt? G3S5: Yeah. T/R: How do you think about our drawing and writing homework, practice? G3S5: I think it can let me remember it and I think I remember for a long time. T/R: Remember what for a long time? G3S5: Like some keywords, some interesting drawing for a long time.	
		T/R: 那你觉得你画的画在学习方面对你有什么帮助吗 (Do you think your drawings can help you learn)? G3S1: I think don't have. 感觉画画对我学习没什么帮助 (I feel drawing doesn't help much with my study), 因为我总是画不到我想达到的效果 (because my drawings always don't meet my expectations)". T/R: 你可以通过写的形式 (You can try to write), maybe write next to your drawing. G3S1: Write some words on the picture and my drawing, I think yeah it's great.	
		T/R: How do you think about the drawing and writing practices we did in the class? G3S3: I like these two also and I like writing more … I think the drawing is a little bit of same very time. T/R: Do you mean you drew a bit similar every time?	

		G3S3: Yes, a bit of similar T/R: Would you make it different, how? G3S3: I think what I can do is every time draw different animals and different habitats.	
	Other learning resources (e.g., digital tool)	T/R: Do you think anything else helped you learn like how to protect habitat and ecosystem, or helped you learn some new words like species and organisms? G3S2: I think I can use book or I can use iPhone to check this word and I will also learn it by myself, I just look at that pictures and also listen to definition, I will learn this word.	
		T/R: 你自己平常课后怎么提高你的 writing 或者关于更多 nature 的 knowledge? (How do you usually improve your writing or learn more knowledge of nature after class?) G3S6: 我妈在网上给我买了一套世界地理的课，全英文配音的 nature programme, 一节 40 分钟，一共十几集，然后每一集都是英文，下面有中文字母，不懂的话可以看中文字幕，然后就可以学习更多英语单词，这种方式我也比较喜欢，因为还可以看很多世界上各种关于 nature 的，动物啊，地方啊，比如说 cave, what is the biggest cave, 会讲到很多关于地理的东西，相当一个纪录片。 (My mom bought me a set of world geography lessons online which is an English dubbed programme about nature with over 10 episodes in total. Each episode is 40min dubbed in English with Chinese subtitles, then I can learn more English words. I quite like this way of learning, because I can watch the word nature including animals, places, such as caves, what the biggest cave in the world is. It covers a lot about geography, like a documentary).	
		T/R: What helped you learn these things? G3S1: My some book have the habitat and ecosystems, and books can help me to learn these thing, and our class also can learn many thing of the habitat and ecosystem. T/R: Is it the book in your own school or the book you bought? G3S1: Books I bought. T/R: What is the name of the book? G3S1: I don't know how to say it in English, I can use Chinese? T/R: Yea, you can tell me in Chinese. G3S1: 生态平衡的重要性 (The importance of ecosystem), 在我的一本科学杂志里的一个文章 (from one of the articles in my science magazine). T/R: The importance of ecosystem balance.	

		G3S1: Yea.	
		T/R: What has helped you to learn in our class? G3S3: Maybe the knowledge about this nature before I learn, and the picture help me to know and to write. Pictures and the text.	
Student course evaluation	Conceptual development	T/R: Did our class help you learn some other things? G3S3: I think only the ecosystem and the food chain. T/R: Helped you…? T/R: How did it help in your science class? G3S3: It's just there has something I don't know and I can't write it, but after the learning, I knew how to write it. T/R: Write what? G3S3: Some…can I say in Chinese? T/R: Of course. G3S3: 题目 (questions). T/R: Some questions. G3S3: I can just say it in questions? I believe it's (questions mean) just 疑问 (queries), not 题目 (exam, textbook, or practice book questions). T/R: 题目也可以用 ('题目' can also be translated as) questions, 不仅是你问的问题 (it's not just the questions you ask), 也可以是试卷或书本上的题目 (but also the questions on test papers or textbooks). G3S3: Alright.	
	Language progression	T/R: Do you think you practiced your speaking and learned some new words from our class? G3S2: Yes, I think this class is use English to tell me something, it's good, and also that word habitat and ecosystem and food chain I heard it before, and biotic, abiotic and other two I don't heard about before. T/R: So that's something new you learned? G3S2: Yes, new word. T/R: How do you feel about our course overall? G3S2: I feel, mm… sometimes I feel great, because it's long time…I think I mean this class lots of time using English, I think this is great, it's good at my English. T/R: Mm, it's good for your English.	
		T/R: Did our class helped you learn some other things in your school? G3S1: Yeah, 在语法方面 (with my grammar).	
	Peer scaffolding	T/R: What help did you receive in the class? G3S1: Um, I get many help from the teacher and other children. T/R: How did you get help from other children?	

