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Conceptualising multilingual classrooms as a digital gamified translanguaging space: fostering language learning motivation and reducing foreign language anxiety in content and language learning

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ABSTRACT

Research in computer-assisted-language-learning has shown that digital game-based learning can enhance L2 students' motivation, improve students' L2 proficiency, and alleviate L2 anxiety. However, few qualitative studies have conducted fine-grained analyses to examine how teachers strategically integrate online games as pedagogical tools to facilitate learning and sustain students' motivation in content and language learning. Adopting a translanguaging lens, this study investigates empirical data from two distinct multilingual classroom settings: an English-Medium-Instruction Mathematics classroom and a Chinese-as-an-Additional-Language classroom. The paper explores how the creation of a digital gamified translanguaging space in these contexts can foster student motivation and reduce students' anxiety in learning both subject matter and target languages. Methodologically, the study employs Multimodal Conversation Analysis to examine classroom interactions, triangulated with video-stimulated recall interviews with teachers and students that were analysed using Interpretative Phenomenological Analysis. The paper introduces the notion of a digital gamified translanguaging space, emphasising how digital games create opportunities for teachers and students to fully leverage their linguistic repertoires while cultivating an engaging learning environment. It is argued that such a space enables teachers to deliver content and language instruction, promote active participation, sustain students' motivation and alleviate students' anxiety in learning new disciplinary and linguistic knowledge.

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Introduction

Enhancing students' motivation for second language (L2) learning and reducing their foreign language anxiety (FLA) are essential educational objectives for teachers during classroom interactions (Dörnyei 2019; Horwitz, Horwitz, and Cope 1986). Studies in Computer Assisted Language Learning demonstrate that digital game-based learning (DGBL) can boost L2 students' motivation (e.g. Yang and Kuo 2022), increase L2 proficiency (e.g. Jia et al. 2024), and reduce FLA (e.g. Yang et al. 2024a). DGBL involves incorporating game design elements into non-game settings to create

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engaging environments is gaining popularity in education (e.g. Hong et al. 2022). The primary goal is to enhance learning, not just to entertain students (Van Eck 2015). Given the advantages of using digital games for both content and language learning, it is important for teachers to explore how DGBL can be strategically integrated into classroom interactions to understand its impact on language use and instruction.

Many studies investigating DGBL primarily use quantitative methods, especially quasi-experimental designs, to assess its benefits in improving students' L2 proficiency, increasing their language learning motivation (LLM), and reducing their FLA through data gathered from perception questionnaires and learning tests (e.g. Hung et al. 2018; Yang et al. 2024a). Yet, a relatively smaller number of studies employ qualitative methods to explore the impact of DGBL on students' L2 learning processes. These qualitative studies usually involve descriptive analyses of students' interview responses about their gaming experiences and basic discourse analyses of computer-mediated communication during gameplay (e.g. Peterson 2012). Therefore, exploring the pedagogical strategies that teachers use to implement DGBL in classroom interactions is a crucial initial step in understanding how teachers utilise diverse multilingual, multimodal and technological resources to transcend the monolingual education policies often present in multilingual settings like L2 classrooms. This approach can facilitate students' content and language learning, enhance their motivation, and reduce their learning anxiety (Tai and Lee 2024).

This study employs translanguaging as an analytical lens to address the research gaps by examining empirical data from two distinct classrooms where L2 is used as the medium-of-instruction, an English-Medium-Instruction (EMI) Mathematics classroom and a Chinese-as-an-Additional-Language (CAL) classroom. Multimodal Conversation Analysis (CA) is applied to investigate classroom interaction data, complemented by video-stimulated-recall-interviews analysed through Interpretative Phenomenological Analysis (IPA). The study aims to provide a detailed analysis illustrating how teachers' use of digital games fosters the creation of a *digital-gamified translanguaging space*', transforming the classroom space into a gameful environment that boosts students' motivation and reduces anxiety in learning content and linguistic knowledge.

Foreign language anxiety

FLA, a type of situation-specific anxiety that is a context-dependent reaction arising in particular interactional situations, is defined as a unique blend of self-perceptions, beliefs, feelings, and behaviours related to learning a language in a classroom setting, stemming from the distinctive nature of the language learning process (Horwitz, Horwitz, and Cope 1986). It tends to be a significant psychological barrier that hinders students' L2 learning due to its potential adverse impacts on students' emotional wellbeing. For instance, students may feel embarrassed thus potentially undermine their confidence (e.g. Dovchin 2021), feel constrained or less capable when using the L2, and have a poor self-assessment of their linguistic and academic abilities (Gundarina and Simpson 2022). Consequently, L2 students may withdraw from communicating in L2 or lack motivation to engage in L2. Since FLA is recognised as a key emotional factor affecting L2 learning, it is important for teachers to develop teaching strategies that reduce students' FLA during classroom instruction (Dewaele 2007).

FLA research often employs quantitative or mixed-method approaches, primarily using questionnaires to gather quantitative data like students' anxiety level and interviews for qualitative enquiries like exploring students' perspectives. Bekleyen (2009), for example, conducts a mixed-method study to investigate first-year undergraduates enrolled in an English-Language-Teaching programme at a university in south-eastern Turkey. The study employs questionnaires, such as the Foreign Language Classroom Anxiety Scale (FLCAS), to provide measurable insights into the students' anxiety levels, complemented by semi-structured interviews to explore the students' perceived causes, effects, and coping strategies. Wang, Xu, and Lin (2025) similarly combine a modified FLCAS with semi-structured interviews to identify sources of anxiety of EFL learners in British

literature classrooms at a university in Mainland China. In Resnik and Dewaele's (2020) mixed-method study, they employ questionnaires to examine students' anxiety level in both first and foreign language classes and gather qualitative data through two open-ended questions at the end of the questionnaires. While the open-ended questions enable researchers to yield some qualitative insights to supplement the quantitative findings, they acknowledge that it may limit the depth of our understanding of the complex and dynamic nature of language use.

Collectively, despite these studies have demonstrated that mixed-method could offer valuable insights by capturing students' anxiety level and revealing individual perspectives on FLA, identifying clear links between types of FLA and individual and contextual factors could be challenging, as each student's learning experience is unique. Additionally, the generalizability of questionnaire results to other contexts is questionable, as questionnaires may not fully capture the intricacies of learners' backgrounds or the accuracy of their responses. Qualitative approaches, though less prevalent, have the potential to reveal FLA as a dynamic social phenomenon, rather than a fixed trait, by observing students' behaviours and offer deeper insights into students' sociocultural experiences linked to FLA (Dryden, Tankosić, and Dovchin 2021; Tai and Wang 2024). To advance our understanding towards FLA, researchers are encouraged to extend beyond the use of semi-structured interviews and conduct fine-grained interactional analysis through collecting classroom observational data to fully capture the intricacies and the dynamic nature of FLA. Notably, Tai (2025a) recently uses fine-grained CA to demonstrate that fostering a supportive translanguaging environment in CAL classrooms can help alleviate L2 students' anxiety, making them feel more secure and confident when engaging with learning Chinese.

Language learning motivation

Motivation research has a rich history in Applied Linguistics and has been conceptualised through various frameworks over the years (e.g. Deci and Ryan 2002; Dörnyei and Ryan 2015), with Deci and Ryan's Self-Determination Theory (SDT) being notably influential. SDT posits that individuals possess the capacity to self-regulate their behaviour and engage in intellectual growth alongside others, categorising motivation into extrinsic and intrinsic types (Deci and Ryan 2002). Extrinsic motivation pertains to the practical advantages of achieving proficiency in an L2, such as career opportunities, higher salaries, and immigration (Csizér and Dörnyei 2005). Conversely, intrinsic motivation arises from internal satisfaction, such as feelings of competence and self-determination. Intrinsically motivated individuals might engage in activities for its inherent enjoyment, interest, and challenge, rather than external rewards like money or recognition. SDT has been utilised to understand the dynamics of student motivation in English L2 learning, and in content subjects taught in English (e.g. Kojima and Yashima 2017), highlighting its value for examining students' LLM. Additionally, the relationship between self-determined motivation and anxiety has been explored by scholars. Alamer and Almulhim (2021), for example, employ a mixed-method approach to investigate such a relationship among EFL students at a university at Saudi Arabia. They employ questionnaires to gather both quantitative and qualitative data, which include Likert-scale items that assess the students' Basic Psychological Needs, SDT-based motivational orientations, and overall language anxiety, as well as open-ended questions that permit students to elaborate on their language anxiety experience. While they argue motivation influences anxiety, the authors call for more research to unpack this dynamic interplay, suggesting qualitative approaches for deeper insight into the complexity of students' FLA and LLM.

Recent research has further highlighted the importance of situational factors, such as teachers, classroom environment and activities, in shaping learners' motivation (Ushioda 2009). This view challenges earlier perceptions of LLM as an individualised, cognitive, and static concept, instead considering it a dynamic construct arising from the interaction between L2 learners and their changing environments. Lamb (2004) offers a critical perspective on LLM research related to 'integrativeness',' the motivation to learn a language for integration into the target language community.

Using questionnaires, interviews, and classroom observations with Indonesian junior high school English learners, he suggests their motivation is shaped by a desire for bicultural identity – as both global and local Indonesians. He also argues that their motivation may shift as their self-perceptions evolve during early adolescence. On the other hand, Preston (2009) explores how LLM is created collaboratively during real-time classroom interactions. The study focuses on what happens during actual classroom exchanges, using CA to examine various interactional practices, particularly hand-raising, to understand how L2 motivation unfolds over time. The results show that L2 motivation develops as students interact with the learning tasks, and that these tasks encourage students to display their motivational states in social ways. These social displays, in turn, contribute to the development of L2 motivation among students. Similarly, Tai (2025b) introduces a revised framework of the L2 Motivational Self-System (L2MSS) for studying translanguaging and LLM. This framework incorporates analysis at the micro, meso, and macro levels to explore how constructing a translanguaging space in EMI classrooms can shape students' translanguaging learning experiences, support their LLM, and ease their transition from learning content subjects in their L1 to an EMI setting. The study highlights the need to consider the interplay of factors across these levels to fully understand students' translanguaging learning experiences and their impact on LLM, arguing that LLM is dynamic and co-constructed through interactions with micro-level student experiences, meso-level institutional influences, and macro-level sociocultural contexts.

