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THINKING ALLOWED

Research agenda: Synergizing in-class and out-of-class language learning with technology

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Abstract
The prevalence of digital technologies, augmented by the emergence of generative AI, expands opportunities for language learning and use, empowers new modes of learning, and blurs the boundaries of in-class and out-of-class language learning. The language education community is challenged to reconceptualize the paradigm of language learning and utilize the affordances of technologies to synergize in-class and out-of-class language learning. To achieve this, in-depth understanding of in-class learning and out-of-class digital experiences in relation to one another is needed to inform curriculum and pedagogy conceptualization and implementation. With this aim in mind, we put forth a research agenda around six research themes. We hope that this Thinking Allowed piece can stimulate and guide systematic research efforts towards unleashing the potential of technologies to synergize in-class and out-of-class language learning and create holistic and empowering learning experiences for language learners.

Keywords: digital bridging; informal and formal language learning; out-of-class language learning; technology-enhanced language learning

1. Introduction

Language learning takes place through interaction with linguistic and non-linguistic sources in the environment (Van Lier, 2004). The sources are both human and non-human entities – both physical and non-physical – that are 'language-bearing', such as cultural artefacts and information, gathered in specific settings at particular moments in time (Benson, 2022, p. 26). Thus, language learning is distributed in and across activity spaces, each composed of a unique configuration of human and non-human resources (Benson, 2022). Accordingly, to research and support language learning, language researchers and educators are unavoidably dealing with a constellation of settings, language classroom being one of them. Focusing solely on the learning experience inside the classroom or outside the classroom is 'fundamentally at odds with the ways in which individuals learn across various social settings' (National Research Council, 2009, p. 27). Since learning involves sensemaking across contexts, seeking the continuity and synergy of learning experiences across settings is not only ecologically valid but also instrumental to understanding and supporting learning. This Thinking Allowed piece hence focuses on the synergizing of in-class and out-of-class language learning with technology. It aims to shift the focus of students, teachers, and researchers away from the existing narrow emphasis on instructional contexts toward enhancing the continuity of in-class and out-of-class learning.

It needs to be noted that in-class and out-of-class learning are both hybrid varieties of practices, constituting a continuum of learning situations (Rogers, 2014). There are three essential dimensions that define any learning situation:

1) *The spatio-temporal dimension.* Every learning setting constitutes of human and non-human language-bearing objects. These objects afford a 'unique configuration of activities, material resources, relationships and the interactions that emerge from them' (Barron, 2006, p. 195) and 'conditions for language contact' (Benson, 2022, p. 29). The configurations and conditions are shaped by learners' spatio-temporal routines, for example, time restrictions at a particular location (Benson, 2022; Colley et al., 2003). The spatio-temporal characteristics determine the possibilities of learning in a learning situation.
2) *The learning attribute dimension.* Each learning situation contains formal and informal learning attributes, whose nature and interrelationships can vary widely between situations (Colley et al., 2003). These attributes include the extent to which learning is tacit/incidental or explicit/intentional, context-specific or generalizable, didactic or experiential, embodied or conceptual, collaborative or individual, and uniform or personalized (Benson, 2011; Colley et al., 2003; Rogers, 2014; Rogoff et al., 2016). Together, these attributes blend to form the characteristics of the learning experience in a given learning situation.
3) *The learning control dimension.* Learning settings vary in: a) who has the control (i.e. whether the learner or an external agent, such as teachers and textbook publishers, has the control over learning); b) what is being controlled (i.e. the extent to which the purpose of learning, learning content, learning process, and assessment are predetermined or negotiated); and c) the degree of control (i.e. the level of structuredness in the learning experience) (Benson, 2011; Colley et al., 2003; Rogers, 2014). The learning control dimension defines the scope of learner agency in a learning situation.

These three dimensions create a continuum of in-class and out-of-class learning situations that differ in spatial and temporal characteristics, learning attributes, and the scope of learner control. Therefore, the distinction between in-class and out-of-class used in this piece is somewhat arbitrary and serves mainly rhetorical purposes.

Examining language education from a historical perspective, Reinhardt (2022) points out that in-class and out-of-class learning have coexisted since the onset of language learning. The emergence and normalization of various technologies, such as the printing press, broadcast radio, digital media, the internet, and Web 2.0 technologies, has been expanding the settings of language learning, and driving the constant evolution of the nature, scale, foci, and relation of in-class and out-of-class learning (Benson, 2022; Reinhardt, 2022). Thus, technology is inherent to the discussion of in-class and out-of-class language learning and may play an instrumental role in synergizing learners' experience across settings. Technology necessitates and augments the connection of in-class and out-of-class language learning for the following reasons: 1) it brings along new possibilities that challenge the conventional structure, location, and attributes of language learning; 2) it transforms the boundaries of learning settings; and 3) it creates co-located spaces of formal and informal learning attributes (Nordqvist & Liang, 2015). There is hence an urgent need for pedagogical and research initiatives that leverage the boundary-crossing potential of technologies to integrate in-class and out-of-class language learning.

Research interests in synergizing in-class and out-of-class learning with technology have started to emerge. Researchers have explored student and teacher perception of and initiatives in connecting in-class and out-of-class learning experience (e.g. Lai, 2015; Schurz & Sundqvist, 2022; Toffoli & Sockett, 2015), and examined the learning effects of relevant pedagogical initiatives (e.g. Reinhardt & Ryu, 2013). Notwithstanding, the emerging academic interests are only scratching the surface. More systematic research efforts are needed to support the conceptualization of approaches to synergizing in-class and out-of-class learning and the accompanying teacher and learner development. This Thinking Allowed piece hence explores the literature on the relation between in-class and out-of-class

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learning, introduces pedagogical models in synergizing the two, discusses the potential of generative artificial intelligence (GenAI) in augmenting the synergy, synthesizes research on student and teacher perception and practices, and draws attention to contextual variations. It maps six research themes with key research tasks to advance this research field.

