Bringing the Outside In: Connecting Students' Out-of-School Knowledge and Experience through Translanguaging in Hong Kong EMI Classes

Kevin W. H. Tai[a]* and Li Wei[a]

[a]*UCL Centre for Applied Linguistics, UCL Institute of Education, University College London, London, United Kingdom*

Correspondence Details of the Corresponding Author:

Kevin W. H. Tai's Email Address: kevin.tai.19@ucl.ac.uk

Abstract

The present study contributes to a well-established line of applied linguistics research in educational contexts on how teachers can make connections between their students' out-of-school knowledge and experiences and what they learn in the classroom by examining a hitherto under-explored context, namely English-medium-instruction (EMI) mathematics classes in Hong Kong (HK). Adopting a translanguaging perspective, the study examines how fluid and dynamic meaning-making practices afford opportunities for teachers to bring the outside into the EMI classroom in order to support the students' learning of new academic knowledge. The data for the present paper is based on a linguistic ethnography project in a HK secondary school where EMI is practised. Multimodal Conversation Analysis is carried out on the classroom interactional data, triangulated with the video-stimulated-recall-interview data analysed using Interpretative Phenomenological Analysis. The findings demonstrate how the teacher constructs a translanguaging space by integrating the students' everyday life experience in an institutional learning space. It is argued that translanguaging thus helps to transform the EMI classroom into a lived experience, which in turn enhances content learning. The theoretical and pedagogical implications for EMI in other contexts are explored.

1. Introduction

Applied linguistics research in educational contexts has been investigating how teachers can make connections between their students' out-of-school knowledge and experiences and what they learn in school in order to promote students' classroom participation and facilitate understanding of the content (e.g. van Lier, 1996; Cazden, 2001; Young and Miller, 2004; Markee, 2005; Baynham, 2006). In order to conceptualise the act of the teachers bringing the accumulated knowledge into the design of the teaching materials, Moll et al. (1992, p.133) use the term 'funds of knowledge' to refer to the 'historically accumulated and culturally developed bodies of knowledge and skills essential for households and individual functioning and well-being'. Such funds of knowledge entail rich cultural and cognitive resources that can be deployed by the teacher in order to offer culturally responsive and effective pedagogical practices. Both the teacher and students can make use of these funds of knowledge in the classrooms in order to make the classroom more inclusive and engage in real-life meaning-making. Teo (2008) is one of the earliest scholars who builds on the idea of 'funds of knowledge' and adopts the notion of 'outside-in' in classroom discourse which involves the teacher bringing outside knowledge into the classroom interaction. Teo's case study of English and social studies lessons in Singapore secondary schools shows that using various textual resources to connect the students' background knowledge and experience with content knowledge can deepen the students' understanding of the academic knowledge and make schooling a more meaningful experience.

A number of studies on English-for-Speakers-of-Other-Languages (ESOL) classrooms have also examined the benefits of 'bringing the outside in'. Cooke and Wallace (2004), for example, provide evidence of the cultural, linguistic and life experience resources that ESOL learners bring with them into the classroom that facilitate learning and meaning-making. Likewise, Baynham's (2006) analysis of adult ESOL classrooms illustrates that the students initiate uninvited responses and bring in their outside knowledge into the classroom, prompting the teacher to open up interactional space to the students and to respond to their needs accordingly. Similarly, Simpson (2011) explores the construction of identity in adult ESOL classrooms and his analysis demonstrates that creating a space for bringing outside knowledge into the classroom allows the students to affirm their identities and claim control of classroom discourse. A recent study by Tai and Brandt (2018) examines how an ESOL teacher employs embodied enactments to contingently explain vocabulary to learners in an adult beginner-level ESOL lesson. The analysis illustrates that the teacher offers a verbal and physical representation of an imagined outside-of-the-classroom context, which helps students in the class to understand how the specific vocabulary items can be employed in specific contexts and thus bridging the gap between classroom interaction and real-life second language (L2) use.

The present study aims to expand the existing research on bringing the outside into the classroom to facilitate learning by examining a hitherto under-explored context, namely English-medium-instruction (EMI) mathematics classes in Hong Kong (HK), and with particular focus on how translanguaging practices (e.g. Garcia and Li, 2014) afford opportunities for teachers to bring the outside into the EMI classroom in order to support the students' learning of new academic knowledge. The data for the present paper is based on a two-week linguistic ethnography in a HK secondary school where EMI is practised. Observations with fieldnotes, ethnographic interviews, and video recordings form the main database. Multimodal Conversation Analysis (MCA) is carried out on the classroom interactional data, which is triangulated with the video-stimulated-recall-interview data analysed using Interpretative Phenomenological Analysis (IPA). This paper argues that drawing on students' familiar linguistic and multimodal resources and cultural funds of knowledge through translanguaging enables the teacher to integrate the everyday life space into the EMI classroom learning space. It turns the classroom into a lived experience and broadens students' perspectives.

2. EMI and Translanguaging

EMI is an educational system where English as a second or foreign language is used to teach subject matters to learners. Due to recent trends towards internationalisation, especially of higher education, EMI has become a major commodity in the education market (Macaro, 2018; Sah, 2020). Critiques of EMI often point to the exacerbation of global and local inequalities due to detrimental effects on linguistic and cultural diversity provoked by monolingual English-medium teaching (Annamalai, 2004; Tollefson and Tsui, 2014). Nevertheless, EMI seems to be increasing in popularity across the globe (Macaro et al., 2018; Xie and Curle, 2020).

Translanguaging promotes dynamic use of all named languages in the user's repertoire and other semiotic resources in learning and meaning-making. It wants to maximise the multilingual learners' linguistic capacity, recognise the positive role of the learner's first languages in second language use, and run against the monolingual approach to learning seemingly practised through EMI. The translanguaging perspective emphasises the boundaries between named languages, and indeed between language varieties, are social and political in nature (Otheguy et al., 2015; Li, 2018), which can be manipulated by the language users for strategy use in meaning-making. In this study, we adopt Li's (2018) argument which views translanguaging as a process of knowledge construction. It involves going beyond different linguistic structures and systems (i.e. not only different languages and dialects, but also styles, registers and other variations in language use) and different modalities (e.g. switching between speaking and writing, or coordinating gestures, body movements, facial expressions, visual images).Williams (1994) in its original conception wants to

advocate a translanguaging pedagogy in order to assist learners in developing a deeper understanding of content and in scaffolding one language with another. In the context of Welsh bilingual classrooms, Williams conceptualises translanguaging as deliberate switches of languages for receptive or productive use. Later expansions and theorizations of the concept have emphasized the potentially transformative nature of translanguaging for multilinguals to bring in different sociocultural dimensions, including the speakers' social identities, life histories, beliefs, and their knowledge of the wider institutional environment, as resources in the process of meaning-making (Garcia and Li, 2014).

A considerable number of studies has explored code-switching or use of L1 in EMI context (e.g. Lin, 1996; Lin, 2006; Nikula, 2007; Tavares, 2015; Lin and Lo, 2019). Lin (1996) employs interactional sociolinguistics to analyse pedagogical practices in HK EMI classrooms and she reveals teachers' creative use of their L1 to establish a closer relationship with students, reaffirm native cultural values and norms, construct bilingual academic knowledge and promote effective classroom management. A recent study by Lo and Lin (2019) suggests that the teachers also deploy both L1 and L2 to prepare low English proficiency students for certain classroom tasks and the L2 is gradually introduced as an attempt to bridge the students' understanding of the content knowledge in the L1 and L2. In recent years, EMI scholars have attempted to adopt the translanguaging perspective in order to make sense of the classroom participants' complex multilingual and multimodal repertoires in constructing meanings. Several studies (e.g. Lin and He, 2017; Wu and Lin, 2019; Tai and Li, 2020) have illustrated translanguaging as an empowering tool to recognise linguistic diversity in the EMI classrooms and have highlighted the benefits of maximizing language users' full linguistic and semiotic resources in knowledge construction. A recent ethnographic study by Lin and He (2017) investigates how an EMI science teacher uses translanguaging to motivate South Asian ethnic minorities to draw upon their multilingual repertoires. The findings indicate that the teacher and learners' willingness to learn from one another creates a space where learners are motivated to use the L2 and develop their linguistic repertoires. Lin and Wu's (2015) study investigates how learners use translanguaging to actively construct meaning in an EMI science classroom. The findings indicate that by allowing a low-proficiency learner to answer the teacher's response in Cantonese, this creates an opportunity for the learner to display her scientific knowledge. Nevertheless, it is important not to presume that translanguaging itself can necessarily be accepted as a transformative pedagogical practice in all multilingual classrooms. It is important to consider the local circumstances and the predominant discourses in the particular contexts before introducing specific linguistic resources in the classrooms in order to avoid negative influences on students' learning outcomes.

Whilst ample studies exist on the role of translanguaging in supporting classroom

participants to exploit multilingual and multimodal resources to facilitate content teaching and learning (e.g. Lin and He, 2017), there is a distinctive lack of research that investigates how translanguaging can be deployed for bringing the outside world into EMI classrooms to facilitate content learning. As Li's (2014) study of the complementary schools in Britain demonstrates, translanguaging enables the learner, and the teacher, to bring together not only their multiple linguistic resources but also their out-of-school knowledge and experience of the social world, their attitudes and beliefs in the negotiation of meaning. This allows the students to recognise how new knowledge is connected to their older understanding. In other words, translanguaging facilitates teachers and students to draw on different funds of knowledge to challenge and transform old understandings and generate new configurations of language and pedagogical practices. In the present article, we specifically examine how translanguaging can afford opportunities for an EMI mathematics teacher in a HK secondary school to draw on the students' prior knowledge for enhancing students' understanding of the academic content.