Digital game-based learning

DGBL, which involves mobilising digital games for learning, is widely recognised as a leading teaching method for boosting students' motivation and engagement in L2 learning (Millis et al. 2017). DGBL can make learning activities more pleasurable and create a relaxed classroom atmosphere (Hong, Saab, and Admiraal 2025), which in turn encourages students to express their feelings, emotions, and perspectives (e.g. Peterson 2012). It is important to distinguish between Gamification and DGBL, as these terms, though sometimes used interchangeably, refer to different methods of incorporating gaming into education. Gamification involves introducing game-like features – such as point systems, competition, and leader-boards – into non-game settings like classrooms to encourage desired behaviours and increase student motivation and participation (Pastushenkov, Pavlenko, and Clancy 2025). In contrast, DGBL uses actual educational games, such as Kahoot!, that are intentionally developed for learning purposes. In DGBL, the learning experience is built around the game itself, rather than simply adding game elements to an existing educational activity (Tsao 2024).

A growing body of research highlights the motivational benefits of DGBL (e.g. Hung et al. 2018; Li 2021; Yang and Kuo 2022). Yang and Kuo's (2022) quasi-experimental study discovers that primary school students' prior knowledge and gaming experience significantly affect their L2 reading motivation, gaming motivation, and perceptions of the gaming experience. Similarly, Hong et al. (2017) reveal that intrinsic motivation predicted online learning self-efficacy in a Chinese radical learning game using pre- and post-test results alongside questionnaire data collected from ethnic minority students in Taiwan. They recommend L2 Chinese teachers can use digital games to improve students' recognition of Chinese radicals. Likewise, Li's (2021) quasi-experiment results demonstrate that game-based vocabulary learning not only improved Chinese L2 English students' vocabulary acquisition but also boosted their motivation and self-confidence. These empirical studies collectively underscore the pedagogical benefits of DGBL in promoting motivation in L2 learning across diverse learners' populations and teaching contexts.

DGBL has also been shown to reduce learners' FLA. Reinders and Wattana (2015), for instance, discovered that gameplay could reduce learners' anxiety, making them more open to making and learning from mistakes. Yang et al. (2024a) recently explored the impacts on learners' FLA and vocabulary learning when an online simulation game is integrated into face-to-face primary L2 English instruction. The pre- and post-test results, along with questionnaire data, suggest that the online game effectively reduced students with low, moderate, and high FLA levels, thus

facilitating L2 English vocabulary learning. However, the relationship between DGBL and FLA is not consistently positive. Yang et al. (2020) employed a quasi-experimental design to assess the impact of online games on learners' vocabulary learning, motivation, and anxiety in a high school L2 English course. In the experimental group, they observed that while online games improved L2 vocabulary learning, particularly among low-achieving learners, they did not enhance motivational levels and, instead, increased English anxiety. These mixed findings suggest that DGBL alone may not be sufficient to reduce FLA, necessitating further research to explore the intricate interplay between DGBL, different learning contexts, and learners' needs.

Despite the promising findings, Hung et al.'s (2018) scoping review highlights that most DGBL studies use mixed-methods approaches, predominantly centring on quantitative methods, particularly quasi-experimental designs to assess the educational benefits of digital games. While questionnaires and pre- and post-tests, commonly used methods, offer valuable insights into students' L2 learning outcomes and their perceptions of using digital games for language learning (e.g. Yang et al. 2020), they appear to overlook the micro-details of classroom discourse when teachers use DGBL in real-time classrooms. To endorse this under-explored area, this study investigates how teachers in CAL and EMI settings use translanguaging, leveraging diverse multilingual, multimodal, and technological resources, to facilitate DGBL implementation in ways that foster learners' L2 learning motivation and reduce their FLA.

Translanguaging as a theory of language

'Translanguaging', introduced by Williams (1994), originally describes a teaching method that involves switching between different languages for input and output in bilingual classrooms. Li (2018) expands the concept as a means of constructing knowledge that goes beyond different linguistic structures and systems, encompassing not only various languages and dialects but also styles, registers, and other variations in language use, as well as different modalities such as switching between speaking and writing or coordinating gestures, body movements, facial expressions, and visual images. In essence, translanguaging seeks to transcend the boundaries of named languages and challenge traditional configurations, categories, and power structures, thereby levelling language hierarchies in classrooms. By doing so, it creates a 'translanguaging space' (Li 2018) for meaning-making and social justice. Methodologically, using translanguaging as an analytical lens enables researchers to move beyond structural analysis of identifying frequent and regular linguistic patterns to how language users recognise or comment on the use of various linguistic, multimodal, and multi-semiotic resources at particular moments and what might have prompted a specific action during the interaction (Li 2018).

Recent research in Applied Linguistics emphasises the importance of translanguaging as an inclusive pedagogical resource to create a technology-mediated learning environment in multilingual classrooms. Tai's (2023a) comparative study, which investigates how various resources are employed in moments when the teacher creates a technology-mediated translanguaging space through the affordance of a mobile device (iPad) and moments that are not due to technical failure in an EMI mathematics classroom, reveals that the multilingual and multimodal resources utilised in the technology-mediated translanguaging space for facilitating students' mathematics learning transcend the boundaries of modes as they are re-enacted in a new interactional context where the use of technological devices is not an option. In an online L2 Chinese learning context, Ho and Li (2019) examine learners' learning process using translanguaging as an analytical perspective. They demonstrated how the learners connect their present L2 learning with past knowledge and experiences and mobilise different multilingual and multimodal resources to make sense of the Chinese characters. Furthermore, Ho (2022) illustrates how four bilingual undergraduates at a HK university create a translanguaging space in their authored instructional video through blending their in-school academic and out-of-school popular media (YouTube) experiences, thereby transcending socio-historically defined registers, genre norms and conventions, and the distinction between

knowledge 'inside' and 'outside' of the classroom. These studies collectively highlight the important role of their full multilingual, multimodal, and multisensory repertoires in L2 learning, and how classroom participants create technology-mediated translanguaging space by using their full repertoire for meaning-making. However, the agentive role of the teacher in deliberately designing such translanguaging spaces through DGBL remains a significant gap in the literature. DGBL is a crucial area for investigation because its core affordances – such as fostering trial-and-error, enabling anonymous participation, and generating real-time multimodal feedback – provide teachers with a unique and structured means to operationalise translanguaging pedagogy. Addressing this gap, this study aims to investigate how a digital gamified translanguaging space leverages game mechanics to reframe mistakes, reduce FLA, and enhance LLM, thereby creating a more equitable and engaging learning environment.

Methodology

The study aims to address the following research question:

(1) How do teachers use translanguaging to facilitate DGBL implementation in ways that foster students' L2 learning motivation and reduce their FLA in multilingual classrooms?

The study utilises data from two broader projects focused on translanguaging practices in HK's educational settings, EMI secondary classrooms and CAL classrooms for ethnic minority students. The first project investigates how establishing a translanguaging space in EMI classrooms supports Year 7 students' LLM and eases their transition from Chinese-Medium-Instruction (CMI) primary education to a new EMI secondary environment. It addresses a research gap concerning the insufficient support for students transitioning from their first language (L1) instruction to EMI, and the underexplored impact this transition has on their LLM. The second project examines how CAL teachers use translanguaging to reduce anxiety among ethnic minority students related to CAL learning. It addresses previous research that highlights the linguistic challenges these students encounter in learning CAL, which can cause anxiety and impede their integration into the HK society.

Participating schools

School A is a HK EMI secondary school that provides education from Year 7 to Year 12, following the HK Education Bureau's curriculum guidelines. Most classes and examinations are conducted in English, except for subjects like Chinese Language and Putonghua. With the principal's approval, ethnographic research was conducted at the school to explore Year 7 students' transition from CMI primary schools to an EMI secondary school. Although the school's official language policy advocates a monolingual EMI approach, requiring English to be used exclusively during EMI lessons, a more adaptable policy is practised, entailing that teachers and students in EMI classes could use Cantonese when needed, especially in Year 7 classrooms, to ensure all students thoroughly understand the subject material.

School B predominantly caters to South Asian students, comprising around 80% of its student body. This school was selected due to its strong reputation, frequently highlighted in the news, for delivering high-quality CAL education to ethnic minority students. With the principal's approval, the first author conducted ethnographic research at the school to explore interactions within CAL classrooms. The school uses EMI for teaching content subjects, except for Chinese Language.

Participating teachers

Teacher A (TA), the EMI teacher at School A, has one year of experience teaching mathematics in L2 English. She is a native Cantonese speaker proficient in English and Putonghua. She completed

her secondary education at an EMI school and holds a bachelor's degree in Business Administration and Accounting from a HK EMI university. She showed a keen interest in 'translanguaging' and its potential to boost her students' motivation in learning both mathematics and L2 English. Enthusiastic about exploring this further, she readily agreed to participate in the study when the first author suggested it.

Teacher B (TB), the CAL teacher at School B, has two years of experience teaching CAL to ethnic minority students. She is a native Cantonese speaker and fluent in English and Putonghua. She attended an EMI secondary school and holds an undergraduate degree in Chinese Language and Literature with a minor in Japanese from a university in HK. The teacher has not undergone specialised training in using L2 English or other languages for teaching L2 Chinese to ethnic minority students.

Participating students at school A

During a three-month classroom observation at School A, we observed a year 7 class with 34 students. All students had completed at least six years of primary education in Cantonese, their L1. To evaluate their motivation levels for learning L2 English, a questionnaire was distributed. The questionnaire adapted scales from previous research, particularly Hennebry and Gao (2021), Taguchi, Magid, and Papi (2009), Lamb (2012), and Papi and Teimouri (2014), to assess ideal L2 self, ought-to L2 self, and L2 learning experiences in an EMI context. The Cronbach's alpha for the scales ranged from 0.80 to 0.91, indicating a high internal consistency reliability (see Table 1).

The questionnaire contained 17 items rated on a 5-point Likert scale, designed to allow detailed analysis while minimising participant fatigue (Dörnyei 2007). It was administered to Year 7 students at two phases: before and after the lesson observations, to assess their L2 motivational levels. Students were categorised into high, moderate, and low motivational levels based on their scores, using the 25th, 50th, and 75th percentiles as cut-off points. Students with consistent anxiety levels, as indicated by their aggregate scores, were invited to participate in video-stimulated-recall-interviews.