2. Research themes and tasks

2.1. Research theme 1: The relation of out-of-class digital experiences with in-class learning

Understanding the contribution of out-of-class digital experiences to language development and how these experiences relate to students' in-class learning is fundamental to seeking the synergy of the two. In the past decade, we have witnessed an increasing body of literature that examines the language learning potential of learners' self-initiated, self-directed engagement with digital resources for intentional and incidental language learning beyond the classroom, evident in a series of recent synthetic reviews (Guo & Lee, 2023; Soyoof et al., 2023; Zhang et al., 2021). This body of literature has mapped learners' engagement with out-of-class digital experiences, which include both everyday technological resources – such as audio-visual materials (e.g. TV shows, movies, songs, short videos), gaming, social media (e.g. Facebook, YouTube, online chatting, online forums), online reading (e.g. news, blogs) – as well as digital resources designed specifically for learning purposes, like language instruction channels on YouTube and apps such as Duolingo (e.g. De Wilde et al., 2021; Lai, 2015). Studies have linked out-of-class digital experiences to vocabulary gains (e.g. De Wilde et al., 2022; Puimège & Peters, 2019), reading (e.g. Brevik, 2019), writing (Kaatari et al., 2023), speaking (e.g. De Wilde at al., 2021), and listening (e.g. Tsang & Lam, 2024). Research has further associated informal digital experiences with learner agency and digital literacy empowerment (e.g. Soyoof et al., 2023), self-efficacy and identity development (e.g. Liu & Darvin, 2024), and willingness to communicate (e.g. Zadorozhnyy & Lee, 2023).

Despite the rich findings generated, the effort to synergize in-class and out-of-class learning is thwarted by two major limitations: 1) the inconsistent research findings; and 2) the lack of connection with learners' formal learning experience. In the section below, we will elaborate on each limitation and put forth relevant research tasks.

Existing research has tried to pinpoint the contribution of different out-of-class digital activities to language learning, with inconclusive findings thus far. For example, De Wilde et al. (2022) found gaming and TV viewing to be non-significant predictors of Dutch-speaking Flemish primary school children's English receptive vocabulary knowledge. In contrast, Puimège and Peters (2019) identified these two activities as significant predictors of English receptive vocabulary knowledge among the same student population. Similar observations regarding the inconsistent relationships between informal digital activities and incidental vocabulary learning are prevalent in existing literature (e.g. Peters et al., 2019; Schmitt, 2019). These mixed findings might be due to differences in research contexts or target populations. They may also be due to the predominant tool or activity-centered approach adopted in the existing literature. This approach is problematic because: 1) most technological tools or resources comprise a heterogeneous mix of genre (e.g. narrative, information) and auxiliary features (e.g. subtitle/caption, lyrics, pop-up glossary, interactive components), all of which carry implications for learning (e.g. Reynolds et al., 2022); and 2) technology is not a fixed entity with predetermined effects on learning, but is rather proactively (re)appropriated, (re)negotiated, and recontextualized by its users in the context of use (Lai & Wang, 2025; Neufeld & Delcore, 2018). For instance, students may listen to music purely for relaxation or with conscious attention to the lyrics. Moreover, existing measures to map learners' out-of-class digital experience by specific activities are also problematic, given that they often lack theoretical conceptualizations and are context specific, hence lacking universal applicability (Sundqvist, 2024). Thus, focusing on the characteristics of out-of-class digital experience rather than on specific digital resources or tools may potentially minimize contradictory and misleading findings, and provide theoretical bases for the measures. This leads us to propose the first research task.

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Research task 1

To identify the characteristics of out-of-class digital experiences that are critical to specific cognitive and non-cognitive language learning outcomes

Existing literature has suggested two potential solutions to this research task: 1) the features of digital resources; and 2) the attributes of learner action. Researchers have found that the linguistic and discourse characteristics of digital resources shape learning potentials. For instance, Webb (2015) revealed that related videos or TV show episodes afford repeated encounters of vocabularies and hence carry greater vocabulary learning potential than unrelated TV programs. Rodgers and Heidt (2021) found that different video games provide differential encounters of potentially learnable vocabularies. These researchers point out that it is the characteristics of digital resources, such as the narrow viewing of related contents or the scale of interaction afforded in gaming, that shape vocabulary learning potentials. Other researchers have found that the attributes of learner action, that is, patterns of learner agentic interaction with digital resources, determine learning potentials (Peng et al., 2022). These scholars have unravelled that different purposes of interacting with digital resources bring different learning potentials (e.g. Lai & Wang, 2025; Vanderplank, 2019). They have further revealed that the level of affective, cognitive, and linguistic engagement, cognitive attention (such as attention to multimodal information and attention to language form and meaning), and strategic engagement (e.g. depth of attention to lexical information and sustained engagement with vocabularies encountered during informal digital experience) determine the effects (Arndt, 2023; Lai et al., 2022). This line of inquiry helps identify some underlying characteristics of digital experiences that shape learning effects, mostly vocabulary learning. The inquiry can be furthered to uncover other underlying characteristics that are critical to a broader range of cognitive and non-cognitive outcomes, such as different language skills, willingness to communicate, and anxiety.