3. EMI in Hong Kong

The choice of medium-of-instruction in the educational system has been a highly controversial issue for decades in HK, where the majority of the citizens speak Cantonese as their L1. In general, Cantonese as the medium-of-instruction is adopted for teaching most content subjects in the majority of the Chinese-Medium-Instruction (CMI) primary schools and English is taught as a separate core subject, which typically involves six to ten 40-minute lessons per week. At the tertiary level, universities in HK use EMI due to the need to align with global higher education and to cater for a large number of international students. Whilst the medium-of-instruction policies are broadly set for primary and university education, that at the secondary level has undergone significant changes in recent years (Poon, 2010). HK's secondary schools have witnessed three key stages in the development with regard to medium-of-instruction policies, including the colonial government's laissez-faire policy prior to 1994, the compulsory CMI policy during 1998-2010, and the fine-tuning medium-of-instruction policy since 2010.

Before 1997 when the sovereignty of HK returned from Britain to China, the colonial government adopted a laissez-faire medium-of-instruction policy which allowed secondary schools to decide their own medium-of-instruction. With the belief that EMI could better facilitate English acquisition, over 90% of the secondary schools claimed to be EMI schools (Falvery, 1998). However, studies (e.g. Johnson, 1983; Luke, 1991) revealed that the use of mixed Cantonese and English were prevalent in all the so-called EMI schools since many students struggled to learn content subjects through English due to their limited proficiency in English. Education Department (1997) argued that language mixing and switching were generally deemed to impede students' L1

and English proficiencies. Shortly after the handover in 1997, the HK government introduced the 'biliterate and trilingual' policy. Under this policy, both Chinese and English are recognised as official languages, with Cantonese being recognised as the de facto official spoken variety of Chinese in HK, while also acknowledging the role of Mandarin/Putonghua. The goal of introducing this policy is to develop students' proficiency in writing English and Chinese and communicating confidently in Cantonese, English and Mandarin/Putonghua. The Education Department of the HK government promoted the mandatory mother-tongue policy, mandating the use of CMI from primary one to secondary three. Exceptions were granted to 114 schools that had fulfilled certain criteria, in terms of school support measures, teacher capacity and student ability, to remain as EMI schools. This policy has led to severe criticisms from the general public, especially from parents and key stakeholders in education, since it was perceived as a way for the government to impose HK citizen's national identity and their patriotic sentiments (Tsui, 2004). There was also an impression that CMI education contributed to the general decline of students' English proficiency in HK in the post 1997 era (Poon, 2013). The HK government succumbed to public pressures and decided to 'fine-tune' the mother-tongue policy by eliminating the classification of schools into CMI and EMI. The current situation in HK secondary schools is fluid with respect to medium-of-instruction, with some schools having CMI in all content subjects for all classes, other CMI/EMI in different subjects in different classes, or EMI in all content subjects for all classes.

4. Data and Methods

The school is a typical local EMI secondary school, which is subsidised by the HK government, and provides education from secondary one to six based on the curriculum guides set by the HK Education Bureau. The school uses EMI to deliver most of the lessons, and the school examinations are conducted in English (except Chinese literature, liberal studies and Putonghua). Although the school's mission statement explicitly states the aim to develop students to be bilinguals, the school language policy places heavy emphasis on the use of English on the school campus in order to create a rich English learning environment for all students. All morning assemblies and staff meetings are conducted in English. Moreover, English-for-all-day is held every Monday where everyone (all teaching staff and students) in school must use English for communication in order to prepare students to interact effectively with other individuals from other countries.

Our access to the school was gained through a long-term association between the first author and the school. The mathematics teacher in the present study was the first author's former colleague and he has at least eight years' experience in teaching mathematics in English. As this

ethnographic study requires close-up observation of the teacher's translanguaging practices, sufficient familiarity and trust were needed which enabled us to gain access to the classrooms and conduct interviews with the teacher. The teacher is an L1 speaker of Cantonese and previously attended an EMI school for his own secondary education. English is his L2 and he has a limited level of Mandarin/Putonghua proficiency. His bachelor's degree in mathematics and IT education and MSc in Mathematics were obtained from two top-ranked EMI universities in HK. During his undergraduate studies, he occasionally taught drama at several HK secondary schools. He did not receive any specific EMI teacher training while he was pursuing his education degree.

A pre-semi-structured interview was conducted with the teacher in order to understand his perceptions of best practices and his attitudes towards using multiple languages in the EMI mathematics classrooms. During the two-week linguistic ethnography, the first author observed a secondary three (year 9) class. There were 18 students in the class and this class was classified as an enhancement class. Students who ranked below average in their cohort in the internal mathematics examination were enrolled in this class. All students have received at least six years of primary education, where Cantonese was employed as the Medium-of-instruction and English was taught as an L2. All students in the class spoke Cantonese as their L1 except two. Those two students spoke Mandarin/Putonghua as their L1s and Cantonese and English as their additional languages, and they were migrants from mainland China. A total of eleven 40-minute lessons were observed and video-recorded. Informal interviews were conducted with the teacher and students during the two-week observational period in order to gain detailed information about the observed lessons. These informal interviews can be referred to as ethnographic interviews (Spradley, 1979) because they took place spontaneously rather than being scheduled with participants in advance. A post-video-stimulated recall interview was conducted with the teacher in order to compare his actual translanguaging practices and his interpretations of the practices.

This study integrates MCA and IPA to study the functions of translanguaging practices in EMI mathematics lessons. This methodological approach falls under the umbrella of Linguistic Ethnography (LE). LE affords the capacity of a linguistic analysis to 'tie ethnography down' and 'open up' linguistic analysis (Rampton, 2006, p.395) without excluding ethnographic data so that the strengths of each complement the weaknesses of the other. Since translanguaging practices are complex in nature (different sociocultural factors such as personal history, life experience, identity, beliefs can potentially play a role in affecting our use of meaning-making resources in the process of constructing knowledge), it is necessary to have a flexible framework that can integrate different methodologies to understand the complexities of translanguaging practices. This study uses MCA to analyse the classroom interaction data. MCA 'focuses on how social order is co-constructed by the members of a social group' (Brouwer and Wagner, 2004, p.30) through fine-grained analysis

of the social interaction. It takes an emic/participant-relevant approach (Markee and Kasper, 2004) in order to explicate the detailed process of how social actions, such as learning, are co-organised and achieved through talk-in-interaction. The data were transcribed using Jefferson's (2004) and Mondada's (2018) transcription conventions. The framework of IPA is employed to examine how the mathematics teacher understands his own pedagogical practices at specific moments in the interaction and how the classroom interactions are shaped by multiple sociocultural factors. IPA acknowledges the investigation of the meanings of the participants' experiences as an interpretative enterprise on the part of both researcher and participants. A dual interpretation process called 'double hermeneutic' is involved and this requires researchers to take an emic approach in order to make sense of the participants trying to make sense of their world (Smith et al., 2013).

5. Analysis

We first present our analysis of two extracts demonstrating how creating real-life scenarios are done through translanguaging (Extracts 1 and 2). We then examine an example of utilising a metaphor (Extract 3) in order to bring outside knowledge into the classroom for facilitating content explanation.

5.1 Creating Real-life Scenarios

In this study, four instances were found which demonstrate how the teacher draws on the shared knowledge between the teacher (T) and the students, alongside with the multilingual and multimodal resources, to explain the mathematical meaning. Extracts 1 and 2 are typical cases which reveal this interactional phenomenon. Extract 1 is an example of how T deploys translanguaging to connect the real-life scenario of playing war games in order to assist students in understanding the mathematical question. Prior to the extract, T read out the question in English which was projected on the screen (figure 1). This question requires the students to determine whether the aircraft will be detected by the radar within 50 kilometres. In this extract, T translanguages and activates students' prior understanding of computer war games through the use of English, Cantonese and multimodal resources (gestures and projector). In lines 30-45, T mainly deploys colloquial Cantonese to engage in verbal talk with students in order to create a hypothetical scenario related to computer games. In lines 49-55, T switches back to English to initiate a question and T subsequently uses Cantonese to clarify the scenario with the students (lines 58-73). T redirects the talk back to the question and draws on English and deictic gestures to connect the hypothetical scenario of a war game with the mathematical question.
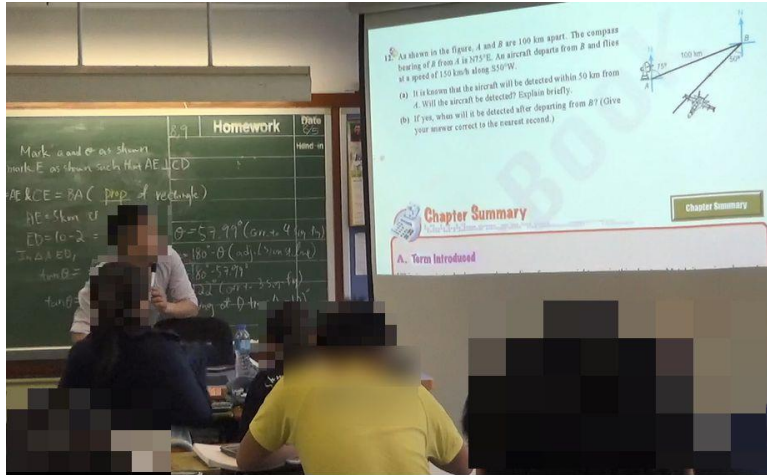
Figure 1