Participating students at school B

A Year 7 CAL class at School B was observed over a semester, comprising 17 thirteen-year-old students of various nationalities: five Nepalese, six Indians, one Russian, three Filipino, and two Chinese. All students had completed at least six years of EMI primary education. Many of the ethnic minority students had either grown up in HK or moved to HK at a young age and were able to speak or understand Cantonese. Three students were born in India, three in the Philippines, one in Russia, and one in Nepal. The remaining nine students were born in HK.

To understand the role of anxiety in CAL learning, a questionnaire, adapted from Botes et al.'s (2022) Short-Form Foreign Language Classroom Anxiety Scale (S-FLCAS), was administered to the students at three phases: after 2nd, 4th, and 6th months. It contains eight items, each using a 5-point Likert scale, to assess the anxiety L2 students experienced during classroom interactions. The adapted S-FLCAS showed good internal consistency reliability in the current sample (Cronbach's alpha = 0.89). Students who consistently showed high, moderate, and low levels of FLA at all three intervals were invited to participate in individual semi-structured interviews and video-stimulated-recall-interviews.

Table 1. Reliability scores for the questionnaire scales.

Construct	Number of items	Reliability (Cronbach's alpha)
Ideal L2 Self	5	0.82
Ought-to L2 Self	5	0.80
L2 Learning Experience in EMI Context	7	0.91

Digital game: Kahoot!

In both EMI and CAL classes, the teachers utilised Kahoot! as their primary digital game for instruction. Kahoot! is an interactive online platform accessible via digital devices like tablets and PCs. This allows teachers to create engaging gamified quizzes to support teaching, such as introducing or reviewing concepts and assessing students' knowledge acquisition (Graham 2015; Hong et al. 2022; Pastushenkov, Pavlenko, and Clancy 2025). During Kahoot! sessions, students should select answers within a set time limit, with immediate feedback provided through displaying students' scores and rankings.

Data collection

Before gathering classroom interaction data, semi-structured interviews were conducted with TA and TB to collect information about their professional backgrounds, language abilities, views on effective teaching methods, and attitudes towards incorporating multiple languages in classroom instruction.

Furthermore, each teacher participated in a one-hour individual professional development session where the researcher introduced the concept of translanguaging, supported by empirical studies. The session aims to encourage the use of multilingual and multimodal resources to support both L2 and content learning, rather than strictly following a monolingual policy. During the latter part of the session, the researcher and teachers explored potential ways to integrate translanguaging practices into classroom teaching. The teachers were reminded that the session was intended to provide pedagogical ideas, and it was their responsibility to adapt their teaching methods to meet students' needs and learning environment.

Classroom interaction data were gathered through observations and video-recordings of ten one-hour EMI mathematics lessons taught by TA and twelve one-hour CAL lessons taught by TB. To further explore their pedagogical practices, each teacher participated in a one-hour video-stimulated-recall-interview. Before the interviews, video clips showcasing notable aspects of the teachers' translanguaging practices were selected as stimuli. The teachers watched the clips and reflected on their pedagogical practices during specific lesson moments. This approach aimed to show how institutional and socio-cultural factors influence their pedagogical practices (Tai 2023b).

A one-hour video-stimulated-recall focus group interview was conducted with selected students from Schools A and B to gather their insights on the effectiveness of their teachers' translanguaging practices in enhancing content learning and motivation for L2 English. At School A, students were selected based on the LLM questionnaire results, with three students from high, moderate, and low motivational levels. Meanwhile, at School B, the selection was based on S-FLCAS results, inviting three students from high, moderate, and low anxiety levels. During the interview, students watched the same video clips presented to their teachers and openly discussed their experiences with translanguaging, focusing on how it supported LLM in the EMI mathematics classroom (students at School A) and helped reduce anxiety about learning CAL (students at School B).

Four students from School A were recruited for the interview based on ethical considerations and their availability. Students 1 and 4 exhibited low LLM, Student 2 demonstrated high LLM, and Student 5 displayed moderate LLM. At School B, three students were invited to the interview. Student 2, born in the Philippines, displayed low anxiety and primarily spoke Tagalog and English at home. Student 3, born in HK with Nepalese heritage, exhibited moderate anxiety and primarily spoke English and Nepali at home. Student 4, born in Russia, also demonstrated moderate anxiety and primarily spoke Russian at home.

Integrating multimodal conversation analysis with interpretative phenomenological analysis

Multimodal CA is utilised to examine the classroom interaction data, an emic/participant-relevant perspective to explore how social order is collaboratively constructed through a detailed

examination of social interactions. CA requires researchers to refrain from preconceiving the relevance and importance of language usage, and the analysis emphasises sequences rather than individual turns/utterances (Hutchby and Wooffitt 1998). The translanguaging instances identified are not predetermined; instead, they emerge from a thorough examination of the classroom corpus. The multimodal CA transcriptions encompass both verbal interactions in Cantonese and English, and multimodal actions, and they are transcribed using Jefferson's (2004) and Mondada's (2018) conventions. Screenshots from the video-recordings are included to highlight multimodal interactions during EMI and CAL lessons.

IPA is employed to examine the video-stimulated-recall-interview data and to complement the CA analysis (Tai 2023b). The authors conducted the IPA analysis collaboratively, following the analytical stages outlined by Smith, Flowers, and Larkin (2013), progressing from a descriptive level to a more interpretative level. To enhance interpretative validity, we utilised iterative coding with constant comparison, wherein the researchers continually verify their interpretations against the actual statements made by the participants in the interviews. The IPA analysis is organised in a three-column table to assist readers in understanding how the researchers interpret the participants' reflections. The first/left column contains the interview transcripts. The second/middle column presents the participants' perspectives on pedagogical practices. The third/right column offers the researchers' interpretations of these perspectives, aligning with IPA's interpretative process.

Analysis

In this section, we present two classroom extracts. Extract 1 showcases an EMI mathematics teacher using Kahoot! to engage students in learning new mathematical terms: 'ascending' and 'descending'. Extract 2 features a CAL teacher using Kahoot! to have students choose the most suitable Chinese vocabulary item corresponding to an English translation. These extracts typify the interactions in these settings and illustrate common translanguaging practices in EMI and CAL classrooms using digital games (ten Have 1990).

Extract 1: creating a digital gamified translanguaging space for facilitating students' mathematical learning and LLM in the EMI classroom

Prior to Extract 1, TA was explaining the meanings of the key mathematical terms 'ascending' and 'descending', and students were taught to understand how these terms apply to ordering numbers based on certain criteria, such as powers of a variable. This extract demonstrates that the students are actively engaged in the Kahoot! game in which they are invited to arrange $6xy^2 - x^2 + 7y$ in ascending powers of x.

04 +(1.1)
+TA turns her head slightly to her RHS and gazes at the smartboard---> Figure #2

Figure #2

05 S?: 加油呀::
((tr. you got this))
06 (0.7)+
--->+
07 S?: +°我認為應該係呢個[掛]°
((tr. I believe this should be the one))
+TA turns her head slightly to her LHS and gazes downwards to the teacher's table---> Figure #3

Figure #3

08 S?: [想清楚]
((tr. think carefully))
09 (.)
10 S?: 我估啦:錯咪再[揀過個囉]
((tr. I am having a guess, if it is wrong, we choose it again))
11 S?: [非常好啊]+=
((tr. very good))
--->+

12 S?: =+係囉錯咪錯囉
((tr. yes, let it be if it is wrong))
+TA gazes at the students with her jaw drops---> Figure #4

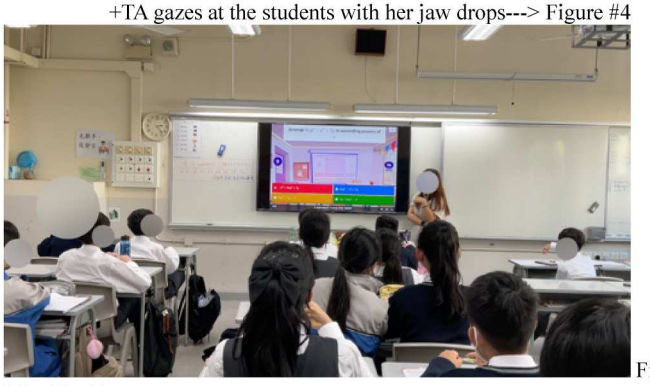

Figure #4

13 (0.4)+
--->+

14 S?: +錯就[錯啦]
((tr. if it's wrong, it's wrong anyway))
+TA turns her head slightly to her RHS and gazes at the smartboard---> Figure #5

Figure #5

15 S?: [答啱]**xx**
((tr. answered correctly))
16 (1.4)
17 S?: 應:該:係咁啦::+
((tr. I think this should be the way))
--->+
18 +(4.0)+Δ
+TA turns her head slightly to her LHS and gazes downwards to the teacher's table---> Figure #6
--->+
ΔThe Kahoot! results appear on the smartboard---> Figure #7

Figure #6


Figure #7

19 S?: +[wu::Δ:::::::]
+TA turns her head to her RHS and gazes at the smartboard---> Figure #8
--->Δ

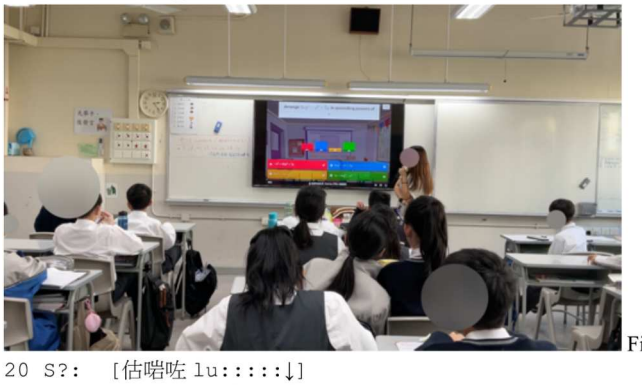
Figure #8

20 S?: [估啱咗 lu:::::↓]
((tr. I guessed it right))
21 (.)
22 S?: 吓?:::錯咗嘅?↑=
((tr. what? why is it wrong?))
23 S?: =又係哩::個人上面嘅↑
((tr. why is it again above this person?))
24 (0.5)
25 TA: <哎:呀↓>
((tr. oops))
26 (.)
27 TA: Δsorry ah:↓
ΔTA raises her RH and places her right palm underneath the question displayed on the smartboard---> Figure #9


Figure #9

28 (.)
29 TA: <this one 應該係我>錯咗:
((tr. this one should be my mistake))
30 (.)
31 TA: he:he::Δ
--->Δ