To conceptualize the underlying characteristics that are critical to a particular learning outcome, we need to start with identifying the critical conditions and factors for the development of that outcome (e.g. reading), and derive an analytic framework of linguistic and experience characteristics that are critical (e.g. genre, purpose of reading, and cognitive strategies). We can then apply this framework to develop coding schemes to code informal digital experience collected through a technological activity diary or an experience sampling method (Arndt et al., 2023; Lai et al., 2022), or to guide the design of questionnaires that survey the characteristics of students' informal learning experience (e.g. the Informal Second Language Engagement questionnaire, Arndt, 2023; and the Extramural English Scale, Sundqvist & Uztosun, 2024). Regression analyses on the survey data can then identify key characteristics that are critical to the outcome. Researchers have also advocated a person-centred approach to derive clusters of prevailing idiosyncratic behavioural patterns and compare learning outcomes across clusters (Peng et al., 2022). Q-method and profile analysis or cluster analysis can be employed to classify individuals into distinct subgroups based on idiosyncratic appropriation and meaning-making of digital experiences (Crowther et al., 2021). Such an emic approach can help illuminate contradictory findings in the existing literature. Findings from this line of inquiry can guide learners to construct optimal out-of-class digital experience that may compensate for their in-class experience to achieve specific learning goals.

Research task 2

To examine the contributions of out-of-class digital experiences in relation to learners' in-class learning experience

Examining out-of-class digital language learning in isolation, without considering what is going on inside the classroom, may lead to biased findings that lack context sensitivity and overlook potential

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areas of synergy between the two. To examine out-of-class digital experiences in relation to in-class learning, we can undertake three lines of inquiry.

First, we may examine the relative contributions of out-of-class digital experiences and in-class learning to various cognitive and non-cognitive outcomes. This can be achieved through including both experiences simultaneously in the same statistical models to predict learning outcomes. This approach has been proven viable in previous research, where different linguistic outcomes are regressed on the frequency of out-of-class digital activities while controlling for students' in-class learning experience (see, e.g. De Wilde et al., 2021). To further reveal the working mechanisms, we may conceptualize various cognitive and non-cognitive mediating factors that are specific to a cognitive and non-cognitive outcome (e.g. different language skills and motivation) or different aspects of a particular outcome (e.g. vocabulary size vs vocabulary depth). These mediating factors may include self-efficacy, identity, interest development, investment, grit, learning beliefs, cognitive attention, self-regulation strategies, and autonomy (Barron, 2006; Lai, 2023). We can then test how these factors may mediate or moderate the contributions of in-class and out-of-class experiences to the outcome via hierarchical regression analysis or multilevel modelling. For instance, Leona et al. (2021) employed path analysis to model how willingness to communicate and linguistic self-confidence mediated the influence of formal reading, consumption of entertainment media, and chatting with friends and family on receptive and productive vocabulary knowledge. In another study, Kaatari et al. (2023) used variable path analysis to model how classroom factors and engagement in out-of-school activities (namely, extramural conversation, gaming, reading, use of social media, and watching) contributed differently to different aspects of writing performance. We envisage that insights from such lines of inquiry can contribute to the theorization of the roles of formal and informal learning on different aspects of language development, and in addition enable educators to strategize and coordinate the experiences to satisfy the multifarious needs in language learning.

Second, we may explore the contribution of out-of-class digital experiences in relation to the characteristics of in-class instruction. Current research has shown that out-of-class digital learning experiences that compensate for what is lacking in in-class learning would contribute significantly to students' language gains and affective outcomes. These studies suggest that the quality of informal digital learning experiences depend on the characteristics of in-class learning (e.g. Lee, 2019). Nonetheless, existing research is correlational in nature and the conclusions are speculative. To follow up, we may rely on cross-sectional designs that compare learners' out-of-class digital experience profiles across contexts. Further, we can examine how other teaching context characteristics, in addition to form- and meaning-focused learning featured in existing literature, shape the indicators of quality of out-of-class digital experiences. Possible teaching context characteristics that can be examined include autonomy-supportive versus autonomy-suppressive learning, receptive- versus productive-dominated learning, and individual- versus social-oriented learning. We anticipate that this line of inquiry may generate fine-tuned context-sensitive insights into our understanding of the quality of out-of-class digital experiences, informing the construction of optimal out-of-class learning ecologies that complement the in-class learning experience.

Third, we may investigate how in-class and out-of-class learning influence each other. Previous studies suggest a potential two-way interaction: on the one hand, out-of-class digital experiences had small but positive associations with motivated efforts in English learning and students' attitudes towards English class (Lamb & Arisandy, 2020); on the other hand, teacher support positively predicted students' engagement in informal digital learning (Hoi & Mu, 2021). However, these studies are cross-sectional and correlational and need to be tested with a longitudinal research design, such as longitudinal case studies or longitudinal panel studies, to substantiate the dynamic interaction over time. They also need to be enriched with qualitative approaches, especially ethnographic study or case studies, that provide more in-depth insights into the interaction between the two. Furthermore, the scope of the research needs to be expanded to examine two critical areas. First, it should investigate how digital experiences outside the classroom influence in-class learning processes, such as anxiety,

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Table 1. Research theme 1 and related tasks

Research theme	Tasks	Subtasks	Method
The relationship between out-of-class digital experiences and in-class learning	To identify the characteristics of out-of-class digital experiences that are critical to cognitive and non-cognitive language learning outcomes	• Identify critical linguistic and discourse characteristics of digital resources	• Regression analysis to identify key characteristics that are critical to an outcome
		• Identify critical attributes of learner action	• Q-method and profile analysis or cluster analysis to derive clusters of behavioural patterns and compare learning outcomes across clusters
	To examine the contributions of out-of-class digital experiences in relation to learners' in-class learning experience	• Examine the relative contributions of out-of-class digital experiences and in-class learning to various cognitive and non-cognitive outcomes	• Hierarchical regression analysis or multilevel modelling to examine the effects and reveal mediating and/or moderating factors
		• Explore the contribution of out-of-class digital experience in relation to the characteristics of in-class instruction	• Cross-sectional designs to compare the effects across contexts
		• Understand how in-class and out-of-class learning influence each other	• Longitudinal case studies or longitudinal panel studies to examine the dynamic interaction over time
			• Ethnographic study or case studies to provide more in-depth insights into the interaction

engagement, the use of learning strategies, self-regulation, and willingness to communicate. Second, it should also assess how various in-class learning factors – such as the design of the curriculum, assessment methods, and autonomy-supportive teaching practices – affect the frequency and nature of out-of-class digital engagement. We anticipate this line of research to generate valuable theoretical insights into the dynamic interplay between in-class and out-of-class learning among varied learner populations. Table 1 summarizes the suggested research tasks.