		G3S1: Other children ask some question, I also can learn something in that. T/R: How do you feel about our class overall? G3S1: 感觉学到了很多东西，感觉非常的不错. (I felt good that I learned a lot.)	
		T/R: How do you think about the help you received in the class? G3S6: It's maybe about the other students, they can send the picture (drawing) and they are sending to the group, I can understand more, for example, I think the animal on the grassland is elephants, but the other will write other animals like the lion, deer, the things I didn't think of, and I can know more, like the shark in the sea. I think I learned a lot from others, yes. T/R: From other students when they are talking about the drawings? G3S6: Yes, and when they are asking questions maybe I don't know the answer, like…(name of a student) I think, he is a small boy, I learned about him, I can know the answers from him, I think it's great. T/R: If other students answer or ask some questions. G3S6: Yeah. T/R: How do you feel about the lessons overall, do you have suggestions? G3S6: Not really, I think it's really great already.	
		T/R: How do you think about the help you received in our class? G3S3: Um, help from you and also from our classmate. Some time they give me some good evidence. T/R: What evidence? G3S3: Just like… (name of a student), once a time I said about Arctic and I forget what animal, she helped me say it. T/R: And how do you feel about our classes overall, do you have any suggestions? G3S3: I think it's great now.	
		T/R: 那我们的课你获得的帮助有什么? (what help did you receive from our class?) G3S5: 感觉就是让我认识到了一些不同的方面，虽然有的单词还是有点模糊，但是经过互动让我清晰了蛮多蛮多, 比如说第一节课我可能 habitat, ecosystem 不知道, habitat 以前学过但还是有点陌生, 然后 ecosystem 就完全没有听过，什么都不知道的, 这两个词语以前也没有想过有多少联系，但是通过这几节课的画图，互动还有一些理解的意思，感觉瞬间就出来了, 知道他们的关系和意思了 (It made me realise some different aspects. The interaction	

		made some words clear to me, for example, I wasn't very familiar with habitat though I have learned it before, and I have never heard of ecosystem nor thought about their connections, but through the drawings and interactions, I know their meanings and relationships. T/R: Ok, 你说的互动是 (you mentioned interaction) what kind of interaction? G3S5: 比如之前有个分组的活动 (such as the group task before).	
	Mentoring learning	T/R: How do you feel about the classes overall, 你有什么建议吗? (Do you have any suggestions?) G3S5: 我有个建议哈我觉得你可不可以上课的时候把摄像头打开 (I suggest you turn on camera in class). T/R: 每次我上课都打开了 (I turned on mine every time in class). G3S5: 不是老师 (not the teacher's), 是成员 (it's the students'), 比如学生在下面低头做其他事的时候 (for example when students bow their heads to do other things), 老师可以看到 (the teacher will be able to notice). T/R: 因为我也顾及到学生的隐私，所以没有主动打开，但这个建议非常好，让学生融入进来，那你平常上网课会打开摄像头吗? (considering students' privacy, so I didn't turn on their cameras, your suggestion is very good as it can engage students more, do you usually turn on your camera when taking online classes?) G3S5: 一般不怎么上网课，有一次是几千人一起上网课，老师经常点不到我，看不到我. (I usually don't take online classes, there was once I had an online class with thousands of students, and the teacher didn't see me or ask me questions.) T/R: 那可能你口语表达的机会就比较少 (Then probably you had less chance to practice your speaking). G3S5: 对, 觉得像这种小班的课蛮好的. (Yes, classes like this with a small number of students is pretty good.)	
Student future recommendations	Deeper learning	T/R: What areas of learning do you want to improve in the future? G3S6: For my own, I like the things about the nature, and when Rise have the special event about a charity group, I like doing the plans, I like learning about how to make a charity group and do you do a special event and I like learning about the nature. T/R: So, more knowledge about nature and how to plan an event, such as a charity group are something you'd like to improve or know more about? G3S6: Yes. T/R: How about improving your ability in event planning and learning nature?	