32 Δ(.)
ΔTA places her right palm on top of her head---> Figure #10

Figure #10

33 S?: 吓:::?↑Δ
((tr. what?))
--->Δ
34 Δ(.)
ΔTA extends her RH and places her right palm underneath the question displayed on the smartboard---> Figure #11

Figure #11

35 S?: huh huh huh
((S? is laughing.))
36 (0.2)
37 S?: w**hh**ah
38 (0.2)
39 S?: ° 唔係應該係 °Δ=
((tr. doesn't it should be))
--->Δ

40 TA: =Δ佢呢度應該係Δ Δ[descending]啊, 我錯↓
((tr. it should be descending here, my mistake))
ΔTA continues extending her RH and extends her right index finger to point at the word "ascending" in the question displayed on the smartboard---> Figure #12
--->Δ
ΔTA continues extending her RH and places her right palm underneath the word "ascending" in the question displayed on the smartboard---> Figure #13

Figure #12

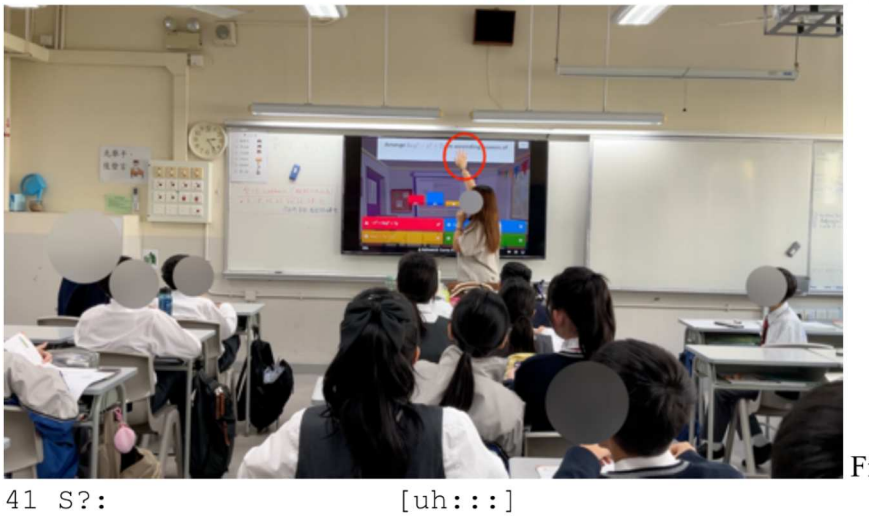

Figure #13

41 S?: [uh:::]
42 (.)Δ
--->Δ

43 TA: Δ哩個我錯↓
((tr. this is my mistake))
ΔTA uses her right palm to tap her head softly and continuously---> Figure #14

Figure #14

44 (0.5) Δ
--->Δ

45 S?: oh::: no:::+
--->+

46 +(0.4)
+TA turns her head and body slightly to her LHS and gazes at the students--->

47 TA: Δ>sor[ry]↓<
ΔTA bows at the students who are seated in the centre of the classroom---> Figure #15

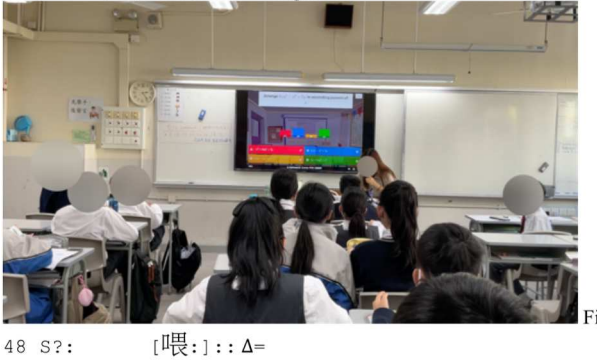

Figure #15

48 S?: [喂:]::Δ=
((tr. hey))
--->Δ

49 TA: =Δ>為此感到深表地抱[歉]↓<
((tr. I sincerely apologise for this))
ΔTA bows at the students who are seated on her LHS---> Figure #16

Figure #16

50 S?: [oh no] ahΔ Δso sad ah
--->Δ
ΔTA bows at the students who are seated on her RHS---> Figure #17

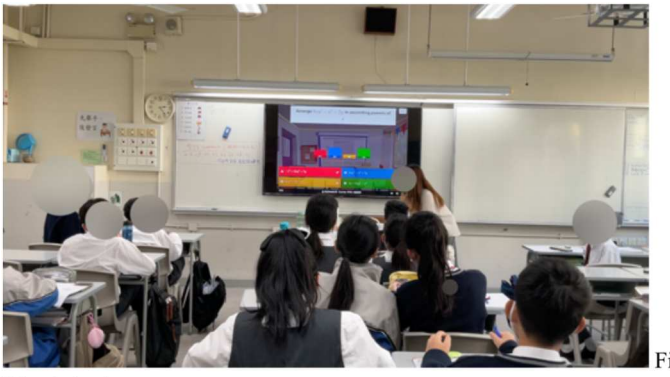
Figure #17

51 (.)+Δ
--->+
--->Δ

52 TA: +Δokay↓
+TA turns her head to her RHS and gazes at the smartboard--->
ΔTA extends her RH to the smartboard and uses her
right index finger to point at the word "ascending"
in the question displayed on the smartboard---> Figure #18


Figure #18

53 (.)

54 TA: ascending↓ΔΔwhat is+ +ascending ah:?
--->Δ
ΔTA places her right palm underneath the word "ascending"
in the question displayed on the smartboard---> Figure #19
--->+
+TA turns her head slightly to her LHS and
gazes downwards to the teacher's desk--->


Figure #19

55 (0.3)

56 S?: °向上[升]°
((tr. moving upwards))
57 S?: [大::]至大::+
((tr. from big to big))
--->+
58 +(0.4)
+TA turns her head to her RHS and gazes at the smartboard--->
59 TA: 咩::+ +呀:::?↑
((tr. what did you say?))
((TA articulates with a shocking voice.))
--->+
+TA turns her head slightly to her LHS and gazes at the students---> Figure #20

Figure #20

60 (.)
61 S?: >大至[細:]<
((tr. large to small))
62 S?: <[細:]至+ +[大::::::]>
((tr. small to large))
--->+
+TA turns her head slightly to her RHS and gazes at the students who are seated on her RHS---> Figure #21

Figure #21

63 TA: [細]至大::::::::, Δ Δ<係::喇::↓>Δ
((tr. small to large, yes))
--->Δ
ΔTA snaps her right index finger and right middle finger--->
--->Δ

64 (0.4)+
--->+

65 TA: +<細::至大::::: 呀::::↓>
((tr. small to large))
+TA turns her head slightly to her RHS and gazes at the smartboard---> Figure #22

Figure #22

66 (.)

67 TA: Δ<咁所以喇↓>
((tr. so therefore))
ΔTA extends her RH to the smartboard with her right middle finger, ring finger and little finger touching the green box displayed on the smartboard---> Figure #23

Figure #23

68 (0.4)Δ
--->Δ

69 TA: Δsh::
ΔTA extends her RH upwards and taps her right palm once underneath the word “ascending” in the question displayed on the smartboard---> Figure #24

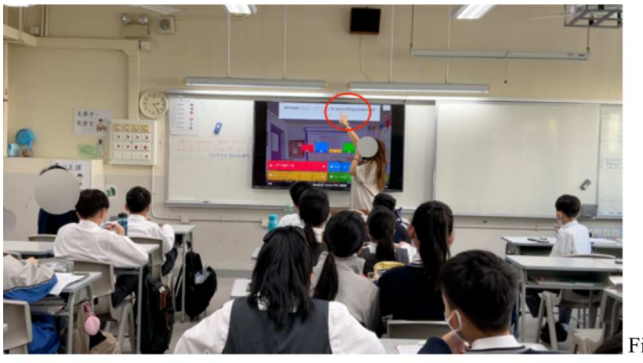
Figure #24

70 (0.3)Δ
--->Δ
71 TA: 細至大:::↓
((tr. small to large))
72 (0.2)
73 TA: Δascending↓
ΔTA extends her RH and places her right palm underneath the word "ascending" in the question displayed on the smartboard---> Figure #25


Figure #25

74 (0.2)

In the given timeframe for answering the question, students engage in conversation amongst themselves. One student encourages others by saying '加油呀' (you got this) using L1 Cantonese (line 5). Another student, uncertain about the choice, guesses the answer (line 7), while a peer advises him to '想清楚' (think carefully) (line 8). Interestingly, the Kahoot! game creates a safe and enjoyable environment where students feel free to try and fail fearlessly, as demonstrated by a student who states that if they get it wrong, they can choose again (line 10), and another student echoes this view (line 11). Two more students agree (lines 12–13) and express acceptance of mistakes, as indicated by '錯就錯啦' (if the answer is wrong, it is simply wrong). Simultaneously, TA is surprised by the students' remarks, as evidenced by her jaw-dropped expression.

As the time for answering the Kahoot! question concludes (lines 18–19), the answer page appears on the smartboard (Figure #7). One student expresses excitement (line 19), while another celebrates his correct guess (line 20). However, a student is surprised by his incorrect answer, loudly exclaiming '吓' (what) with elongated sounds (line 22). TA realises her mistake (line 25), promptly apologises to the students (line 27), and admits her mistake explicitly (line 29). The students' reactions show their shock at TA's mistake (lines 33, 35, 37). TA then uses a pointing gesture to indicate where the mistake occurred (line 40) and sincerely apologises, demonstrated through both her words and her physical gesture of bowing to the students (lines 47–51).

TA then transitions to explaining the answer to the question, as indicated by TA's loud utterance of 'okay' while extending her hand towards the smartboard, pointing at the word 'ascending' displayed there. She then poses a question to assess the students' understanding of the concept of 'ascending' (line 54). One student answers '向上升' (moving upwards) (line 56), and another offers '大至大' (big to big) (line 57). TA appears surprised by these responses (line 59). In line 61, a student softly and quickly answers incorrectly with '大至細' (big to small), but another student immediately corrects this by slowly saying '細至大' (small to large), notably elongating the sound of the word '大' (big) (line 62). TA acknowledges the correct answer by repeating it three times in Cantonese, each time with prolonged sounds (lines 63, 65, 71). TA reinforces the meaning of 'ascending' using gestures to stress that it means moving from small to large numbers (line 73).