2.2. Research theme 2: Pedagogical designs that synergize out-of-class digital experiences and in-class learning

To conceptualize the synergizing of in-class and out-of-class learning, the three defining dimensions of learning situations – the spatio-temporal dimension, the learning control dimension, and the learning attribute dimension – are useful lenses.

Pedagogical initiatives that synergize the affordances of in-class and out-of-class learning in *the spatio-temporal dimension* focus on creating seamless learning experience in time and space. For instance, Wong et al. (2015) proposed a seamless vocabulary learning framework, MyCLOUD, that utilizes the affordances of in-class learning (systematic instruction and teacher support) and that of

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out-of-class contexts (contextualized and networked learning). The model consists of the following pedagogical components: in-class teacher-guided learning of new vocabularies and co-creation of photo blogging on some vocabularies; out-of-class personalized generation of photo blogging that involved using these vocabularies to describe one's daily encounters; peer review and discussions on learner-generated artefacts on a social networking space; and teacher-facilitated and scaffolded in-class discussion and consolidation of both teacher-supplied and learner-generated artefacts. Similarly, Lan and Lin (2016) developed a mobile platform to provide contextualized support to students' application of in-class learning to real world communication tasks and enable asynchronous sharing among peers. Experimentation of a seamless learning model with second language learners at secondary and university levels has yielded positive results on language performance and learning habits (Lan & Lin, 2016; Wong et al., 2015).

Synergizing in-class and out-of-class learning from *the learning control dimension* emphasizes designing self-determined learning experiences to incentivize and cement the continuity of learning across spaces. Hase and Kenyon (2000) proposed heutagogical approaches that highlight supporting learners' agentic actions in learning and developing their 'capability, self-reflection and metacognition or an understanding of one's own learning process' (Blaschke & Hase, 2016, p. 27). In such approaches, learners are given the autonomy to make decisions on learning journeys and processes and engage in self-directed inquiry. They are also encouraged to utilize avenues and social connections inside and outside the classroom, mediated by technology, to create their own networks of knowledge, information, and learning. Ito et al. (2013) further advocated building connected learning experiences across spaces that center around learners' pursuit of personal interests or passion. Such experiences have a few key characteristics. First, they allow learners to voluntarily explore projects that align with their personal interests. Second, they facilitate the development of relationships with peers who share similar interests, as well as mentors and experts, both inside and outside the classroom. Third, they provide learners with opportunities to integrate and apply their interests and knowledge across academic, professional, and civic arenas. Pedagogical initiatives along this lens have started to emerge. For instance, York (2023) instructed his Japanese university English students to search and join sub-Reddit communities that fit their personal interests and structured the in-class learning experience around supporting students' out-of-class participation in these online interest communities.

Synergizing in-class and out-of-class learning from *the learning attribute dimension* underscores designing pedagogical activities in ways that coordinate and complement formal and informal learning attributes across learning situations. This pedagogical design allows learners to benefit from enhanced fluidity of knowledge, capacities, and mindset across learning situations. Existing literature suggests three major approaches along this lens.

- *An integration approach*: An integration approach underscores designing pedagogical activities that incorporate informal learning attributes into in-class learning and vice versa. Scholars have argued for designing cognitively meaningful pedagogical activities that simulate daily life tasks, such as problem-solving tasks, to prepare language learners for performing similar life tasks in the target language (Sockett & Toffolio, 2020). Others have experimented with selecting instructional materials based on learners' interest areas to elevate interest level in L2 learning and boost reading performance (Asgari, 2023). Jiang (2022) designed video production activities that simulate the multilingual and multi-semiotic nature of language use in daily life and found that such activities empowered learners to overcome limited linguistic repertoire for civic participation. Similarly, formal learning attributes have been integrated into out-of-class learning spaces to create 'non-formal' online educational resources, such as online educational social networking sites like Busuu or Duolingo, as well as context-aware smartphone services that assist migrants with daily life tasks in a city, such as the MASELTOV project (Kukulska-Hulme, 2015).

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- *A compensatory approach*: A compensatory approach highlights designing pedagogical activities that compensate for the weakness of informal learning contexts. For instance, teacher participants in Schurz and Sundqvist (2022) reported designing pedagogical activities to strengthen the aspects that learners might not acquire through informal English experiences, such as accuracy in language use. Considering that learners' out-of-class activities are dominated by receptive activities, such as watching films/TV shows/short videos, listening to music, browsing social media posts, and online news, Sockett and Toffoli (2020) recommended dedicating in-class pedagogical activities to productive activities like speaking and writing activities.
- *An ethnographic-metacognitive approach*: An ethnographic-metacognitive approach highlights the design of pedagogical activities that capitalize on the strengths of both in-class and out-of-class learning, fostering a seamless flow between them. In this approach, students take on the role of ethnographers who curate and share authentic online materials and interactions from digital wilds. Teachers act as boundary brokers, helping to establish metalinguistic and metacognitive connections by guiding students through in-class linguistic and discourse analyses of these digital artefacts (Godwin-Jones, 2019). They also familiarize students with the multicultural and multilingual aspects of online interaction (Godwin-Jones, 2019). The three-step pedagogical cycle of bridging activity proposed by Thorne and Reinhardt (2008) has drawn much attention. For instance, Yeh and Mitric (2023) demonstrated that a six-week intervention involving university English language learners in the analysis of Instagram artefacts boosted learners' cyberpragmatics and increased their intent to engage in similar digital practices for professional purposes.