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30  T: 點樣先會 detect 到先=
       ((tr. how can it be detected))
31  S1: =係個範圍裏面
           ((tr. within the area))
32  (1.0)
33  T: 係啦(0.4) 你哋打機打得多啲啦
       ((tr. yes (0.4) you guys often play computer games))
34  (0.2)
35  T: 個敵人行入你個圈嘅範圍入邊你咪攻擊到佢啦係咪
       ((tr. when the enemy walks into your territory, you will then be able to attack them
        right?))
36  (0.4)
37  S3: 你有冇打邊啲呀？
         ((tr. have you attempted to play any computer games))
38  (0.5)
39  T: 哦姐 (0.3) 嗰啲 (0.3) 嗰啲 (0.2)你哋打塔都係架
       ((tr. oh like (0.3) the (0.3) the (0.2) it's like you guys destroying the tower))
40  (0.4)
41  T: 你哋打 lol(0.7) 呀嘛 (.) 推塔
       ((tr. you guys were playing LOL (0.7) right (.) demolishing the tower))
42  (.)
43  S3: 我唔玩 lol 㗎
          ((tr. I don't play LOL))
44  (.)
45  T: 玩傳說嗰啲
       ((tr. playing games like Arena of Valor))
46  (0.2)
47  S3: 我唔玩傳說㗎
         ((tr. I don't play Arena of Valor))
48  (.)
49  T: 推塔嘅時候點啊 (0.4) okay? you will not walk okay
       ((tr. what do you do when you demolish the tower))
50  (0.5)
51  T: inside the
52  (1.2)
53  T: inside the circle of a tower right?
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54  (0.5)
55  T: you will not walk inside right?
56  (0.5)
57  S9: °佢哋會用槍攻擊你㗎喎°=
        ((tr. they will use guns to shoot you))
58  T: =+[我知]↑你會搵啲兵仔俾佢
          ((tr. l know you will deploy your army and let them))
        +T looking at S9
59  S9: [hahaha]
59  (0.3)
60  T: $俾佢去食咗先$ (0.2) [然後你係 (0.2) 然後入去(0.2) 佢任打]你
        ((tr. let them be eaten first (0.2) then you (0.2) then go in (0.2) the enemy will
        continuously attack you))
61  S12:                    [阿 sir 你有玩㗎 (0.4) 你係唔係有玩㗎]
                            ((tr. sir, have you played it before (0.4) have you played it
                             before))
62  (1.0)
63  T: [但係 (0.2) 多謝]
        ((tr. but (0.2) thank you))
64  S3: [佢有玩啦]
        ((tr. he has played it before))
65  (1.1)
66  S1: +°再唔係佢會打你先°
        ((tr. or else they will attack you))
         +T looking at S1
67  (0.3)
68  T: 我知 (.) 唉=
      ((tr. I know (.) urgh))
70  S3: =我明白點玩啦
        ((tr. I know how to play it))
71  (0.2)
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72 T: 唉(0.8) 好啦 (.) +得啦 (.) 大家清楚啦=
        ((tr. urgh (0.8) okay (.) right (.) everybody understands))
                                    +T nodding
73 T: =明白點 (0.4) 點樣運作得㗎啦 (.) okay thank you
        ((tr. understands how (0.4) how it works))
74 (0.3)
75 S3: 好好玩咁
        ((tr. looks fun))
76 (0.3)
77 T: this is +the tower (1.1) +$okay?$
                +T points at the radar on the screen #1
                            +T repeatedly points at the radar
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Image #1

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78 (0.7)
79 T: 呢個塔會攻擊你嘅(0.8) +駕機係出邊飛過 (0.7) 接唔接受所有攻擊啊
        ((tr. this tower will attack you (0.8) an aircraft is passed by (0.7) will it be attacked))
                                    +T walks to the BB
80 (1.6)
81 T: +你覺得？
        ((tr. what do you think))
        +T cleans the BB--->
82 (0.3)
83 S1: 㗎機係出邊咪唔會有事囉
        ((tr. the plane will not be attacked because it's outside the zone))
84 (0.7)
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After T accepts S1's response, T makes a comment in Cantonese by predicting the students' hobbies, '你哋打機打得多啲啦 (you guys often play computer games)' (line 33). By doing so, T potentially signals to the class that his forthcoming verbal talk will relate to computer games. T then initiates a yes-no question (line 35) and such question encourages students to imagine the situation where an enemy is invading their territories. In line 39, T makes a comment about the nature of the war games which involves destroying a tower, '你哋打塔都係㗎 (it's like you guys

destroying the tower)'. T continues his turns by providing examples of the war game, such as League of Legends (LOL) in line 41 and Arena of Valour in line 45. By doing so, T illustrates his awareness of the popular war games that are played by the students. T continues to elaborate on the real-life scenario by initiating a display question in Cantonese, '推塔嘅時候點啊 (what do you do when you demolish the tower) (line 49)' in order to encourage students to foresee what will happen when they demolish a tower. After a 0.4-second pause, T switches the linguistic code from Cantonese to English, probably because T is orienting towards the English-only norm in EMI classroom. He provides a yes-no question to prompt students' thinking, 'you will not walk okay' (line 49) and 'inside the circle of a tower right' (line 53). This implies that when demolishing a tower, the students should not send their game characters into the war zone.

In line 57, student 9 (S9) raises an issue to identify the flaw of T's question, '佢哋會用槍攻擊你 㗎喎 (they will use guns to shoot you)'. Such statement challenges T's assumption that staying outside the circle of a tower does not guarantee safety since the enemy can use guns to attack the students' respective characters in the game. T immediately deploys Cantonese to explain that students will use their army to defend themselves, '你會搵啲兵仔俾佢 (you will deploy your army and let them)'. In line 60, T continues to use Cantonese to explain the strategies for dealing with the enemy. Note that T also uses metaphor of being eaten, '$俾佢去食咗先$ (let them be eaten first)', in order to refer to the purpose of sending the army to the dangerous zone.

In lines 72-73, T indicates his plan to redirect the topic of the talk back to the mathematical question. In line 77, T draws the students' attention on the radar on the screen by pointing at it (image #1) when he utters 'the tower'. By doing so, T metaphorically compares the radar with the tower in the computer war games. Here, T encourages students to draw on the real-life scenario, which was established in lines 30-70, in order to make sense of the mathematical question. In line 79, T switches back to Cantonese to further construct the real-life scenario to facilitate understanding. T first encourages students to imagine the tower as a dangerous entity which will attack the students in the aircraft, '呢個塔會攻擊你嘅 (0.8) 駕機係出邊飛過 (this tower will attack you (0.8) an aircraft is passed by)'. After a 0.7-second pause, T raises a yes-no question which prompts students to think about whether the tower will be able to attack the aircraft (line 79).

During the post-video-stimulated-recall-interview, T comments on the purpose of using war games in Extract 1. Based on the teacher's interpretations, it is evidenced that the teacher draws on his pedagogical belief and his awareness of youth culture in order to construct such real-life scenario.

Classroom Interaction Transcript	Video Stimulated Recall Interview Selected Excerpts	Teacher's Perspectives	Analyst's Interpretations of the Teacher's Perspectives

30 T: 點樣先會 detect 到先=
    ((tr. how can it be detected))
31 S1: =係個範圍裏面
    ((tr. within the area))
32 (1.0)
33 T: 係啦(0.4) 你哋打機打得多啲啦
    ((tr. yes (0.4) you guys often play computer games))
34 (0.2)
35 T: 個敵人行入你個圈嘅範圍入邊你咪攻擊到佢啦係咪
    ((tr. when the enemy walks into your territory, you will then be able to attack them right?))
36 (0.4)
37 S3: 你有冇打邊啲呀？
    ((tr. have you attempted to play any computer games))
38 (0.5)
39 T: 哦姐 (0.3) 嗰啲 (0.3) 嗰啲 (0.2)你哋打塔都係架
    ((tr. oh like (0.3) the (0.3) the (0.2) it's like you guys destroying the tower))
40 (0.4)
41 T: 你哋打 lol(0.7) 呀嘛 (.) 推塔
    ((tr. you guys were playing LOL (0.7) right (.) demolishing the tower))
42 (.)
43 S3: 我唔玩 lol 㗎
    ((tr. I don't play LOL))
44 (.)
45 T: 玩傳說嗰啲
    ((tr. playing games like Arena of Valor))
46 (0.2)
47 S3: 我唔玩傳說㗎
    ((tr. I don't play Arena of Valor))
48 (.)
49 T: 推塔嘅時候點啊 (0.4) okay? you will not walk okay
    ((tr. what do you do when you demolish the tower))
50 (0.5)
51 T: inside the
52 (1.2)
53 T: inside the circle of a tower right?
	01 K: 因為你其實，你其實，你其實同啲學生嗰個年齡都唔係真係爭好，即係唔係真係爭咁遠，你覺得你其實你當時用呢一啲 example 係咪覺得可以拉近返嗰個距離
	((tr. That is because the age difference between you and your students is not that wide. So, do you think that using this example can allow you to bridge the gap?))
	
	02 T: 會啊會啊，拉近啲距離好重要，係呀，即係佢，佢會知道，啊原來你，都知我哋做緊乜嘢
	((tr. it will, it will. Bridging the gap is very important. Yes. So that they, they will understand. Oh so you actually know what we are doing))
	
	03 K: um
		T acknowledged the importance of bridging the social gap between himself and his students	The researcher was trying to make sense of the reason why T employs the example of computer games to facilitate content explanation
			
			T imitated students' voice – predicting the students' reactions when T knows their hobbies.

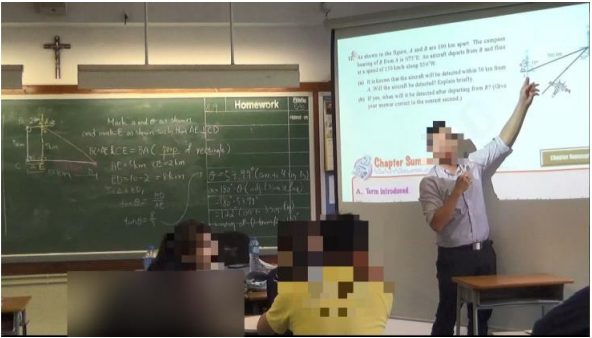|			

54 (0.5)
55 T: you will not walk inside right?
56 (0.5)
57 S9: °佢哋會用槍攻擊你㗎喎°=
    ((tr. they will use guns to shoot you))
58 T: =+[我知]↑你會搵啲兵仔俾佢
    ((tr. l know you will deploy your army and let them))
    +T looking at S9
59 S9: [hahaha]
59 (0.3)
60 T: \$俾佢去食咗先\$ (0.2) [然後你係 (0.2) 然後入去(0.2) 佢任打]你
    ((tr. let them be eaten first (0.2) then you (0.2) then go in (0.2) the enemy will
    continuously attack you))
61 S12:   [阿 sir 你有玩㗎 (0.4) 你係唔係有玩㗎]
    ((tr. sir, have you played it before (0.4) have you played it
    before))
62 (1.0)
63 T: [但係 (0.2) 多謝]
    ((tr. but (0.2) thank you))
64 S3: [佢有玩啦]
    ((tr. he has played it before))
65 (1.1)
66 S1: +°再唔係佢會打你先°
    ((tr. or else they will attack you))
    +T looking at S1
67 (0.3)
68 T: 我知 (.) 唉=
    ((tr. I know (.) urgh))
70 S3: =我明白點玩啦
    ((tr. I know how to play it))
71 (0.2)
	04 T: 咁佢哋好似，即係好似赤裸裸地比我見到你其實玩緊呢啲遊戲，但係我都可以同學術有關
	((tr. So they will be like, like being naked. It allows me to see through the fact that they will play these kind of computer games. However, it can be related to academic content too.))
	