The analysis underscores TA and students' use of translanguaging practices in the EMI classroom, where both L1 Cantonese and L2 English are employed to deepen students' understanding of the new mathematical term 'ascending'. Peer collaboration is prominent, with students using L1 Cantonese to offer emotional support like '加油啊' (you got this) (line 5), and friendly reminders like '想清楚' (think carefully) (line 8). TA plays a vital role by fluidly altering both languages to clarify and emphasise key terms, ensuring all students follow the explanation. The extract shows that students are not concerned about making mistakes or choosing incorrect answers; instead, they embrace errors as learning opportunities. This digital gamified translanguaging space, mediated by Kahoot!, encourages student participation and potentially fosters students' LLM when learning new L2 English mathematical terms. During the video-stimulated-recall-interview (Table 2), the representative students comment on the role of Kahoot! in facilitating the creation of a joyous translanguaging space in the classroom:

Students in the interview consistently associate Kahoot! with heightened engagement in mathematical learning. S4 notes that the tool shifts classroom dynamics from passive listening to active participation, with students 'more focused' and even 'standing up' during sessions. This echoes S1's observation that Kahoot! transforms the classroom atmosphere into a 'game-like' environment, reducing fatigue associated with traditional lecture-based teaching. By framing mathematical problems as interactive challenges, Kahoot! fosters intrinsic motivation – students engage not just to complete tasks but to 'win' or participate in a dynamic activity. S5 further emphasises that the tool appeals to teenagers' affinity for digital gaming culture, leveraging their familiarity with electronic devices to sustain attention on mathematical content.

It can be argued that for students transitioning from CMI primary schools to EMI secondary education, Kahoot! serves as a low-stakes platform to acquire and practice English mathematical terms. S1 and S4 indirectly highlight how the gamified format fosters their motivation in learning mathematical knowledge and new L2 English mathematical terms. This suggests that Kahoot! mitigates the cognitive load of learning both mathematics and L2 English academic vocabulary simultaneously, as the game format distracts from the perceived difficulty of EMI instruction.

During the video-stimulated-recall-interview with TA, TA is invited to comment on the affordances that the Kahoot! provides in terms of supporting students' motivation for learning new L2 mathematical terms (Table 3):

TA's use of Kahoot! to motivate students' learning of L2 English mathematical terms, like ascending and descending, reflects a deliberate pedagogical strategy that merges exam preparation, DGBL, and contextualised language practice. By designing Kahoot! quizzes in a multiple-choice format mirroring exam requirements, TA aligns classroom activities with high-stakes assessment structures, normalising the use of L2 English terminology in a low-pressure environment. Kahoot!'s interactive and competitive nature further promotes students' LLM and engagement, as real-time feedback and rankings create urgency to self-correct misunderstandings immediately. The CA analysis shows that TA leverages bilingual scaffolding by presenting questions in both Chinese ('小至大' for ascending) and English during the classroom interaction, helping students map familiar L1 concepts to L2 terminology. This contextualised repetition solidifies retention, as students repeatedly engage with terms like ascending/descending to numerical ordering tasks, transforming

Table 2. Video-stimulated-recall-interview with students (Extract 1).

Video-stimulated-recall-interview excerpts	Students' perspectives	Analyst's interpretations of students' perspectives
01 R: 咁你見到啦，呢條片入邊TA就用咗Kahoot! 啦，去，去想，教你哋啲數學啦。咁你哋覺得點樣啊？即係用Kahoot! 呢一個方法 ((tr. So, as you can see, in this video, TA used Kahoot! to, well, teach you guys some math. What do you think about that? Using Kahoot! as a method.))		
02 S4: 因為其實你見到，我哋呢一條片呢，個個都係眼睛望住個螢光幕嘅，即係代表我哋係非常之用心去上堂啦。咁可能平時例如其他老師上堂，佢哋未必會用Kahoot! ,咁我哋就有啲同學可能就傾偈呀，玩呀。不過自從用咗Kahoot! 之後呢，你可以見到我哋係，活躍咗嘅。即係專心咗嘅。甚至有啲同學你見到企埋起身添。咁所以其實我覺得，用Kahoot! 呢一種方法上堂係有用嘅，即係令我哋可以更加投入啊，更加專心去聽阿Miss講嘢咁樣囉 ((tr. Because actually, as you can see, in this video, everyone is looking at the screen, which means we are very attentive in class. Normally, for example, other teachers might not use Kahoot!, so we might have some students chatting, playing, or not paying much attention. But since we started using Kahoot!, you can see that we have become more active. We are more focused. Some students even stand up. So, I think using Kahoot! as a method in class is effective. It allows us to be more engaged, more focused on listening to what TA is saying.))	Students notice a marked increase in attention and engagement when Kahoot! was used in lessons. S4 highlights that while traditional teaching methods might lead to distractions, such as chatting or lack of focus, the introduction of Kahoot! results in students actively participating and concentrating more on the lesson.	The interactive nature of Kahoot! seems to draw students' attention to the screen, indicating heightened involvement and interest.
03 S1: 即係我覺得Kahoot! 係可以令你更加專心，即係，你更加對佢有興趣囉會，有一個game。即係可能個氛圍會好啲囉，即係唔係好似你一味咁樣講書，咁，咁有啲同學可能就會聽到有啲攰囉。即係咁樣Kahoot! 可以令你更專心囉。同埋學，佢會有興趣同埋有動力去學嗰樣嘢多啲囉 ((tr. I think Kahoot! can make you more focused, that is, you become more interested because it's like a game. The atmosphere might be better, not like just listening to a lecture where some students might get tired. Using Kahoot! can help you be more focused. And students will be more interested and motivated to learn more things.)) 04 S5: 可能例如話玩Kahoot! 啦，咁你，你知而家啲人好鍾意玩Kahoot! 㗎啦，即係又興打機，咁佢哋都聽到啲電子產品一定實會	S5 notes that Kahoot! resonates with students' existing interests, particularly in gaming and electronic devices. This familiarity makes students more receptive and excited to engage with the material presented through Kahoot!, enhancing their focus and energy levels during lessons.	The use of a game-like format in teaching can transform the classroom atmosphere, making it more lively and preventing students from feeling fatigued or disinterested. By incorporating elements of play, Kahoot! not only captures students' attention but also fuels their motivation to learn, suggesting that gamification can be an effective strategy to maintain student interest.

(*Continued*)

Table 2. Continued.

Video-stimulated-recall-interview excerpts	Students' perspectives	Analyst's interpretations of students' perspectives
醒晒，咁一定會接觸多啲呀，例如可能玩Kahoot! 可以玩得興奮啲囉。可以即係知，唔使瞓覺囉，都係專心啲，都係專心啲教學囉 ((tr. For example, playing Kahoot!, you know, nowadays many people enjoy playing Kahoot!, it's like playing games, so they become more alert when they hear electronic products. They will definitely engage more, for example, playing Kahoot! can make learning more exciting. It helps you stay awake, be more focused, and be more engaged in teaching.))		The alignment with students' preferences for digital interaction supports sustained attention and active participation.

abstract vocabulary into actionable knowledge. Integrating DGBL with exam-aligned practice may suggest that TA not only motivates students to engage with L2 mathematical terms but also bridges the gap between language learning and content mastery within an EMI transitional context.

The interview reveals TA's initiative to integrate Kahoot! matches Generation Z students' learning preferences, who have grown up immersed in technology and often gravitate toward interactive modes of engagement. By leveraging technology that mirrors the fast-paced, gamified environments familiar to this generation – such as mobile apps and digital games – Kahoot! transforms traditional mathematics instruction into an opportunity for active participation. This approach caters to Generation Z's affinity for digital interaction and provides alternatives to textbook-centric learning, which students may perceive as static or disconnected from their daily experiences. It can be argued that this strategic use of technology bridges generational preferences with pedagogical objectives, positioning digital tools as catalysts for dual-focused motivation: sustaining interest in abstract mathematical content while normalising the use of L2 English academic language.

Extract 2: constructing a digital gamified translanguaging space for alleviating students' anxiety towards CAL learning

Prior to Extract 2, TB introduced students to various Chinese action verbs. As the lesson concluded, TB instructed all the students to pick up their iPads and join a Kahoot! game altogether by scanning a QR code. In this extract, the Kahoot! question prompts students to choose the correct Chinese character that corresponds to the English meaning of spending time or money. The options provided include '換' (exchange), '花' (spend), '送' (give), and '發' (send out).

Table 3. Video-stimulated-recall-nterview with teacher A (Extract 1).