Current pedagogical initiatives have three limitations: 1) this emerging body of literature has focused primarily on substantiating its effectiveness, lacking deeper insights into pedagogical issues critical to successful implementation; 2) there are no cross-over discussions between different pedagogical models and approaches, which limits the exploration of potential hybridization of elements across these models; and 3) existing studies have primarily examined the immediate effects on linguistic performance, failing to capture the longitudinal impact on learners' in-class learning and out-of-class digital experience. Given the limitations, we suggest the following research tasks:

Research task 3

To conduct in-depth explorations into pedagogical design issues under each pedagogical model

To deepen our understanding of pedagogical models in terms of *the spatio-temporal dimension*, we need to delve deeper into students' interpretation and appropriation of the spatio-temporal characteristics of a particular learning situation. For instance, it is worthwhile to examine what material resources students consider relevant or irrelevant, how they position themselves and others within the learning space, the social relationships they establish and utilize, and how their spatio-temporal habits influence the activities they engage in. Insights from these in-depth explorations can enrich the design dimensions of seamlessness when designing synergizing learning experiences. To enrich the design of pedagogical models along *the learning control dimension*, we may explore how varying levels and combinations of learner control – such as autonomy, competence, and relatedness in self-determined learning initiatives – alongside the nature of teacher support, can shape the degree and sustainability of learning that learners initiate across different spaces. To enrich the design of pedagogical models along *the learning attribute dimension*, we may examine what types of pedagogical activities can be designed and what scaffolding mechanisms need to be built in to enhance the fluidity of knowledge, capacities, and mindset across spaces. Moreover, we may want to identify issues that

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safeguard successful implementation of each pedagogical design, investigating factors such as learner characteristics (e.g. language proficiency, metalinguistic skills, learning beliefs, and prior informal digital experience), task procedure (e.g. feedback and post-task reflection), and task scaffolding (e.g. discourse analysis framework and reflection prompts).

Research task 4

To examine and compare the strengths and weaknesses of individual pedagogical models and explore how elements can be combined across pedagogical models to achieve target outcomes

These different pedagogical design models have different foci, and hence may carry different affordances for learning. Pedagogical initiatives along *the spatio-temporal dimension* focus on expanding the time and space for learning to enhance the learning effects and form the learning habits of connecting in-class and out-of-class learning (Lan & Lin, 2016; Wong et al., 2015). Pedagogical initiatives along *the learning control dimension* emphasize self-determined learning and may hence contribute more to the development of self-regulation skills and self-direction in learning (Hase & Kenyon, 2000). Pedagogical initiatives along *the learning attribute dimension* focus on familiarizing students' with both formal and informal learning attributes, and may carry more potential for empowering learners to benefit from informal learning experiences (e.g. processing and learning from authentic materials and participating effectively in social activities online). Within the learning attribute dimension, the compensatory approach aims for balanced and holistic language development, while the integration and ethnographic-metacognitive approaches focus on enhancing learners' informal digital experiences. In this context, the integration approach may boost learners' self-efficacy through providing mastery experience, whereas the ethnographic-metacognitive approach is likely to enhance relevant metalinguistic skills through metalinguistic and metacognitive analysis. Thus, it would be meaningful to investigate the respective benefits and pitfalls of different pedagogical models, enabling the field to have a comprehensive view and comparative understanding of the effects. We can then integrate effective elements from different pedagogical models to form hybrid models that augment the benefits and minimize the pitfalls of individual models towards a certain learning outcome. Different hybrid pedagogical models can be developed in relation to different outcomes.

Research task 5

To examine the longitudinal impact of pedagogical models on learners' experience both inside and outside the classroom

Pedagogical models that synergize in-class and out-of-class learning may influence both students' in-class learning performance and their out-of-class digital engagement. When examining the effects of synergizing activities, we need to measure both. As self-directed out-of-class learning behaviour may take time to develop, we may want to adopt longitudinal research designs that track both students' attitudes towards and engagement in in-class learning and the frequency and nature of students' self-directed out-of-class learning engagement over a time period upon the completion of the interventions. Table 2 summarizes the pedagogical models and suggested research tasks.

To undertake these tasks, we may want to conduct intervention studies, such as teaching action research, quasi-experimental studies, and design experiments. Teaching action research or (quasi-)experimental studies can be used to reveal the effects of these pedagogical models on various linguistic and/or cognitive and non-cognitive learning outcomes. For instance, researchers can engage parallel classes with different pedagogical models and compare the target learning outcomes across the two groups. Design experimental research can be used to examine effective design of a pedagogical model on the target linguistic and/or cognitive and non-cognitive learning outcome through

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Table 2. Research theme 2 and related tasks

Research theme	Pedagogical models	Tasks	Method
Pedagogical design that synergizes out-of-class digital experiences and in-class learning	• Synergize *the spatio-temporal dimension* to create seamless learning across time and space	• To conduct in-depth explorations into pedagogical design issues under each pedagogical model	• Design experimental research to examine design elements
	• Synergize *the learning control dimension* to enhance learner-initiated continuity of learning	• To examine the strengths and weakness of individual pedagogical models and explore hybrid models	• Teaching action research or (quasi-) experimental studies to reveal the effects
	• Synergize *the learning attribute dimension* to enhance fluidity of knowledge, capacities, and mindset across learning situations o The integration approach o The compensatory approach o The ethnographic-metacognitive approach	• To examine the longitudinal impact of pedagogical models on in-class and out-of-class learning	• Longitudinal research designs to capture long-term impact

rounds of iterative design so as to identify critical design elements, or combinations of elements. To assess the effects of a pedagogical model, it is essential to use a longitudinal research design. This approach allows us to capture the long-term impact not only on the target learning outcomes but also on students' attitudes towards and engagement in language learning both inside and outside the classroom.