	05 K: um
	
	06 T: 咁所以，即係其實係，er ，即係 academic 都可以 apply to games 啊，games 都可以係 related to academic，咁佢哋度，即係希望佢哋玩緊嘅時候，從良啦，hahaha 讀書啦咁樣
	((tr. so I think, this means that academic subjects can also be applied to games. Games can also be related to academic content. So I hope that while they are playing the games, they can realise their mistakes and start doing revision.))
	
	07 K: um
		T reinforced the implication for using the example of computer war games.
		
		Potentially allowed students to understand the importance of doing revision
			Using the metaphor of being naked as a way to refer to his ability to see through his students
			
			T's motivation to link the students' computer games with the content subject → potentially makes it more interesting and easier for students to understand
			
			T imitated students' voice: predicting their reactions when they learn that T will also play computer games.

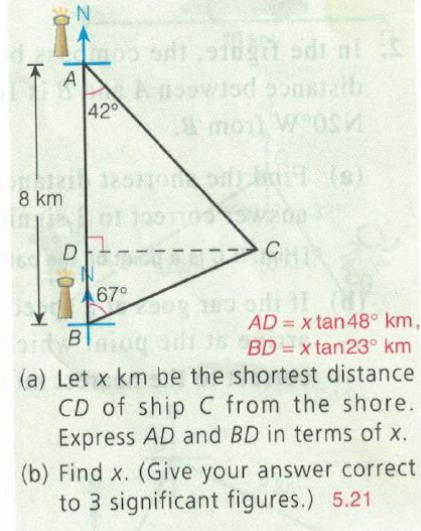|			
72 T: 唉(0.8) 好啦 (.) +得啦 (.) 大家清楚啦= ((tr. urgh (0.8) okay (.) right (.) everybody understands)) +T nodding 73 T: =明白點 (0.4) 點樣運作得㗎啦 (.) okay thank you ((tr. understands how (0.4) how it works)) 74 (0.3) 75 S3: 好好玩咁 ((tr. looks fun)) 76 (0.3) 77 T: this is +the tower (1.1) +$okay?$ +T points at the radar on the screen #1 +T repeatedly points at the radar Image #1 78 (0.7) 79 T: 呢個塔會攻擊你嘅(0.8) +駕機係出邊飛過 (0.7) 接唔接受所有攻擊啊 ((tr. this tower will attack you (0.8) an aircraft is passed by (0.7) will it be attacked)) +T walks to the BB 80 (1.6) 81 T: +你覺得？ ((tr. what do you think)) +T cleans the BB--->· 82 (0.3) 83 S1: 㗎機係出邊咪唔會有事囉 ((tr. the plane will not be attacked because it's outside the zone)) 84 (0.7)	08 T: 即係會有呢種感覺，佢哋會，係囉，啊原來你都有做呢件事，即係，咁，老師都做，都會打機，咁然後咁下老師都會讀書㗎喎，咁樣，即係即係 um 可能佢哋會讀返書咁樣囉，即係希望佢哋會，係囉 ((tr. So I do have this rationale behind it. Yes. Oh, so you will actually do this, so the teacher will also play computer games, but the teacher will also study hard. So, um, this may encourage the students to do more revision rather than focusing too much on playing computer games. That's my hope. Right.))	T as the role model who will play computer games and do revision. Encouraging students to realise the importance of doing revision.	T is portraying himself as a role model who will study hard, but he will also play computer games as a hobby.

Table 1: Post-video-stimulated-recall-interview (Extract 1)

The researcher believes that the reason why T chooses to use the example of computer war games to facilitate content explanations is because T aims to bridge the social gap between the teacher himself and his students. Such prediction is acknowledged by T and T also reinforces the importance of bridging the social gap with the students in order to show his awareness of the current youth culture. In particular, T shifts the footing by imagining himself as his students and voicing out his students' reactions when they learn that T knows their hobbies, '啊原來你，都知我哋做緊乜嘢 (oh so you actually know what we are doing) (line 2)'. T further employs a simile of being naked, '好似赤裸裸地 (like being naked)', as a way to refer to his ability to see through his students' hobbies. It is important to note that this mathematical question is classified as an advanced question. Since the students in this class are not high achievers in mathematics, it can be suggested that T brings his knowledge, in terms of the strategies for mastering computer war games, into the classroom for facilitating the explanation of the mathematical questions. T also clearly states that using computer war games as an example can implicitly show to the students that computer games can be related to academic knowledge, '即係 academic 都可以 apply to games (this means that academic subjects can also be applied to games)'. By doing so, the teacher is bringing the students' everyday life experience into the classroom space where he can facilitate his explanation of the mathematical question and bridge the social gap between himself and the students.

The MCA analysis in Extract 2 has shown how T has employed multilingual (e.g. colloquial Cantonese, L2 English) and multimodal resources (e.g. deictic gestures, drawings on the blackboard) to create several real-life scenarios for explaining the technical term 'shortest distance'. Prior to Extract 2, T was reading aloud the mathematical question on bearings (figure 2). Question (a) requires students to find out the distance of the dotted line (CD). In line 6, T draws students' attention to the term 'shortest distance' (lines 7-9) which is the target technical term that T is attempting to explain from lines 13-57. In this extract, T first makes use of Cantonese translations of the mathematical terms, English utterances, gestures and the drawings on the blackboard to construct a scenario of a person walking across the road (lines 1-26). From lines 27-43, T deploys English if-clauses, Cantonese translation of the house-estate and gestures to activate students' knowledge regarding the actual geographical locations of the infrastructure near the school (i.e. the house-estate, tunnel, zebra-crossing) in order to facilitate his construction of a real-life scenario.

Classwork 10.22

On a straight coastline, lighthouse *A* is 8 km due north of lighthouse *B*. The compass bearings of ship *C* from *A* and *B* are S42°E and N67°E respectively.

$AD = x \tan 48°$ km,
$BD = x \tan 23°$ km

(a) Let *x* km be the shortest distance *CD* of ship *C* from the shore. Express *AD* and *BD* in terms of *x*.

(b) Find *x*. (Give your answer correct to 3 significant figures.) 5.21

(Figure 2, Chan et al., 2008: 10.45)

```
01 T: okay? (0.5) you need not something new
02 (0.5)
03 >okay?< +part a
             +T looks at the screen from the T's desk
04 (1.1)
05 T: let k kilometer (0.4) be the shortest distance c d
06 (0.6)
07 T: er +by +the way
          +T looks at students
              +T walks to the screen
08 (0.2)
09 T:do you know +why this is +the shortest distance+
                  +T points at the triangle on the screen
                                  +T moves his finger from the left to right repeatedly
                                   along the dotted line CD--->
                                                        --->+
10 (4.4)
11 T: +do you know why
      +T looks at the students
12 (3.8)
13 T: okay (0.2) +for a triangle like this (1.0) okay
                 +T draws a rotated triangle on the BB
14 (0.7)
15 T: +if you (0.3) if you are (standing) here (1.0) okay?
      +T draws a person on the BB ((next to a corner point of a triangle)) #2
```
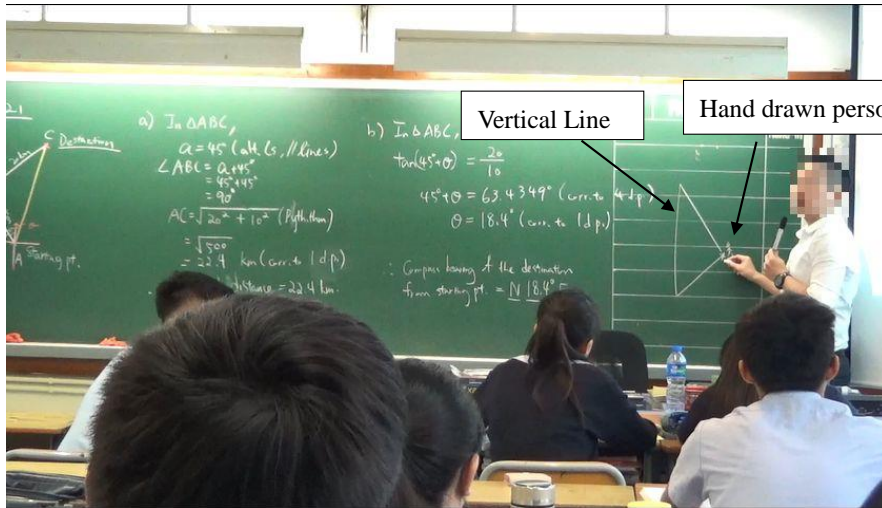
Image #2

16 (0.2)

17 T: if you want to +cross the road (0.7) +to reach this +line

                              +T moves his index finger from the 'person' to the vertical line

                                          +T moves his index finger up

                                       and down along the straight

                                       line

                                               +T looks

                                         at students

18 (0.6)

19 okay?