Video-stimulated-recall-interview excerpts	Teacher's perspectives	Analyst's interpretations of the teacher's perspectives
01 R: 嗯。咁喺呢度你睇到就係用Kahoot! 啦，嚟去教學生嗰個difference between ascending同埋descending。我就想聽吓點解當時你會有諗過會用Kahoot! 呢個形式嚟去，係啦，嚟去facilitate你嘅教學 ((tr. Okay. So here you can see that Kahoot! is being used to teach the students about the difference between ascending and descending. I am wondering what led you to use Kahoot! as a way to facilitate your teaching.)) 02 TA: 首先因為Kahoot! ，即係佢喺呢一啲情況之下我會用嘅Kahoot! 必須會係四個答案揀一個。呢一樣嘢其實有啲類似我哋multiple choice嘅一個情，即係一個問答嘅方式。咁所以我會首選用Kahoot! 就係呢個原因，因為佢似返我哋multiple choice。因為我哋而家考我哋exam都會有paper two，都會有multiple choice ，俾佢哋去做。咁而尤其是喺multiple choice啦，我可以俾更加多可能類似會比較伏嘅答案佢哋，可能會俾返少少trap佢哋，會唔會好容易去墮入返呢啲咁樣樣嘅陷阱呢。咁所以呢，我就會用Kahoot! 去做返一個，俾佢哋做返一個類似選擇題，當係少少side track on，平時因為我哋做開long question多，咁除咗long question之外，其實因為佢哋都要接觸返，考試都要考multiple choice。咁所以就當係一個，俾一個機會佢哋去接觸更加多multiple choice，我會點樣樣去出一條題目呀，又或者去接觸更加多可能類似multiple choice會有啲咩選擇咁樣樣，可以補返佢哋paper two呢一邊嘅方法。咁跟住之後另外，出返ascending/descending就係因為，其實ascending同埋descending基本上應該係佢哋上嚟中學為止，第一個佢哋必須要學識嘅生字。因為其實跟書嘅syllabus都係，佢一開始就會叫你分返ascending/descending咁樣樣。咁所以ascending/descending，佢必須要好清楚究竟邊一樣嘢，邊一個係小至大，邊一個係大至少咁樣樣。咁所以in multiple choice，in Kahoot! 嚟講呢，我可以同時又出小至大，又出大至少咁樣樣去俾佢哋去揀，咁我可以更加去清晰究竟佢哋到底知唔知咩叫ascending，咩叫descending咁樣樣 ((tr. First of all, I will use Kahoot! in a circumstance requiring us to select one answer amongst four. This is very similar to how multiple-choice questions are presented in maths, which is why I prefer Kahoot!. The math exam also consists of paper two which features multiple-choice questions for students to answer. In multiple choice questions, it enables me to create some confusing distractors to trap the students. This would also enable me to see whether the students would fall into the trap. Therefore, I use Kahoot! to offer an opportunity for the students to engage in multiple choice questions. You may also treat it as a side-track, as we tend to work on long questions. However, apart from long questions, it is necessary to provide the students with opportunities to engage in multiple choice questions, particularly the ways in which the teachers will construct the questions, to compensate for the absence of training on paper two. The reason for creating the question concerning ascending and descending is that these mathematical terms are the terms that students must first learn before moving on. Following the syllabus provided by the book, the students would be required to categorise ascending and descending. Because of this, it is important for the students to understand the distinction between ascending and descending. Kahoot! offers me an opportunity to create a question that incorporates both ascending and descending and invite the students to choose whether the answer to the question is ascending or descending. As such, this also provides me with a clear picture of whether the students fully understand the meanings of ascending and descending.))	TA's use of Kahoot! to motivate students' acquisition of L2 English mathematical terms like ascending and descending reflects a deliberate pedagogical strategy that merges exam preparation, gamification, and contextualised language practice.	It appears that the students do not have many opportunities to work on multiple choice questions in math lessons, e.g. "做開long question (typically focusing on doing long question in class)". In this case Kahoot! is not only a game-based learning platform; rather it transforms the classroom space into an exam-like environment, akin to the Paper 2 in math exams. It creates a space for the students to have more opportunities to engage with multiple choice questions during math lessons, which they tend not to have in math lessons. It also enables the students to gain exposure to different types of multiple-choice questions and the potential traps that they may encounter in exams. This, in turn, could enable the students to be familiar with the types and characteristics of various types of multiple choice questions, thus nurturing them with skills that are crucial for tackling tricky multiple-choice questions that they may encounter in future exams.

(*Continued*)

Table 3. Continued.

Video-stimulated-recall-interview excerpts	Teacher's perspectives	Analyst's interpretations of the teacher's perspectives
03 R: 頭先你講到啦，Kahoot! 就可以，即係模擬返好似數學嘅paper two咁樣。咁我就想問吓，你可唔可以講吓，用Kahoot! 嚟對學生嘅學習動機有冇影響。因為我見到頭先片中嘅學生都係話，錯咗咪算囉，咁樣，再揀過囉，咁樣。我就想即係睇吓你嘅睇法，即係對於佢哋對第二語言，英文嘅學習動機啦，同埋數學嘅學習動機咁樣 ((tr. What you just mentioned, Kahoot! could mimic paper two of the maths exam. So, I would like to ask whether you could elaborate on whether Kahoot! influences students' learning motivation. This is because the students in the video stated that it is okay to be wrong. If we selected the answer wrong, we could choose it again. In light of this, I would like to hear your thoughts on whether it might affect the students' learning motivation for both learning English as a second language as well as their learning motivation of maths.)) 04 TA: 因為始終宜家佢哋Z世代呀嘛，係咪叫佢做。Z世代佢哋一定會接觸好多電話呀，嗰啲咁嘅電子工具嘅。其實因為尤其是我哋，即係我哋學校唔會，即係冇話提供iPad俾佢哋上堂。咁which，其實佢哋接觸少咗電子嘅工具呢，佢哋有陣時直情係望住本書嘅話，佢哋會覺得好悶呀。咁所以that's why我會provide返少少電子嘅教學俾佢哋啦，咁樣樣去令到佢哋，即係除咗望住本書之外，都可以望吓第二啲device呀，咁樣樣。咁可以令到佢哋嘅，可以更into返呢一個課堂。因為尤其是有陣時Kahoot! 我都會擺喺課堂嘅偏尾嗰度時間呢，因為其實講真，你上完一堂啦，唔係，上咗四分之三堂你都覺得開始眼瞓㗎啦嘛，即係坦白咁講。咁所以呢個時候佢哋會需要其他嘢去提升返佢哋嘅精神，咁樣樣。咁所以其實我整Kahoot! 擺喺尾，最主要嘅原因，冇話要特別佢哋好，點講好呢，冇話佢哋一定要啱晒，但係我，其實反而我嘅目的係要令佢哋提升返佢哋嘅精神，令到佢哋知道究竟喺呢一堂入邊，佢哋有啲乜嘢學習嘅地方係佢哋catch到，有啲咩學習嘅地方佢哋catch唔到，呢一樣嘢係我會擺個Kahoot! 喺課堂尾嘅最主要嘅一個原因 ((tr. This is because they are the Generation Z (Gen Z), I suppose this is how they are named. Gen Z is sure to have lots of exposure to smartphones, those digital devices. In fact, this is because especially us, that is, our school does not provide iPads for students to use in class. As a result, they will have less exposure to digital devices. When they are looking at the books, they will become bored. Therefore, that's why I will provide students with some e-learning to enable them to look at other devices apart from books. This would increase their level of engagement in the lesson. This is because, especially, sometimes I will typically put Kahoot! at the end of the class time. This is because, actually, frankly speaking, after attending the whole lesson, no, after attending three-quarters of the lesson, you will feel sleepy, right? Speaking honestly. Therefore, at this moment, students would need something to lift their spirits. Therefore, when I design Kahoot! to be placed at the end of the lesson, the major reason, I do not say I wanted them to be specifically good at, how should I put it, they do not necessary to select all of the right answers, but for me, the main goal is to lift their spirits, to enable them to know what they have learnt and what have not learnt. This is the major reason why I design Kahoot! to be placed at the end of the lesson.))	Gen Z, being digitally native, are the millennial generations and those that follow, having grown up almost entirely in the digital age. They have been surrounded by computers, digital devices, and the world of social media. The teacher believes that the integration of technology into the classroom space might appeal to Gen Z's interest in using digital tools and possibly their preference for dynamic and interactive learning environments. The students' attention, particularly approaching the end of the lesson, tends to wane. Particularly when the students have already been listening to their teacher(s) for a prolonged period of time during the day.	Such an integration could arguably offer students alternative learning opportunities beyond textbooks and potentially stimulate their curiosity and engagement in the learning process.

01 TB: 好第三題+=
((tr. okay the third question))
+the next Kahoot! question appears on the screen--->Figure #1

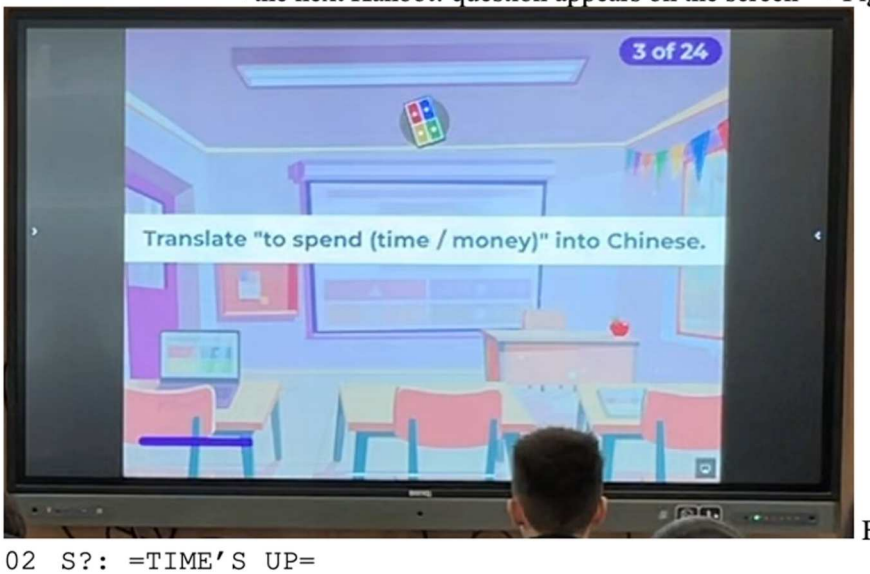

Figure #1

02 S?: =TIME'S UP=
03 S?: =you didn't even **XX**=
04 TB: =spe:nd=
05 S?: =**XX**++=
--->+
+the Kahoot! answer choices appear on the screen--->Figure #2

Figure #2

06 =((Kahoot! music begins to play.))=
07 S8: =Δoh no no no no noΔ=
ΔS8 shakes her hand in the air--->Figure #3
--->Δ
((S8 acts distraught. It is likely that she has selected the wrong answer.))