2.3. Research theme 3: GenAI and learner-initiated synergizing of in-class and out-of-class learning

GenAI, with its capabilities of generating human-like, multilingual-versatile textual and visual outputs, holds great potential for self-directed personalized out-of-class learning (Vareberg & Platt, 2024). The affordances of GenAI for self-directed informal learning are multifaceted, including offering tailored and interactive support, providing immediate feedback and guidance, proffering learning materials, helping students locate and utilize open educational materials, and supporting monitoring and reflection on individual learning progress (Firat, 2023). These capacities enable tailor-made learning pathways, individualized feedback, and adaptive learning content and materials that fit individual needs and preferences. The generative capacity of GenAI, powered by advanced machine learning and natural language processing, enables it to assume various roles in supporting students' learning, including private tutor, learning partner, teacher, and peer. GenAI hence affords multiple possibilities of relationships, interactions, resources and activities, which distinguishes it from other digital resources. In this regard, it is important to discuss the potential of GenAI in supporting learners' self-directed personalized learning that extends learning beyond the classroom.

Research task 6

To explore the potential of GenAI in supporting learners' initiatives in synergizing in-class and out-of-class language learning

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To explore the potential of GenAI, we need to conceptualize dimensions of personalized learning that GenAI can support. At *the spatio-temporal dimension*, GenAI can serve as an out-of-class space that allows learners to seek customized learning materials (e.g. adaptive reading materials), feedback (e.g. feedback on individual essays) and scaffolding (e.g. explanations on sentence structures). The personalized task implementation allows optimal affective and cognitive states in completing school tasks (FitzGerald et al., 2018). At *the learning attribute dimension*, GenAI allows learners to personalize the contexts of learning activity through incorporating their out-of-school interests, experiences, and cultural backgrounds to recontextualize learning tasks (e.g. generate texts on topics of personal interest using textbook vocabularies or chat on topics of interest). The personalized recontextualization of learning enhances personal relevance of school learning experiences (Walkington & Bernacki, 2018). At *the learning control dimension*, GenAI supports learners to construct personal learning pathways that link experiences across contexts to solve authentic problems in daily life (e.g. recommend English resources on weight control) or participate in community initiatives. The personalized learning pathways help enhance the continuity of learning and boost personal meaning and value of language learning (Oller et al., 2021). Researchers may examine how GenAI changes learners' perception of language education and the goal of language learning in general, and how it consequently shapes their positioning of the role of in-class and out-of-class learning experience in the process. Researchers may also examine learners' perception of and engagement in different dimensions of self-initiated use of GenAI to synergize in-class and out-of-class learning, as well as the effects and influencing factors of such initiatives. Sequential exploratory mixed-method research design – comprising GenAI log data analysis, narrative inquiry, and/or interview studies, followed by survey studies – can be employed to understand and test the nature of the initiatives, effects, and the influencing factors.

At the same time, we need to be aware of the potential hazards associated with GenAI use, including over-reliance and passive dependence on the tool, diminished critical thinking, academic dishonesty, and thoughtless consumption of misinformation and biased information (Lo et al., 2024). Moreover, the level of expertise required for harnessing the capabilities of GenAI may contribute to an emerging digital divide (Cooper & Tang, 2024). Thus, it is equally important to examine not only the positive but also the negative influences of GenAI on the synergizing of in-class and out-of-class across student populations. It is meaningful to inquire how GenAI may augment or curtail (as a result of over-reliance) learner agency in out-of-class digital experiences and in language learning in general. Intervention studies can also be conducted to examine how GenAI-empowered personalized learning to synergize in-class and out-of-class learning can be supported. We envision that such inquiries can provide valuable suggestions on how GenAI can be harnessed to instrument learners' self-directed engagement in synergizing their learning experiences across spaces. Table 3 summarizes the potential of GenAI and suggested research tasks.

2.4. Research theme 4: Learner perception and practices

Learner agency influences the efficacy of both teachers' pedagogical design (research theme 2) and learners' self-directed initiatives (research theme 3) in synergizing in-class and out-of-class learning. Learners have been found to actively utilize, coordinate, and orchestrate technological resources and spaces to construct and reconstruct personalized learning ecologies across spatio-temporal situations (Cabot, 2014; Lai et al., 2022). Lai (2015) documented how a group of Hong Kong university foreign language learners consciously connected in-class and out-of-class learning: learners reused or extended digital resources from in-class activities outside the classroom and utilized out-of-class learning experience to enrich and compensate for the limitations of in-class learning. Kurata (2024) further found that Australian Chinese and Japanese language learners used in-class learning to compensate for limitations in out-of-class learning, such as grammar. Scholars have also observed variations in students' perceptions of the connection between in-class and out-of-class learning (Kashima & Benson, 2018; Kurata, 2024). These variations are attributed to learner beliefs.