20 (0.8)

21 T: how to get there will be (0.5) er (0.9) the time spent=

22 T: =will be the shortest

23 (0.9)

24 S1: 直行

    ((tr. go straight))

25 (0.6)

26 T: yes +very good (0.2) 直行

                           ((tr. go straight))

        +T draws a horizontal dotted line on the triangle #3
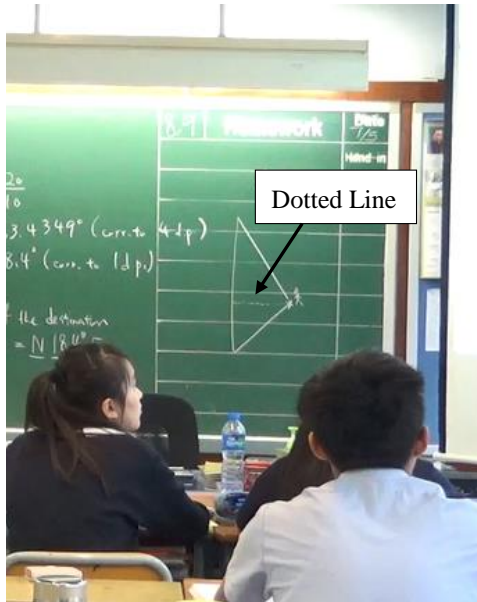
Dotted Line

Image #3

27 (1.1)
28 T: +just like imagine if +you really need to go to 洪福村

((tr. Hung Fok Estate))

+T walks to the windows on his LHS

+T raises up his RH at chest level, stretches out his
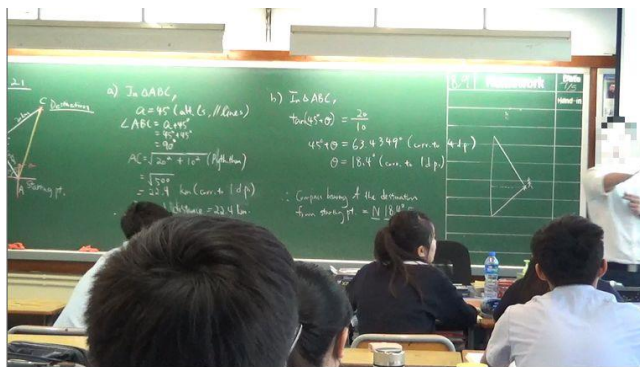RH arm, extends his index finger to point at his LHS
#4

Image #4

29 (0.7)
30 T: okay (0.8) directly
31 (0.9)

```
32 T: +if we can cross the road+ directly
        +T points at his LHS and moves his elbow backward and then moves forward--->
                                        --->+
33 (0.3)
34 T: it will be the shortest right? (0.5) okay?
35 (0.4)
36 T: so (0.3) er
37 (0.3)
38 T: otherwise we we +need to go to the tunnel=
                      +T uses his chalk to first point at the 'person' then moves his RH
                      downward along the slanting line #5
```
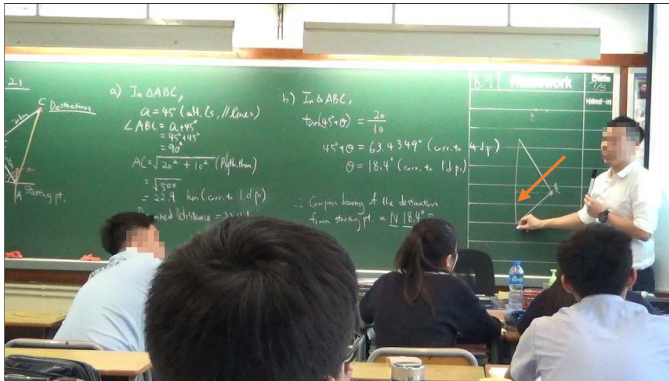
 Image #5

```
39 T: =and +then go to the (0.3) um (0.3) +zebra-crossing
           +T raises up his RH along the straight-line
                                          +T first points at the 'person' then
                                            moves his RH upward along the
                                            slanting line #6
```
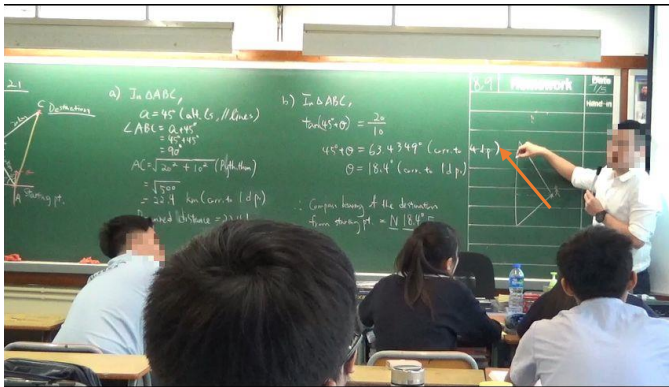
Image #6

40 (0.4)

41 T: and then

42 (0.5)

43 T: +we need to walk so many road and +then reach there

    +T first points at the 'person' then moves his RH downward along the slanting line

                         +T points at the middle point of the
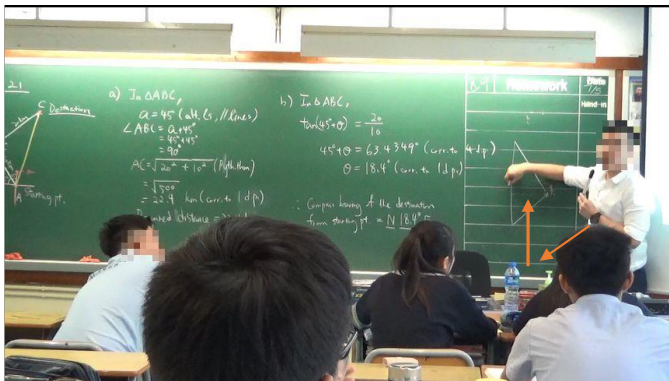
                           vertical line #7

Image #7

44 (0.6)

45 T: okay so +if we can walk it

              +T points at the 'person'

              +T then moves his index finger to the LHS to the midpoint of the triangle

46 (1.4)

47 T: +perpendicular to our +target

    +T draws a 90-degree symbol on the triangle

                        +T moves his RH index finger from top to low position

                        along the vertical line

48 (0.7)

49 T: +then it will be the shortest distance (0.8) okay?+

    +T moves his RH index finger from left to right along the horizontal dotted line--->

                                    --->+

In line 13, T first utters 'for a triangle like this' and draws a rotated triangle on the blackboard, which is the same as the triangle in classwork 10.22 (figure 2). T then draws a person next to a corner point of the triangle in line 15 (image #2). He further utters 'if you want to cross the road' in line 17 and concurrently moves his finger from the hand-drawn person to the vertical line to enact the act of 'walking'. Here, it is noticeable that T is creating a real-life scenario of a person walking across the road.

After constructing the scenario, T asks another display question 'how to get there will be (0.5) er (0.9) the time spent will be the shortest' (lines 21-22) to scaffold students' understanding of the ways for searching for the distance. In line 24, student 1 (S1) responds to T's display question in Cantonese by uttering '直行' ('go straight'). Although S1's Cantonese utterance deviates from the local institutional norm (i.e. using English in the classroom), T echoes S1's Cantonese response '直行' and concurrently draws a horizontal dotted line on the triangle in order to reflect the distance between the hand-drawn person and the vertical straight line (image #3).

Afterward, T constructs another real-life scenario by referring to the physical locations of the infrastructures around the school. In line 28, T asks students to 'imagine if you really need to go to 洪福村 (Hung Fok Estate)' (line 28). The distance between the school and the estate is approximately ten minutes. Simultaneously, T walks towards the windows on his left-hand side and he stretches out his right arm and extends his finger to point at the windows (image #4). This is possibly because the estate is on T's left-hand side (fieldnotes). Hence, by pointing to the window on his left-hand side and switching to Cantonese to announce the name of the house estate ('洪福村'), he is activating the students' knowledge regarding the location of the estate to the students.

Figure 3

In line 32, T constructs another if-clause to encourage students to imagine if they cross the road directly to the estate, 'if we can cross the road directly'. Since no one responds to T's display question in line 34, T continues to explain the alternative route if students cannot cross the road directly to the house-estate (lines 38-43) and he mentions the tunnel and the zebra-crossing. These are the infrastructures which are located near the school (figure 3). Notably, T uses his chalk to first point at the hand-drawn person on the blackboard and moves his right-hand downward along the slanting line (image #5) when T explains that the alternative way of arriving at the estate is to go to the tunnel (line 38). T then moves his right-hand upward along the slanting line (image #6) when T explains that the walking path to the zebra-crossing (line 39). Subsequently, in line 43, T visually illustrates the walking path from the zebra-crossing to the estate by moving his right hand downward along the slanting line (image #7). T then points at the middle point of the vertical line (image #7) when he says 'then reach there' in order to visually and metaphorically represent the location of the estate.

In lines 45-47, T continues to establish a real-life scenario by uttering another if-clause, 'so if we can walk it (1.4) perpendicular to our target'. Simultaneously, T points at the hand-drawn person in order to metaphorically refer the hand-drawn person as the classroom participants in the class (line 45). T then moves his finger to the middle point of the vertical line in order to visually represent their walking path to the estate (line 45). In line 49, T completes his construction of the conditional sentence by offering the main clause, 'then it will be the shortest distance'.

As shown, in Extract 2, T draws on the knowledge related to the infrastructures near the school and it is familiar to all students, whereas in Extract 1, T utilises the knowledge of computer war

games and that is related to students' hobbies. Despite the differences, both extracts illustrate that T utilises various multilingual and multimodal practices to connect students' prior knowledge and experience in order to create a real-life scenario and assist students to understand the mathematical question.

During the post-video-stimulated-recall-interview, T comments that bringing the knowledge of the geographical locations into the lesson can facilitate students' understanding of the concept. It can be argued that T's construction of the real-life scenario is based on students' common knowledge about the geographical locations of the infrastructures nearby the school. This contributes to the creation of an integrated translanguaging space which bridges students' familiar experience and the mathematical content.