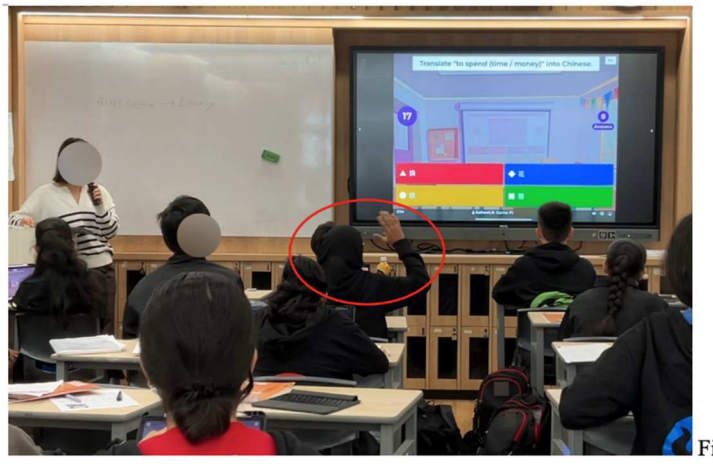

Figure #3

08 S?: =ΔohΔ=
ΔS8 partially covers her face with her hands--->Figure #4
--->Δ

Figure #4

09 Ss: =ΔNO::::=
ΔS8 points at the screen with her RH --->Figure #5

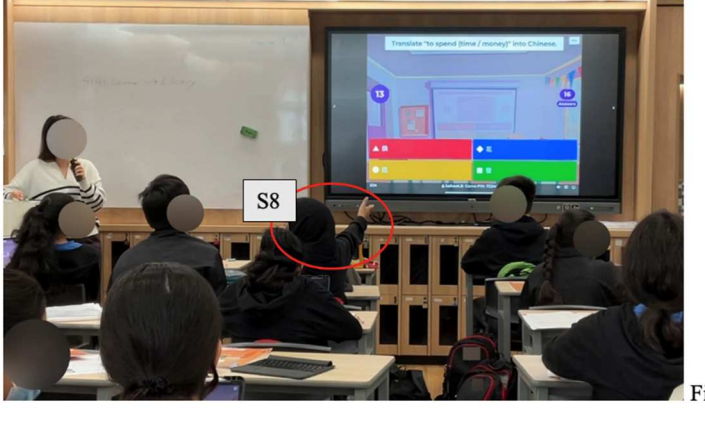

Figure #5

10 S?: =flowerΔ, flower=
--->Δ
11 =((Kahoot! music stops.))=

12 TB: =++haha $is flower, 喺啦$
((tr. that's right))
--->+
+the Kahoot! results appear on the screen--->Figure #6
((10 Ss correctly selected the blue option "花" (spend),
3 Ss wrongly selected the red option "換" (exchange),
2 Ss wrongly selected the yellow option "送" (gift), and
2 Ss wrongly selected the green option "發" (send).))

Figure #6

13 (.)
14 TB: $花[啊吓, 花$]
((tr. flower alright, flower))
((The pronunciation of the character 花 in Cantonese is [faa1],
and it has two meanings, flower as a noun and spend as a verb.))
15 S?: [WHO IS X,D?]=
16 Ss: =**XX**=
17 TB: =$花, 呢個喺 spend 咁解$=
((tr. flower, this means spend))
((The pronunciation of the character 花 in Cantonese is [faa1],
and it has two meanings, flower as a noun and spend as a verb.))
18 S6: =it's flower ya +it's flower+=
+S6 makes a pinched fingers
gesture with her RH--->Figure #7
--->+

Figure #7

19 TB: =好啦
((tr. okay))
20 (.)

21 TB: +the 哎呀全部都揀-=
((tr. oh no you all select))
+TB points and taps at the red option "換" (exchange) with her left index finger--->Figure #8

Figure #8

22 S?: =**XX**=
23 TB: =喺呀花先喺 spend
((tr. yes flower means spend))
24 (.)
25 TB: 紅色呢個哩, 換:+, +換:喺?
((tr. the red one here, exchange, exchange means?))
((The pronunciation of the character 換 in Cantonese is [wun6], and it is a verb that means exchange or change.))
--->+
+TB continuously moving both hand's index fingers in a cyclical pattern--->Figure #9

Figure #9

26 (0.5)
27 S?: WHAT
28 (0.4)
29 TB: 換喺咩呀?=
((tr. what does exchange mean?))
((The pronunciation of the character 換 in Cantonese is [wun6], and it is a verb that means exchange or change.))
30 S?: =exchange↑=
31 TB: =exchange 係+[change, exchange]
((tr. is))
--->+

In this extract, TB introduces the third question (line 1) and stressing the word 'spend' in English elongating sounds (line 4). The commencement of the Kahoot! music in line 6 signifies that the students can start selecting the correct answer presented in Kahoot!. The students actively engage in the game, as evidenced by their dramatic reactions, such as S8 shaking his/her hand in the air (Figure #3), covering his/her face with his/her hands (Figure #4), and extending his/her right hand and point at the screen (Figure #5), the students' prolonged loud utterance (line 9) and one student repeatedly voices the answer 'flower' (line 10).

The Kahoot! music stops (line 11), and a result page displayed on the screen featuring students' answer distribution (Figure #6). TB then utters the right answer 'flower' and acknowledges the students' responses by saying '係啦' (that's right) (line 12). While TB is repeating the correct answer '花' (spend) in Cantonese (line 14), one student's utterance, which he/she is wondering who chose the wrong answer, overlaps with TB's (line 15). TB appears to redirect the students' attention by reiterating the correct answer in Cantonese followed by an English explanation (line 17), as the students seem overjoyed, as seen in S6's repeated utterance of 'it's flower' and pinched fingers gesture (line 18).

TB's utterances and pointing gesture suggest that TB notices several students wrongly selected '換' (exchange) (line 21). TB reiterates the right answer, '花' (spend) in Cantonese, followed by an English explanation (line 23). To clarify the students' thought, TB asks the students whether they know the meaning of '換' (exchange), even though it is the wrong answer (line 25). TB additionally moves both index fingers in a circular motion, an iconic rotation gesture, to prompt the students' response. A student fails to follow as indicated by his/her exclamation (line 27). TB subsequently reiterates her question in Cantonese (line 29). A student promptly provides an English translation, 'exchange', to TB using a rising intonation, indicating his/her uncertainty (line 30). TB affirms the student's response by repeating the answer provided by the student and provides a synonym, 'change', to facilitate the students' understanding (line 31).

In this extract, it is evident Kahoot! offer both TB and the students immediate feedback on the students' answers, as indicated by the prompt students' answer distribution. Students demonstrate high levels of engagement during the game, as shown by their dramatic reactions (e.g. S8, Figures #3–5). TB provides follow-up feedback using both L1 Cantonese and L2 English to help students understand the meaning of 'spend' in Chinese. Notably, although the correct answer is '花' (spend), TB also explains the meaning of '換' (exchange) to the students. TB's explanation may be prompted by Kahoot!'s immediate feedback, indicating that several students have wrongly chosen '換' (exchange). TB uses L2 English, the students' more familiar named language, and multimodal resources, such as an iconic rotation gesture (Figure #9), to aid comprehension that '換' (exchange) has a different meaning from '花' (spend). Thus, it can be argued that Kahoot!, as a digital game, facilitates the creation of a digital gamified translanguaging space, enabling TB and students to use various linguistic and multimodal resources to enhance the teaching and learning of CAL. During a video-stimulated-recall-interview with representative students, they commented on how the use of Kahoot! in CAL classrooms engage their CAL learning (Table 4).

The interview data indicate that the students, with varying levels of FLA, collectively perceive Kahoot! could support CAL learning by making lessons more interactive and engaging. S4, with a mid-level of FLA, appreciates Kahoot!'s competitive element, which encourages students to quickly find correct answers to climb the leaderboard. It can be suggested that this gamified element could motivate students to think quickly and accurately, thereby enhancing engagement and reducing anxiety associated with traditional learning methods. S2, with a low-level of FLA, appreciates the interactive aspect as a refreshing departure from conventional note-taking and listening, describing it as a means to activate the brain and maintain alertness. S3, with a mid-level of anxiety, acknowledges the importance of accuracy in the competition and echoes S2 that the interactive nature keeps them awake, especially in early morning classes. Their views may suggest that the creation of a digital gamified translanguaging space in the CAL classroom can mitigate students' FLA by transforming the CAL learning space into a more dynamic and competitive environment.

Table 4. Video-stimulated-recall-interview with students (Extract 2).

Video-stimulated-recall-interview excerpts	Students' perspectives	Analyst's interpretations of students' perspectives
01 S4: This still has a competitiveness type of thing to it. So it encourages students to find the answers more quicker. 02 R: Isn't that more exciting? 03 S4: Yeah. 04 S1: The quicker you get, you're going to be on the leaderboard. 05 S3: But you have to get it correct. 06 S4: It encourages you to be more fast, to be more correct, in order to get more points, to be higher on the leaderboard. I like this type of interactive game. It tests your speed in terms of thinking. 07 R: S2, any thoughts?	S4, who experiences a mid-level of anxiety, appreciates Kahoot! for its competitive nature, which encourages students to quickly find correct answers to climb the leaderboard.	This gamified element appears to motivate students to think quickly and accurately, thereby enhancing engagement and reducing anxiety associated with traditional learning methods.
08 S2: So, like, it's fun to have an interactive game in a lesson. Instead of, like, just taking notes and listening to the teacher. And they make us a game for us to play for a while. And then it just, it makes your brain wake up. 09 R: Yeah, just to be awake. Because it was very early in the morning, at 9am. 10 R: S3, what do you think?	S2, with a low-level of anxiety, appreciates the interactive aspect as a refreshing departure from conventional note-taking and listening, describing it as a way to activate the brain and maintain alertness.	
11 S3: Sometimes I feel sleepy in class, but like games makes me wake up. So I'm glad she does this often. Because now I want to compete with my other friends.	S3, also with a mid-level of anxiety, acknowledges the importance of accuracy in the competition and notes that the interactive nature of the game keeps them awake and engaged, especially in early morning classes.	

During a video-stimulated-recall-interview with TB, she commented on how Kahoot! helps alleviate students' anxiety about learning CAL (Table 5).

In the interview, TB highlights that Kahoot!'s interactive nature allows students to engage in trial and error, a crucial aspect of the learning process. It encourages students to experiment with language use in a low-stakes environment, where mistakes are part of the game and not something to be feared. This is particularly beneficial for weaker students, who might otherwise be hesitant to participate due to fear of failure or embarrassment. By normalising mistakes as part of the CAL learning journey, this gamified approach helps reduce students' anxiety levels.

The competitive and rewarding elements of Kahoot! boost students' motivation to learn. The desire to see their names on the leaderboard or achieve high scores drives students to focus and engage with the content wholeheartedly. This gamified learning experience transforms the classroom dynamic, making learning more enjoyable and less intimidating. Consequently, students would participate actively, which enhances their overall language skills. It can be argued that Kahoot! fosters a sense of accomplishment and encourages all students to take an active role in their learning journey. This transformation of the classroom environment into a more engaging and supportive space can reduce students' FLA and foster a positive attitude towards learning CAL.

Discussion and conclusion

Summary of the findings

This paper investigates how teachers' use of Kahoot! as a digital game fosters the creation of a translanguaging space in two multilingual classroom settings, an EMI Mathematics classroom, and a

Table 5. Video-stimulated-recall-interview with teacher B (Extract 2).