		G3S6: Maybe like our 社区举办的一些活动 (some activities organised by the community) and I can improve something of the nature. T/R: What kind of activities have they planned before? G3S6: About the nature like 沙龙活动 (Salon activities), they will give you some sand and you can build a place and you put your favorite animals in it, and you can talk about the animals, the second part you build a food chain, and you talk about it, the third part, you build a place that you like.	
		T/R: Is there something you want to learn in the future? G3S3: In the future, I want to learn some about the fiction and some book that other write. T/R: Books about what? G3S3: About stories and about the history. T/R: How are you going to improve your knowledge about history? G3S3: Maybe in the class I can say something more. T/R: In your history class? G3S3: I don't have a history class; I learn history by book.	
	Language practice	T/R: Which parts of your learning do you want to improve? G3S2: Writing because I think drawing is a good way to learn English, but we also need to writing, because my word, sometimes I cannot write in the correct way. T/R: So, you want to improve writing in English? G3S2: Yes. T/R: How are you going to improve? G3S2: I think I will do lot of 听写 (dictation), yes, maybe.	

		T/R: What areas of learning do you want to improve in the future? G3S6: For my own, I like the things about the nature, and when … (name of the school) have the special event about a charity group, I like doing the plants, I like learning about how to make a charity group and do you do a special event and I like learning about the nature. T/R: So, more knowledge about nature and how to plan an event such as a charity group are something you'd like to improve or know more about? G3S6: Yes. T/R: How about English learning? G3S6: Writing, I like writing, in our Rise class, we will write a little school, one about the adventure, we can write our own story, I like writing for my own. T/R: So, you want to improve more of your writing? G3S6: Yes. T/R: How are you going to improve these things you just talked about, like your writing, your event planning? G3S6: My Rise class is finish and I think maybe on the English class at the other places, maybe there are writing so I can practise more over there.	
		T/R: 那今后学习中你有什么要提高的吗 (What would like to improve in your learning in the future)? G3S5: 觉得还是词汇量不够 (I think I don't have enough vocabulary), 语法还可以 (my grammar is ok), 读也没有什么太大问题 (so is my pronunciation), 就是看到这个词会拼会读但就是不知道什么意思 (I don't know the meanings of the words though I can spell and pronounce them). T/R: How are you going to improve your vocabulary? G3S5: 有的时候就是读一下英语，早上读一下 (Sometimes I read in English like in the mornings).	
		T/R: Any parts of learning do you want to improve in the future? G3S1: 我觉得我的英语表达能力还不是很好 (I think my ability in English expression is not very good). T/R: Your English speaking? G3S1: Mm! T/R: How are you going to improve your English speaking? G3S1: 就是多读吧 (Just read more). T/R: Read what? G3S1: Some English book.	

		T/R: 通过读英文书你可以怎么提高口语呢 (How are you going to improve your speaking by reading)? G3S1: 主要是提高词汇量 (mainly to improve my vocabulary), 然后读音也不是很标准 (and my pronunciation is not very standard). T/R: Oh, reading some English books can improve your vocabulary and pronunciation? G3S1: Yes.	
Visual Narrative with Creativity	Learners' Affective and Cognitive Representations		G3S5: I think it is so cool, I draw a shark and it is in ocean and I draw small fish swim, also in the ocean, I think this shark didn't see these fish because I want to draw a people was run but the time is up and I doesn't draw.
	Connectivity of Life Experiences		G3S6: The first drawing is my cat and it lives in her cat house and probably sometimes on my bed, I think its habitat sometimes is in cat house playing and sometimes on my bed sleeping. G3S4: I draw the four cats, the two is in the grassland and another two is a house that we build, my friends have two cats, these mice is food for the cat and that bird is the food for cat too, because it's in the grassland and I think there might be birds so I draw a bird and cats also eat birds too.