Classroom Interaction Transcript	Video Stimulated Recall Interview Selected Excerpts	Teacher's Perspectives	Analyst's Interpretations of the Teacher's Perspectives

Image #3
 	
27 (1.1)
28 T: +just like imagine if +you really need to go to 洪福村
 	
                                ((tr. Hung Fok Estate))
  +T walks to the windows on his LHS
      +T raises up his RH at chest level, stretches out his
      RH arm, extends his index finger to point at his LHS
      #4
 	
Image #4
 	
29 (0.7)
30 T: okay (0.8) directly
31 (0.9)
	01 K: 你其實當時係咪喺度用返我哋學校圍繞出邊嗰啲 infrastructure 嗰啲 physical locations
	(tr. At the moment, are you referring to the locations of the infrastructure that are near the school area)
	
	02 T: 係
	(tr. Yes)
	
	03 K: 來做一個
			Interpreted T's use of examples as a strategy for activating the shared knowledge between T and his students.

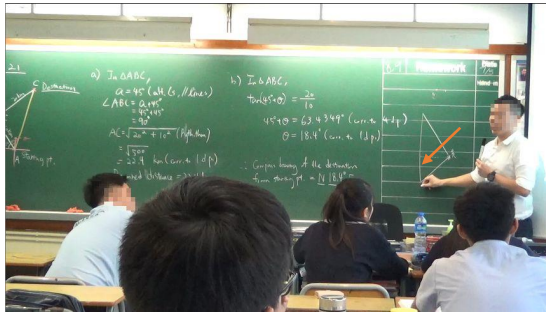|			

32 T: +if we can cross the road+ directly
    +T points at his LHS and moves his elbow backward and then moves forward--->
                                    --->+
33 (0.3)
34 T: it will be the shortest right? (0.5) okay?
35 (0.4)
36 T: so (0.3) er
37 (0.3)
38 T: otherwise we we +need to go to the tunnel=
                    +T uses his chalk to first point at the 'person' then moves his RH
                    downward along the slanting line #5
 	
Image #5
39 T: =and +then go to the (0.3) um (0.3) +zebra-crossing
       +T raises up his RH along the straight-line
              +T first points at the 'person' then
              moves his RH upward along the
              slanting line #6
	example
	(tr. As an example)
	
	04 T: 係呀係呀
	(tr. Yes. Yes)
	
	05 K: 係囉，即係呢一種 knowledge 係，你同學生都係共同係擁有 (tr. Yes. So that's the knowledge which is shared between you and your students.)
	
	06 T: 係，要接近佢哋囉，即係佢哋會易啲代入到件事，咁樣佢哋就會易明白啲囉，雖然嗰個直接嘅關係，即係類似囉，即係中文類比論證咁樣，即係攞啲接近啲嘅 haha 例子嚟同佢哋解釋嗰個，嗰個 concept 囉"
	(tr: Yes, it has to be relevant to them. This means that they can easily be immersed in the context, so that they could easily understand.
		Explicitly stated his goal for facilitate their understanding of the mathematical concept of 'shortest distance'.	Reference of analogical argument indicates his understanding of the importance of connecting similar examples together
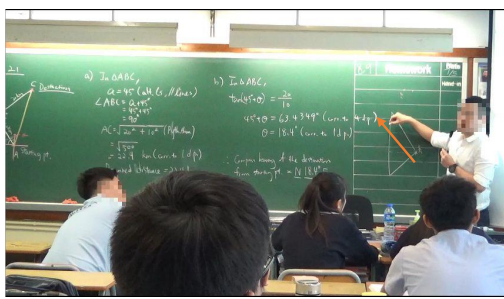
26

Image #6

```
40 (0.4)
41 T: and then
42 (0.5)
43 T: +we need to walk so many road and +then reach there
        +T first points at the 'person' then moves his RH downward along the slanting line
                                +T points at the middle point of the
                                    vertical line #7
```
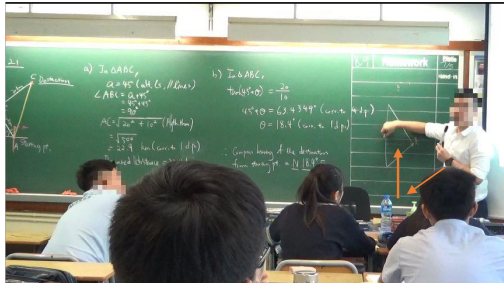

Image #7

```
44 (0.6)
45 T: okay so +if we can walk it
              +T points at the 'person'
              +T then moves his index finger to the LHS to the midpoint of the triangle
46 (1.4)
```

This is the equivalent of the idea of analogical arguments in Chinese. It refers to the use of any objects that are bound to be similar in some ways in order to explain the concept.)

Table 2: Post-video-stimulated-recall-interview (Extract 2)

In the interview, the researcher interprets T's use of examples (e.g. tunnel and house estate) as a strategy for activating the shared knowledge between T and his students. T explicitly states that his goal of drawing on examples, which are familiar to the students, is to allow students to understand the real-life scenarios constructed by T. This, in turn, can facilitate their understanding of the mathematical concept of 'shortest distance'. T's explicit mention of analogical argument in the interview, 即係中文類比論證 (this is the equivalent of the idea of analogical arguments in Chinese), indicates his understanding of the importance of connecting similar examples together. By drawing on his own pedagogical belief, the teacher is creating a translanguaging space where he integrates the everyday life shared knowledge into the classroom space in order to facilitate his explanation of the mathematical term 'shortest distance'.

5.2 Using an everyday life metaphor to address student-initiated questions

In this study, two instances were identified which illustrate how T uses everyday life metaphors to facilitate his mathematical explanations. Extract 3 is a typical case which demonstrates this feature. Prior to Extract 3, the students have completed the question, T provided the correct answer on the blackboard which allowed students to check their own work. The question provides four coordinates: P (-3, -5), Q (h, 1), R (0, -8) and S (2, -7) and students need to find the value of 'h' if slope PQ is parallel to slope RS. In this extract, T draws on English to respond to a student initiation (lines 8-32). In lines 40-44, T employs various Cantonese colloquial registers in his utterances to construct the metaphor of cooking. Then in line 52, T makes use of colloquial Cantonese phrases, gestures and spatial positions to vividly enact the movements of chopping and frying food in the wok in order to figuratively explain how the mathematical steps can be combined within an equation.

```
01 T: can you find the same answer
02 (4.0)
03 T: can you find the same answer=
04 S6: =nine=
05 T: =[nine (0.3) +okay?]
                        +T looks at S1
```
06 S1: [唔係(0.2) 其實可唔可以]直接搵咗個(0.6) 搵咗 rs 先會唔會方便啲？
　　　　((tr. [no (0.2) actually is it possible] to directly find the (0.6) find rs first so that it will
　　　　become more convenient?))
```
07 +(1.6)
    +T looks at the steps at the BB
08 T: +okay lah
      +T points at the equations (mpq=mrs)--->+ #8
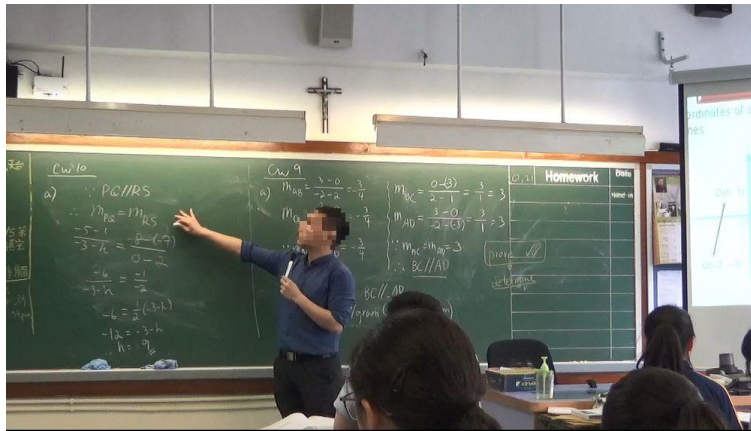```



Image #8

```
09 (0.3)
10 T: if you directly find the slope of rs (0.7) first
11 (1.2)
12 T: and then okay you can separate the the steps+
                                            --->+
13 (0.3)
14 S6: why
15 (0.2)
16 T: okay? (NAME-S1) +suggests
                      +T draws a straight line on the BB
17 (0.6)
```

```
18 T: +can we find the slope of rs first
        +T writes 'mrs='
19 (0.3)
20 T: after +er er er er er er +something like this
              +T writes several dots on the BB
                              +T writes '1/2' on BB #9
```


Image #9

```
21 (0.7)
22 T: +okay? (0.6) after calculations find this pattern+
        +T points at 1/2 on BB--->
                                              --->+
23 (0.6)
24 T: and then (1.7) connecting this value (0.8) +equal to
                                                  +T points at the
                                          equation 'mpq=1/2' on BB
25 (0.8)
26 T: one over two (0.8) okay?
27 (0.2)
28 T: you can also do it in this way (0.7) okay?
29 (0.2)
30 T: but er +to save time
                +T points at the equation 'mpq=mrq'
31 (0.6)
```

```
32 T: I I +just use +this method directly (0.7) okay?
            +T uses his index finger to point at the beginning of the solution #10
                    +T tilts his head to his LHS and shrugs his shoulder and moves his
            RH and points at the middle part of the solution #11
```


Image #10

Image #11

```
33 (0.2)
34 T: +呢個我係慳時間嘅啫(.)+同埋慳墨水姐我自己啊
```
((tr. here I am just saving time (.) and saving the ink too))
    +T moves his index finger from the top of the step to the middle part of the step
                            +T moves his index finger from the top of the step to the
                                middle part of the step