Video-stimulated-recall-interview excerpts	Teacher's perspectives	Analyst's interpretations of the teacher's perspectives
01 R: 哦係啊。第一次見你用呢個類似嘅軟件來去motivate學生去學中文，可唔可以講一下教學目標係乜嘢?同埋點解會咁樣做，同埋點解會咁樣做？點解會用呢啲資源? ((tr. Oh yes. It's the first time I've seen you use this kind of software to motivate students to learn Chinese. Could you talk about what the teaching goals are? And why do you do it this way? Why do you use these resources?))		
02 TB: 因為用電子，我覺得現在基本上小朋友都係比較吸引佢哋嘅，好多時候。我現在真嘅覺得用Kahoot! 嘅成效真係再大一點，即係入腦好多。你每天講十次可能比起玩一次Kahoot! 因為係想贏，佢就好focus，所以就會學得好啲。 ((tr. Because using digital tools, I feel that they are generally more attractive to children nowadays, most of the time. I truly believe that the effectiveness of using Kahoot! is significantly greater, meaning it sticks in their minds much more. Saying something ten times might not be as effective as playing Kahoot! once, because they want to win, so they really focus, and consequently, they learn better.))	TB emphasises that digital resources like Kahoot! are inherently appealing to secondary school students, capturing their attention more effectively than traditional teaching methods. The competitive nature of Kahoot! encourages students to focus intensely on the content in an effort to win, which can lead to better retention and understanding of the material.	The sense of accomplishment, evidenced by scores and leaderboard positions, can potentially contribute to a feeling of satisfaction and success, particularly for weaker students who might struggle with traditional methods.
03 TB: 所以我都好鍾意 … 有時間因為都好嘥時間，有時間我都會鍾意整一啲遊戲比佢哋玩。呢個就係用遊戲最主要嘅目嘅。同埋我哋一堂好長，15分鐘去到最後個attention已經好差，咁遊戲就會好啲。 ((tr. So I really like … when there's time, although it's quite time-consuming, I like to create some games for them to play. This is the main purpose of using games. Also, our classes are quite long, and after about 15 min, their attention is already very poor, so games help improve that.))	Additionally, TB notes the strategic use of games to break the monotony of long lessons, thereby maintaining students' attention and engagement.	The playful and interactive environment of Kahoot! provides a contrast to the anxiety-inducing experience of facing a daunting pile of paper-based exercises, encouraging students to participate willingly and confidently.
04 R: 嗯，我覺得咁樣做法其實都能夠motivate到學生同埋raise到佢哋嘅language awareness，你覺得咁樣有沒有機會可以減低學生嘅焦慮？佢哋學Chinese嗰個anxiety？ ((tr. Hmm, I think this approach can indeed motivate students and raise their language awareness. Do you think it has the potential to reduce students' anxiety? Their anxiety about learning Chinese?))	TB believes that incorporating games into the learning process can alleviate students' anxiety associated with learning Chinese. As students engage with the game, they become more immersed in the activity, sometimes even enjoying the challenge of correcting mistakes.	
05 TB: 我覺得都會嘅，因為玩遊戲嘅時候佢又投入啲啦，有機會有時候佢又有啲人錯咗又鍾意撞，就係係都要玩返啱佢，然後佢就會有滿足感，就係見到我有tick啊，有幾多分啊，我喺leaderboard啊。所以我覺得係對於弱嘅學生嚟講，佢都肯試咗先，比起對住一堆紙字啊。 ((tr. I think it does, because when they're playing games, they get more involved. Sometimes they make mistakes but enjoy trying again, so they want to play correctly, and then they feel satisfied when they see the ticks, the scores, and their position on the leaderboard. So I think that for weaker students, they're more willing to try first, compared to facing a pile of papers.))		

CAL classroom. Previous research on DGBL has primarily employed quantitative methods to assess its benefits in improving students' L2 proficiency, increasing their LLM, and reducing their FLA (e.g. Hung et al. 2018; Yang et al. 2024a). However, the potential of digital games to enable teachers and students to mobilise diverse multilingual and multimodal resources to create new knowledge remains underexplored. In Extract 1 and the interviews with TA and students, the analysis highlights Kahoot!'s role in creating a dynamic translanguaging space within the EMI classroom. By facilitating an environment where both L1 Cantonese and L2 English are used interchangeably, Kahoot! encourages peer collaboration, allowing students to offer emotional support and reminders in Cantonese, and enables TA to fluidly switch between languages to clarify concepts. In the analysis of Extract 2 and the interview data, it is noticeable that TB uses Kahoot! to bridge L1 Cantonese and L2 English, providing follow-up feedback that helps students understand complex Chinese terms like 'spend'. This use of Kahoot! facilitates a dynamic CAL learning environment where linguistic and multimodal resources enhance comprehension and participation. In both classroom extracts, Kahoot! is shown to promote students' LLM, making learning interactive and enjoyable, reducing students' anxiety about making mistakes and encouraging them to view errors as learning opportunities.

Previous research in computer-assisted language learning has investigated how technological tools can facilitate the creation of translanguaging spaces. Tai and Li (2024) pioneered the concept of 'technology-mediated translanguaging space', which illustrates how classroom interactions can be enhanced through the strategic use of technology. Their study highlighted how iPads in HK EMI mathematics classrooms utilised touch-based features, like digital annotation and manipulation of visuals, to bridge the gap between mathematical symbols and their conceptual meanings. This expanded the teacher's instructional toolkit with a richer array of semiotic and spatial resources. The findings indicate that classroom interactions inherently involve translanguaging, and utilising the multimodal capabilities of technological devices aids teachers in creating a technology-mediated translanguaging space to enhance students' content and language learning. What remains unclear, however, is how teachers might use digital games to engage in multilingual interactions, thereby supporting translanguaging practices in L2, EMI, or CLIL classrooms. While prior research has demonstrated that digital games can offer engaging and interactive platforms that enhance language learning (e.g. Reinders and Wattana 2015; Yang et al. 2020; Yang et al., 2024b; Yang and Kuo 2022), exploring their potential will yield empirical evidence to advance our understanding of how digital games and translanguaging practices can be combined, offering innovative teaching strategies that support both content and language learning.

Theorising the notion of digital gamified translanguaging space

Building on Tai and Li's (2024) concept, this paper proposes the notion of a '*digital gamified translanguaging space*', exploring how digital games like Kahoot! can foster a playful classroom environment that enhances students' motivation and alleviates the anxiety often associated with content and language learning. While Tai and Li's (2024) 'technology-mediated translanguaging space' focuses on leveraging the multimodal affordances of technology (e.g. touch, annotation, visual manipulation) to expand semiotic resources for meaning-making, the 'digital gamified translanguaging space' advanced in this paper is a more specific construct. It zeroes in on leveraging the unique game mechanics of DGBL (e.g. points, leaderboards, trial-and-error, anonymity) to directly target and transform the socio-affective conditions of learning. This shift moves the focus from technology as a multimodal resource bank to technology as an engineered system designed to lower students' anxiety and boost motivation. In other words, the notion of the technology-mediated translanguaging space is about what linguistic and multimodal resources are used for learning. On the other hand, a digital gamified translanguaging space is a learning environment pedagogically engineered through the affordances of digital games to foster the low-anxiety and high student engagement conditions necessary to motivate student participation and normalise risk-taking.

The conceptualisation of a digital gamified translanguaging space represents a theoretical and pedagogical evolution, moving beyond the mere use of games or the incidental allowance of translanguaging. Instead, it theorises an engineered learning environment designed to address specific socio-affective and cognitive challenges. This innovative pedagogical approach synergizes the principles of translanguaging (García and Li 2014; Li 2018) with the affordances of DGBL (Hung et al. 2018; Li 2021; Millis et al. 2017) to cultivate joyful, low-anxiety learning environments where students can freely experiment with both language and content. The digital gamified translanguaging space emphasises how game mechanics, such as Kahoot!'s trial-and-error approach, normalise mistakes as natural opportunities for L2 learning. This is particularly crucial for students mastering abstract L2 academic terms during their transition from L1 medium-of-instruction to L2 medium-of-instruction (as shown in Extract 1) and for ethnic minority students who are required to learn a mainstream language, such as CAL in HK, as a compulsory subject (as shown in Extract 2). By harnessing the principles of DGBL, this translanguaging space encourages dynamic interactions, enabling both teachers and students to fluidly draw on their diverse linguistic and multimodal resources. Integrating competitive yet low-stakes elements, such as anonymous leaderboards, with translanguaging practices, this translanguaging space can play a role in reducing students' FLA and motivate students' L2 learning through immediate multimodal feedback and peer collaboration. Therefore, the concept of a digital gamified translanguaging space not only challenges monolingual classroom norms, but it also transforms traditional learning paradigms. It enhances the accessibility of content and language learning by reframing mistakes as opportunities for teachers and students to co-construct knowledge, ultimately fostering more equitable and engaging learning experiences for multilingual students.

Implications of the findings

The findings contribute to translanguaging in multilingual classroom interactions scholarship in several ways. Theoretically, this paper demonstrates how a multilingual classroom can be transformed into a digital gamified translanguaging space where digital games facilitate the creation of a translanguaging space during classroom interactions, fostering a playful atmosphere that enhances students' LLM and reduces FLA while learning both content and language. The critical importance of this notion lies in the synergistic relationship between its components. DGBL serves as the operational mechanism that enables the application of translanguaging principles in authentic classroom settings. Such a translanguaging space constructs a low-anxiety and collaborative classroom environment where translanguaging is normalised and integrated into the learning process. Consequently, this synergy renders both DGBL and translanguaging not as mere theoretical concepts, but as a foundation for a practicable pedagogical approach. Methodologically, the study underscores the value of integrating Multimodal CA with IPA to examine how EMI and CAL teachers use digital games for creating diverse multilingual and multimodal practices for making learning accessible for all, supporting students' LLM and mitigating students' FLA in multilingual classrooms (Tai and Lee 2024). Pedagogically, the findings emphasise the importance of enhancing teachers' practical understanding of the potential digital games offer, encouraging them to innovate in their teaching approaches within their specific classroom contexts. While it has been demonstrated that a digital gamified translanguaging space can enhance students' LLM and reduce FLA in multilingual classrooms, future studies could employ longitudinal studies to explore the long-term use of DGBL in classrooms. This would permit researchers to capture the trajectory of students' motivational and emotional states, especially investigating whether the positive effects persist as students become accustomed to the integration of digital games into their learning in classrooms.

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