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Table 3. Research theme 3 and related tasks

Research theme	Potential of GenAI in synergizing in-class and out-of-class learning	Tasks	Method
Affordances of GenAI in synergizing in-class and out-of-class learning	• GenAI enables out-of-class personalized support for school task implementation	• To examine how GenAI shape learners' perception of language learning and the role of in-class and out-of-class learning	• sequential exploratory mixed-method research design (with GenAI log data plus learner narrations followed by questionnaire) to understand learner perceptions, the nature of use, effects, and the influencing factors
	• GenAI empowers the incorporation of out-of-class interests, experience, and cultural resources to recontextualize of school learning	• To examine the positive and negative influence of GenAI on learner agency in synergizing in-class and out-of-class learning	• Intervention studies to examine the effects of GenAI and the effects of learner training programs
	• GenAI supports personalized learning in fulfilling daily life needs and civic participation to infuse personal meaning and value to school learning	• To examine learners' engagement in different dimensions of personalized learning with GenAI, including the effects and influencing factors • To explore how to develop learner capacity in harnessing GenAI to synergize in-class and out-of-class learning	

For instance, Lai (2015) found that learners' perceptions of the limitations of in-class learning, along with their beliefs about language learning, influenced their engagement – or lack thereof – in out-of-class digital experiences and the nature of those experiences. Kashima and Benson (2018) revealed that learners' perception of language learning in general (e.g. the communicative functions of English) shaped whether they would perceive the necessity of connecting in-class and out-of-class learning and would seize the opportunities for bidirectional transfer of experiences across the settings.

This body of literature has mainly documented the nature of learners' perceptions and practices, shedding limited insights into whether and how these perceptions and practices influence learning processes and outcomes. More importantly, although researchers point out the necessity and importance of supporting learners in connecting in-class and out-of-class learning (Kashima & Benson, 2018; Kurata, 2024), there has been a scarcity of research on how such support can be delivered.

Research task 7

To profile learners' synergizing initiatives and examine its effects and its influencing factors

Research efforts are needed to examine what synergizing practices learners engage in. Qualitative inquiries (e.g. interview and diary studies) can shed light on types of synergizing practices, and profile or cluster analysis can be utilized to unravel clusters of synergizing practices. Subsequent quantitative methods (e.g. regression analysis, ANCOVA analysis, and structural equation modelling) can reveal how different synergizing initiatives associate with students' in-class and out-of-class learning. Further, in-class learning attitudes and experience, out-of-class learning behaviours, and various

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linguistic, cognitive and non-cognitive outcomes can be compared across clusters of learners who exhibit different patterns of synergizing initiatives. The clusters and relationships can also be compared among learners in foreign language learning contexts and second language learning contexts to reveal how patterns may vary across these environments. In addition, research is needed to identify influencing factors that shape learners' frequency and nature of synergizing initiatives. Factors that influence students' self-directed out-of-class language learning might be a starting point for the investigation (e.g. Lai, 2023; Rezai et al., 2024). Insights gained from this line of inquiry can shed light on the quality of synergizing initiatives and guide the design of learner support.

Research task 8

To explore how to support learners' agentic actions in synergizing in-class and out-of-class learning

To promote and support learners' agentic actions in connecting in-class and out-of-class learning, we refer to self-directed learning theories for insights. These theories highlight that self-direction is both a purposeful process driven by the need to solve real world problems, and a proactive process where learners autonomously manage the learning trajectory to achieve personal growth (Morris, 2023). Thus, both real life purposes and self-regulation need to be considered when promoting agentic actions in connecting in-class and out-of-class learning. For instance, Lai et al. (2024) found that pursuing personal interest in English and self-regulation both significantly predicted learners' engagement in out-of-class digital English learning, though with differing effects. Morris (2023) has further added two more dimensions: 1) empowering learners to deal with contextual constraints, such as to overcome barriers in the digital resource, in institutional practices and policies, and in sociocultural contexts; and 2) developing positive personality traits, such as openness, conscientiousness, optimism, robustness in maintaining intrinsic motivation, and the adeptness of learning from varied sources.

Teachers play an essential role in supporting learners to make the connection between in-class and out-of-class learning. Teachers can validate students' everyday use of digital resources, create opportunities for students to draw on their everyday knowledge and practices, share resource quality evaluation criteria, deliver explicit learner training on self-regulation, and suggest strategies of interacting with individual digital resources and language learning strategies (e.g. García Botero et al., 2021; Lewin & Charania, 2018; Rashid et al., 2021). Hoi and Mu (2021) conceptualized two types of teacher support: teachers' orientation support (e.g. encouragement, recommendation, cognitive and metacognitive support) and teachers' behavioural support (e.g. incorporation of digital resources in teaching and student activities). They found that both types of teacher support predicted Chinese university students' perceived usefulness and competence and their actual engagement in out-of-class digital activities.

The efficacy of these training components and teacher support mechanisms needs to be put into empirical testing. We need to explore how these training components and teacher support mechanisms interplay to influence learners' synergizing initiatives. We need also to reveal contextualized manifestations of these components and mechanisms in different contexts. Both retrospective (e.g. narrative inquiry or interview) and prospective (e.g. longitudinal ethnographic or diary study) qualitative methods can be employed to shed light on these issues. The conceptualized relationships can then be tested through larger-scale quantitative research methods, such as structural equation modelling, to reveal mediation or moderation effects. Longitudinal methods, such as latent growth modelling, can also be employed to reveal the strengths of individual dimensions at different developmental stages. Multi-group analysis can generate context-sensitive insights into effective training. Classroom-based research, such as quasi-experimental studies, teaching action research or design experiments, can shed light on the design of effective intervention programs in different contexts. Insights into the manifestation and interactions of these dimensions in different contexts and for

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Table 4. Research theme 4 and related tasks