```
35 (0.6)
36 T: 得唔得啊
```
((tr. okay?))

37 (0.6)

38 T: okay?

39 (0.3)

40 T: 不過如果你+鍾意拆件(0.2)+冇問題 (0.5)+預先準備好個材料

((tr. but if you like to detach it (0.2) that's fine (0.5) prepare the ingredients in advance))

+T moves his index finger from the top of the step to the middle part of the step

+T extends his index finger and shakes it from left to right

+T moves his RH to his waist level, palm facing upward #12

Image #12

41 (0.4)

42 T: +先至一齊落鑊

   ((tr. then put them together in the wok))

   +T makes rotation around the equation 'mpq=1/2' #13

Image #13

43 (0.3)

44 T: 冇問題(0.7) okay? +我呢個一齊喺個鑊入邊 (0.9) +斬埋件咁樣

   ((tr. no problem (0.7) okay? here l put them all together in the wok(0.9) chopping them
   too))

   +T points at the equation 'mpq=mps' on BB #14
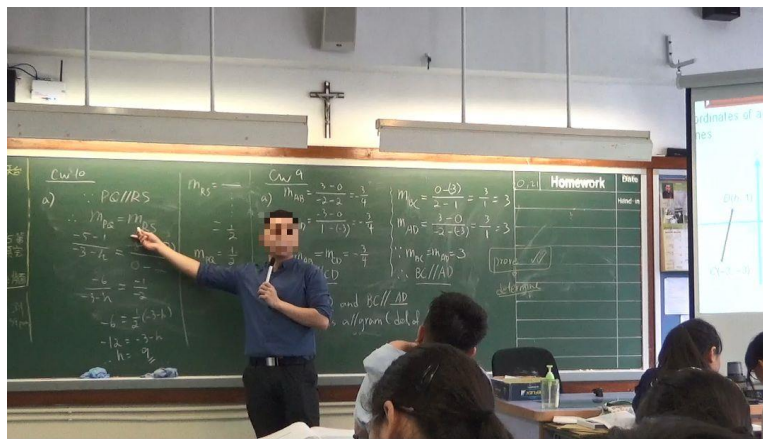

Image #14

45 (1.3)

46 S1: $係個鑊入邊斬件$

   ((tr. chopping the food in the wok))

47 (0.4)

```
48 T: +你唉(0.3) 你明㗎啦
        ((tr. you eh (0.3) you understand))
      +T points at S1
49 (0.2)
50 S1: 你估真係 Gordon Ramsay
        ((tr. you think you are Gordan Ramsay))
51 (0.4)
52 T: +係呀一路係個+鑊度+切 (0.5) +一路喺度炒呀嘛
        ((tr. yes, chopping the food in the wok and frying the food at the same time))
      +T walks to the teacher's desk
                    +T extends his right arm and locates his RH above the box cover
                      (exercise books on the surface), T's RH fingers are extended, and the
                    palm is flat
                        +T enacts a chopping gesture by moving his RH rapidly, moving
                      up and down repeatedly #15
                            +T holds up his fist
                            +T enacts a gesture of frying food by moving his
                          fist from right to left rapidly, making a small rotation
                          #16
```


Image #15

Image #16