Appendix III: Ethics

Parental Information Sheet

Information sheet for parents

Project title: *Visual Languaging:* Exploring Visualisation in Language and Cognitive through a Pluriliteracies Model in Online EFL Classrooms

Invitation to participate. Your child is invited to participate in a research study in the Dingtalk app study group assigned by their own English school (Rise Subject English) on how children learn English with visualisation. This document explains this study, what your rights are, and what will be done with the data I collect. You should keep this page for your records.

What is the study about? When children learn English as an additional language, they may encounter circumstances when they lack certain appropriate words or expressions to articulate their understanding of concepts introduced in EFL classrooms. There seem to be potential benefits of using visual presentation to support their English verbal communication. This study aims to explore how children learn through visualisation as one main mode of representation that bridges oral and written languaging to deepen their linguistic understanding and enhance their cognitive progression.

What will happen? If you agree for your child to participate, I will deliver five English lessons to your child with simple images in ppts and guide them to articulate their understanding and learning with visuals. Each lesson will last between 45-60 minutes. Afterward, your child will be invited to take part in two 15min learning conversations after the second and the fourth lessons and a 15min interview after the fifth lesson via the Dingtalk app with me. These will be video recorded. So, the data I will retain are video recordings of the lessons, after-class learning conversations and interviews, and the digital photos of children's visual work taken by themselves, which will be sent to me via the Dingtalk app. I will work with your child to make sure they enjoy these tasks.

Risks and benefits. There are no known risks to participate in this study. There are no tangible benefits to you or your child. However, after all the data collection phases of this study are ended, your child will receive a certificate of completion in EFL *visual languaging* as a thank you for participation. Moreover, your child will be contributing to our knowledge about language and how it is learned through *visual languaging.*

Confidentiality and use of data. All data collected during this main study will be processed in accordance with Data Protection Law. In order to safeguard your own and your child's privacy, only I will

have the access to the data and your child's personal information will not be shared with anyone else. Your child's data will be referred to by their non-legal English first names (i.e., pseudonyms) rather than their legal Chinese names. The research data (e.g., video recordings) and the personal data (e.g., signed forms) will be stored in separate password-protected archives (.rar). The data will only be used for my Ph.D. and with your permission, it can be used for my publications and presentations (e.g., online conference) arising from this work.

What are my data protection rights? The University of Edinburgh is a Data Controller for the information you provide. You have the right to access information held about you. Your right of access can be exercised in accordance with Data Protection Law. You also have other rights including rights of correction, erasure, and objection. For more details, including the right to lodge a complaint with the Information Commissioner's Office, please contact the Moray House Ethics Lead – Fiona at O'Hanlon@ed.ac.uk or the Moray House email: MHSES-Ethics@ed.ac.uk. Alternatively, you can

visit www.ico.org.uk. Questions, comments, and requests about your personal data can also be sent to the University Data Protection Officer at dpo@ed.ac.uk.

Voluntary participation and right to withdraw. I will ask your child's permission before we begin the study, and I will make sure they understand that they can stop the study at any point. You may also choose to withdraw your child from the study at any time. Any data supplied up to that point will be deleted.

This project has been approved by the MHSES Research Ethics Committee. If you have any questions about what you have just read, please feel free to ask, or contact me by email at s1236615@ed.ac.uk.

Thank you for your help! Now please complete the consent form on the next page.

Dandan Chen

Consent Form

Parental consent and agreement to data usage

Project title: *Visual Languaging:* Exploring Visualisation in Language and Cognitive Development through a Pluriliteracies Model in Online EFL Classrooms

Please tick the boxes beside the statements you agree with, and sign and date the bottom of the page.

I confirm that I have read and understood the Information Sheet and consent to my child taking part in the above study, including recording my child's voice/face.	☐
I agree that the data generated by my child can be used for future publications or presentations arising from this study by the researcher.	☐
I understand that I am free to withdraw my consent for involvement with this research project at any time.	☐

Caregiver's name	Child's name	Caregiver's relationship to the child
Caregiver's signature	Child's signature	Today's date

Appendix IV

DingTalk Screenshots