```
53 (1.3)
54 T: 係啦 (0.3) +就係咁樣啦 okay?
       ((tr. yes (0.3) that's it))
                    +T holds his RH up, palm facing upward
55 (0.3)
56 T: no +problem? (0.3) lah question ten=
          +T looks down on the computer
57 T: =will be the last type of question related to
58 (1.3)
59 T: er the new (1.4) concept
60 (0.6)
61 T: okay? (3.4) no problem?
62 (3.4)
```

In line 6, S1 asks whether it is possible to look for the coordinates of slope RS first before searching for the value of 'h' (line 6). In lines 10-28, T explains that S1 can look for the value of slope RS first and then look for the value of slope PQ. Both values should be one over two and since they are equal, it can be suggested that both slopes, PQ and RS, are parallel lines.

In line 40, T first explains to students that it is acceptable to first prove that slopes mRS is equal to mPQ before moving on to look for the value of 'h', '不過如果你+鍾意拆件(0.2)+冇問題 (but if you like to detach it (0.2) that's fine)'. Note that the Cantonese vocabulary item, '拆件', literally means detaching something into pieces. After a 0.5-second pause, T introduces a metaphor of cooking by explaining to the students that they have to first prepare the cooking ingredients in advance, '預先準備好個材料 (prepare the ingredients in advance)', and T holds up his right-hand with his palm facing upward (image #12). By enacting this iconic gesture, T is possibly pretending holding the ingredients on his right hand. Then in line 42, T utters '先至一齊落鑊 (then put them together in the wok)' and make a rotation around the equation 'mpq=1/2' (image #13) on the blackboard. The 'ingredients' are metaphorically referring to the values of slope PS and PQ and

by putting these 'ingredients' into the wok, this figuratively refers to the use of these values to search for the final answer. In line 44, T points at the equation 'mPQ=mPS' on the blackboard (image #14) and verbally explains that he coincidentally puts all the ingredients into the wok, '我呢個一齊喺個鑊入邊 (here l put them all together in the wok)', and chops up all the ingredients, '斬埋件咁樣 (chopping them too)'. Here, T continues to employ these Cantonese vocabulary items to figuratively justify how he combines the steps together into one rather than separating them into several steps.

In line 50, S1 initiates an uninvited turn in Cantonese to question T's response by asking whether T thinks that his cooking skills are comparable to Gordon Ramsay who is a famous British chef. In line 52, T agrees with S1's statement by first saying, '係呀 (yes)' and then explains to S1 that he chops off the ingredients into pieces in the wok, '一路係個鑊度切(chopping the food in the wok)'. It is noticeable that when T utters the noun '鑊 (wok)', he extends his right arm and locates his right-hand above the box cover on the T's desk. It can be seen in image #15 that the box is filled with students' exercise books. It is possible that the box cover is momentarily being represented as a wok and his right hand represents a knife. When T utters the verb '切 (chop)', T enacts the chopping gesture by moving his right-hand up and down rapidly (image #15) to reinforce the act of chopping. After a 0.5-second pause, T utters '一路喺度炒呀嘛 (frying the food at the same time)', and enacts a gesture of frying food by moving his fist from right to left rapidly in order to make a small rotation (image #16). T is possibly enacting the act of holding a spatula for frying the food in the wok. These translanguaging practices allow T to reinforce the message (i.e. combining the skipped steps into a single step) that he intends to provide through using a cooking metaphor in line 44.

In the post-video-stimulated-recall-interview, T is invited to comment on his rationale in using the metaphor of cooking. Based on T's interpretations, it is evidenced that the translanguaging practice is shaped by his prior learning experience which motivates him to bring in everyday life examples into the classroom in order to facilitate students' understanding of the approaches for describing mathematical steps.

Classroom Interaction Transcript	Video Stimulated Recall Interview Selected Excerpts	Teacher's Perspectives	Analyst's Interpretations of the Teacher's Perspectives
32 T: I I +just use +this method directly (0.7) okay? 　　　+T uses his index finger to point at the beginning of the solution #10 　　　　+T tilts his head to his LHS and shrugs his shoulder and moves his 　　　　　RH and points at the middle part of the solution #11 Image #10 Image #11 33 (0.2) 34 T: +呢個我係慳時間嘅啫(.)+同埋慳墨水姐我自己啊 　　　*((tr. here I am just saving time (.) and saving the ink too))* 　　　+T moves his index finger from the top of the step to the middle part of the step 　　　　+T moves his index finger from the top of the step to the 　　　　　middle part of the step 35 (0.6) 36 T: 得唔得啊 　　　*((tr. okay?))*	01 K: um! Interesting 咁你覺得呢你用 cooking metaphor 離去 activate 學生嗰個 like 嗰個 Prior knowledge 佢哋肯定知 cooking 係乜嘢啦，你係咪 assume 佢哋用呢一個 metaphor 頭先你就話，可以用來 show 個 step 出嚟，佢哋係會容易，都一定係會容易啲去明白你 (English translation: um! Interesting. So, do you believe that using the cooking metaphor to activate students' prior knowledge. Will the students understand the meaning of cooking? Are you assuming that the metaphor, can be used to illustrate the mathematical steps? So that students will find it easier to understand your explanation?)	Allowed students to make sense of the mathematical procedures that	

37 (0.6)
38 T: okay?
39 (0.3)
40 T: 不過如果你+鍾意拆件(0.2)+冇問題 (0.5)+預先準備好個材料
((tr. but if you like to detach it (0.2) that's fine (0.5) prepare the ingredients in advance))
+T moves his index finger from the top of the step to the middle part of the step
+T extends his index finger and shakes it from left to right
+T moves his RH to his waist level, palm facing upward #12

Image #12

41 (0.4)

02 T: 我覺得會明，易啲明白，因為， 可，可能啲同學讀數呢係唔知點入手啊，即係唔知點樣去，開始去寫第一步，咁所以我先至，諗一啲方法幫佢拆件做嘢，然後先至合埋一齊囉

(English translation: I think it's a yes. Students would find it easier to understand. It is because some students might not know what to do at the beginning. This means that they might not know how to describe the first mathematical step. So, this motivates me to think of a way to help students to understand that they have to look for different pieces of information first and then combine these pieces of information together.)

03 K: um!

they had to follow in order to solve the question.

Helped students to realise the need to: 1) find the information that are necessary for solving the mathematical problem, 2) utilise the gathered information to form coherent steps in solving a mathematical problem.

T was reflecting his struggle in writing essays and he compared such experience with his students' struggle in describing the mathematical steps.

T's prior struggle in mastering English writing skills potentially allowed him to better understand students' needs in having a concrete step-by-step guide to support

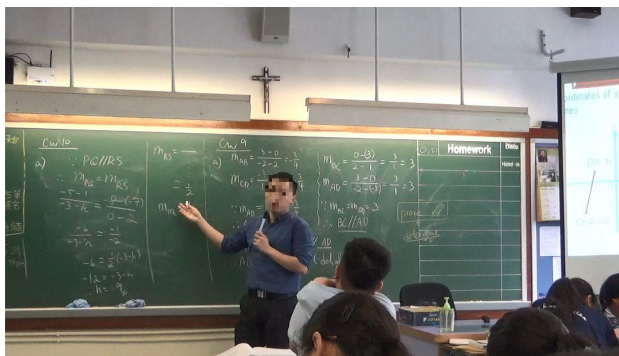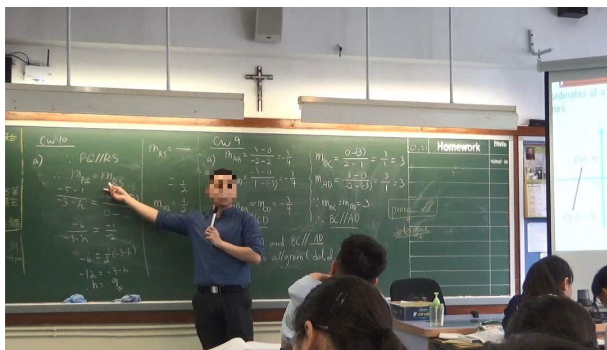|			
42 T: +先至一齊落鑊 *((tr. then put them together in the wok))* +T makes rotation around the equation 'mpq=1/2' #13 Image #13 43 (0.3) 44 T: 冇問題(0.7) okay? +我呢個一齊喺個鑊入邊 (0.9) +斬埋件咁樣 *((tr. no problem (0.7) okay? here l put them all together in the wok (0.9) chopping them too))* +T points at the equation 'mpq=mps' on BB #14 Image #14 45 (1.3) 46 S1: \$係個鑊入邊斬件\$ *((tr. chopping the food in the wok))* 47 (0.4)	04 T: 即係好似我，我唔識作文我唔識點落手咁樣 haha (English translation: So, it's similar to my situation. I don't know how to write essays. Haha.) 05 K: haha 06 T: 然後之後，哦，原來我做數係咁樣落手嘅，咁我就，我就搵一啲類似嘅嘢，咁但係咁類似嘅嘢冇理由話做數咁樣㗎嘛 (English translation: Then, oh, so when I did mathematics, I followed that approach to describe the mathematical steps. So, then I, I try to find similar examples. But then these examples, you can't use mathematics as an example, right?) 07 K: um hm 08 T: 咁我就攞其他啲生活啲嘅例子來講，就	Bringing in students' familiar everyday examples into the classroom for scaffolding content learning and increasing students' motivation.	their learning.

40

48 T: +你唉(0.3) 你明㗎啦 　　　　*((tr. you eh (0.3) you understand))* 　　　+T points at S1 49 (0.2) 50 S1: 你估真係 Gordon Ramsay 　　　　*((tr. you think you are Gordan Ramsay))* 51 (0.4) 52 T: +係呀一路係個+鑊度+切 (0.5) +一路喺度炒呀嘛 　　　　*((tr. yes, chopping the food in the wok and frying the food at the same time))* 　　　+T walks to the teacher's desk 　　　　　　+T extends his right arm and locates his RH above the box cover (exercise books on the surface), T's RH fingers are extended, and the palm is flat 　　　　　　　　+T enacts a chopping gesture by moving his RH rapidly, moving up and down repeatedly #15 　　　　　　　　　　+T holds up his fist 　　　　　　　　　　+T enacts a gesture of frying food by moving his fist from right to left rapidly, making a small rotation #16 Image #15	係咁，我，我估佢哋應該生活啲嘅，會好啲嘅，haha，有趣啲囉可能佢哋會覺得，冇咁悶囉 hahaha (English translation: So, I draw on some everyday life examples to facilitate my explanation. So, then I, I think using everyday life examples would be preferable. Haha. The students would probably find it more interesting. It won't be boring. Hahaha.)"

Table 3: Post-video-stimulated-recall-interview (Extract 3)

T justifies that introducing the metaphor of cooking into the classroom allows students to make sense of the mathematical procedures that they have to follow in order to solve the question. T suggests that some students may not know how to describe steps when solving equations. This inspires him to think of a metaphor, which have to be drawn from students' everyday life experience, in order to help students to realise the need to: 1) find the information that are necessary for solving the mathematical problem, 2) utilise the gathered information to form coherent steps in solving a mathematical problem.

It is important to note that T reflects on his struggle in writing essays and he compares such experience with his students' struggle in describing mathematical steps. In fact, T mentions in the pre-interview that he struggles in mastering the skills of English composition because he finds it quite abstract and there are no 'rules' or 'theory' which he can employ as a reference. It is noticeable that in line 6 of the post-interview, T switches the footing by voicing out his own reflection, '哦，原來我做數係咁樣落手嘅 (oh, so when I did mathematics, I followed that approach to describe the mathematical steps)', to explain his realisation regarding the way for describing mathematical steps. Thus, T's prior struggle in mastering English writing skills potentially allows him to better understand his students' needs in having a concrete step-by-step guide to support their learning. Such prior learning experience shapes T's translanguaging practices and affords the opportunity for T to bring the outside knowledge of cooking into the classroom space.

6. Discussion and Conclusion

The principal aim of the present article is to show how translanguaging is used as a resource for bringing relevant out-of-school knowledge into the classroom to support knowledge construction and content learning. Extract 1 reveals how T deploys translanguaging to create a real-life scenario context of playing computer war games in order to assist students in understanding the complex mathematical question. Extract 2 illustrates how T creates real-life scenarios through translanguaging to mirror the actual walking route from the school to the house-estate. By bringing students into everyday life world through translanguaging, it enables students to imagine and experience the specific situation as richly as they would in a multi-sensory environment. In Extract 3, T deploys a variety of registers, multimodal and spatial resources to construct the metaphor of cooking for facilitating his content explanation. T's translanguaging practices are bridging the gap between what students learn in class and their everyday life experience because T employs cooking, which is an everyday life experience, as a metaphor to explain the necessity to construct every mathematical step in order to solve the question.

This paper demonstrates that the teacher creates an integrated translanguaging space (Li, 2011) by including the everyday life space in the EMI institutional learning space in order to transform the classroom into a lived experience. Such translanguaging space does not only allow the teacher to switch between everyday language and academic register (subject-specific terms or expressions) for facilitating meaning-making processes (Lin, 2018). It affords opportunities for the teacher to bring his funds of knowledge to the forefront, including his pedagogical knowledge, linguistic knowledge, cultural and life experiences, in order to make the academic knowledge more relatable and relevant to the students' life experience. It is vital to note that this study does not show any direct evidence that bringing outside knowledge through translanguaging can lead to content and language learning. Nevertheless, it is possible that integrating students' real-life knowledge into the EMI classroom through translanguaging can potentially serve to advance students' understanding of the mathematical concepts and broaden the students' perspective as they recognise the meaning and value of the academic knowledge beyond instructional context. Future research can assess the specific learning outcomes of connecting students' out-of-school knowledge and experience through translanguaging in EMI classrooms.

This study yields several pedagogical implications for developing translanguaging pedagogy in secondary EMI contexts. The study demonstrates that while it is important to construct opportunities in EMI lessons for promoting English acquisition (Lo and Macaro, 2012), teachers can consider integrating students' familiar linguistic, sociocultural and semiotic resources into the learning opportunities. As Lin (2018) and Li (2018) argue, the aim of bilingual education is not to replace students' multiple resources with school-recognised codes. It is necessary for teachers to acknowledge that these resources constitute a holistic repertoire of the student that is constantly expanding for communication. Hence, we suggest that the objective of EMI could be expanded to include enhancing one's communicative repertoire by assisting them to connect their familiar everyday linguistic and cultural knowledge with the target linguistic and cultural knowledge (Li, 2014). By doing so, it potentially develops the students' capacity in making use of the best available resources and knowledge for achieving content learning and meaning-making in the classrooms.

The findings contribute to the current literature on translanguaging and EMI teaching and learning in a number of ways. Methodologically, this study demonstrates how the combination of MCA with an ethnographic approach can shed light on the potential of translanguaging in transforming the EMI institutional space into a lived experience. This study is also one of the few studies which

employs the analytic framework of IPA to illuminate the 'insider' accounts (Smith et al., 2013) of the teacher's interpretation of his/her translanguaging practices in the EMI lessons (Tai and Li, 2020). Second, the findings of this study illuminate that EMI classroom can consist of multiple translanguaging spaces (everyday life space and institutional learning space) where teachers and students engage in multiple meaning-making systems which can create new configurations of language and pedagogical practices (Zhu et al., 2019). Practitioners in culturally and linguistically diverse classrooms will benefit from the findings of this study because of the capacity of translanguaging as a way of scaffolding to enable the teacher to fulfil the pedagogical goals specific to their EMI classroom contexts, to maximise both content and language learning through meaning-making. Third, the findings draw attention to the importance of raising EMI teachers' awareness of the pedagogical philosophies of translanguaging to enrich their repertoires for teaching and professional development. It would be useful for teachers and teacher trainers to understand the concept of translanguaging and its pedagogical implications and find ways to implement translanguaging pedagogies in ways that are appropriate for their own professional contexts.

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Notes on Contributors

Kevin W. H. Tai is Economic and Social Research Council (ESRC) Scholar and Doctoral Candidate in Applied Linguistics in the UCL Centre for Applied Linguistics at the UCL Institute of Education, University College London (UCL). He completed his doctoral coursework in Educational Research at the University of Cambridge, where he was Hughes Hall Hong Kong Alumni Scholar. He holds an MSc degree in Applied Linguistics and Second Language Acquisition from the University of Oxford. Kevin is CELTA-qualified and his research interests include second language teaching and learning, sociocultural theories, classroom discourse, translanguaging practices in multilingual contexts, qualitative research methods and language teacher education. His research has appeared in international peer-reviewed journals such as *Classroom Discourse (2018)*, *Language and Education (2019)*, *Linguistics and Education (2019), Applied Linguistics (2020)* and *System (2020a; 2020b).* <kevin.tai.19@ucl.ac.uk>

Li Wei is Chair of Applied Linguistics and Director of the UCL Centre for Applied Linguistics, UCL Institute of Education, University College London (UCL). He is also Director of the ESRC-funded UCL, Bloomsbury and East London (UBEL) Doctoral Training Partnership. His research covers different aspects of language contact, bilingualism and multilingualism. His publications won the British Association of Applied Linguistics Book Prize twice, in 2009 for *The Blackwell Guide to Research Methods in Bilingualism and Multilingualism* (with Mellisa Moyer), and in 2015 for *Translanguaging: Language, Bilingualism and Education* (with Ofelia Garcia). He is Editor of the *International Journal of Bilingual Education and Bilingualism* and Principal Editor of *Applied Linguistics Review*. Li Wei is also a Fellow of the Academy of Social Sciences (AcSS), UK. <li.wei@ucl.ac.uk>