Research theme	Tasks	Method
Learner perception and practices	• To understand learners' synergizing practices and examine the effects and influencing factors	• Qualitative inquiry to understand the types of practices and profile or cluster analysis to identify clusters
		• ANOVA test to compare the nature across contexts
		• Structural equation modelling or regression analysis to understand the influencing factors
	• To conceptualize how to support learners' agentic actions in connecting in-class and out-of-class learning o To devise the training components ■ Four dimensions of self-directed learning (driven by real life purposes; self-regulation; strategies to overcome contextual constraints; positive personality traits) ■ Language learning beliefs o To devise the types of teacher support	• Retrospective (e.g. narrative inquiry, interview) and prospective (e.g. longitudinal ethnographic or diary study) qualitative methods followed by large-scale quantitative testing
	• To examine the interplay of the training components and the effects of different teacher support in different learning contexts	• Multigroup analysis to generate context-sensitive insights into effective training
		• Classroom-based research, such as quasi-experimental studies, teaching action research or design experiments, to examine the training effects

different learners can inform the prioritization and sequencing of intervention components. Such insights may also enable the optimization of high-leverage components, and context-specific tailoring thereof, when designing learner support programs in different learning situations. Table 4 summarizes the suggested research tasks.

2.5. Research theme 5: Teacher perception and practices

Teachers are important boundary brokers who can strengthen the link between in-class and out-of-class learning (Lewin & Charania, 2018). Previous studies have shown that teachers, despite acknowledging the value of out-of-class digital experiences, tend to assume minimal responsibility for students' learning experience beyond the classroom. The lack of enthusiasm is driven by: 1) an overestimation of students' capacity in locating online resources themselves; 2) a self-positioned role of delivering foundational knowledge about the language; and 3) concerns over learners' inability to process authentic materials online and engage in ineffective interaction with online resources, and the inaccuracy of the information and language use online (e.g. Hannibal Jensen & Lauridsen, 2023). Accordingly, teachers' synergizing initiatives are primarily in the form of encouragement or awareness raising, and recommendation of well-structured instructional materials or adapted materials for the purpose of reinforcing instructional content (Toffoli & Sockett, 2015). They integrate online resources as teaching materials primarily for instructional purposes, with no intention of stimulating or supporting learners' use of similar materials beyond the classroom (Upara & Chusanachoti, 2023). Teachers also report adjusting in-class teaching in response to students' out-of-class digital experiences. Reported strategies include adjusting activity designs to incorporate

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authentic cultural artefacts and providing students with opportunities for creative language use to minimize motivational dissonances of in-class and out-of-class learning (Henry et al., 2018), as well as strengthening grammar instruction to ameliorate learners' exposure to inaccurate language use in online spaces (Schurz et al., 2022).

Teachers can facilitate the synergizing of in-class and out-of-class learning both through pedagogical design and through learner support. Existing literature lacks a comprehensive picture of teachers' perceptions and practices of synergizing initiatives and the influencing factors, information that is critical to the development of teacher education programs. We therefore recommend the following research task:

Research task 9

To examine the nature of teachers' synergizing initiatives and the influencing factors

To understand the nature of teachers' synergizing initiatives, we can start with qualitative inquiries, such as interviews, reflection journals, class observations, or analysis of teaching artefacts, to derive emic views into teachers' cognition of and actual engagement in connecting in-class and out-of-class learning. The pedagogical models in research theme 2 and the teacher support framework in research theme 4 provide theoretical frameworks to guide the qualitative inquiries. Collecting contextualized emic insights into teachers' digital bridging practices informs the design of questionnaires, which can be employed to determine the factor structure of digital bridging initiatives through exploratory and confirmatory factor analyses. Schurz and Sundqvist (2022) represent an initial step towards this direction. Their survey study with secondary school English teachers from four European countries revealed three factors: 1) 'perceived importance of connecting EE [extramural English] and ELT [English Language Teaching]'; 2) 'bridging EE material to class'; and 3) 'compensating for informal extramural language use'. Given that teaching practices are shaped by characteristics of the teaching contexts, this line of inquiry needs to be expanded to varying contexts, such as examination-centred cultures and different education levels.

To unravel the influencing factors, we can refer to two bodies of literature: 1) teachers' boundary-crossing pedagogical initiatives and 2) teacher technology adoption. Previous studies have revealed the following factors that shape teachers' intention to connect in-class and out-of-class learning: teachers' visions of education and perception of learning (Lai & Smith, 2018; Nordqvist & Liang, 2015) and school culture (e.g. the legitimization of informal experiences in school assessment practices, curricular foci) (Ito et al., 2013; Schurz & Sundqvist, 2022). Previous literature also suggests a rich list of factors that influence teachers' instructional behaviours in relation to technology (Lai, 2023): 1) internal factors: teachers' epistemological, pedagogical, and motivational beliefs, teacher identity, teachers' knowledge and skills, teachers' anxiety and techno-stress, and dispositional characteristics such as personal innovativeness and attitudes towards change; 2) macro-level factors: policy pressure, school culture, language and literacy standards in conventional assessment, parental ideology of language learning and digital surveillance at home, and home literacy practices; and 3) local-level factors: social influences and facilitating conditions. These factors serve as a point of departure to conceptualize factors that influence teachers' synergizing initiatives, which can be further contextualized via qualitative inquiries and validated via survey studies (e.g., Lai & Shi, 2025). Contrastive case studies, multigroup statistical modelling or epistemic network analysis can generate insights into the interplay of influencing factors in different teaching contexts. As the prominence of factors may vary for different synergizing initiatives and at different stages of implementation, the relative influence of these factors can be revealed through cross-sectional research designs, such as to document and compare the influencing factors for teachers with different synergizing profiles. The

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Table 5. Research theme 5 and related tasks

Research theme	Tasks	Method
Teacher perception and practices	• To explore the nature of teachers' synergizing practices	• Qualitative inquiries, such as interviews, reflection journals, class observations, or analysis of teaching artefacts, to derive emic views
		• Exploratory and confirmatory factor analyses to determine factor structure
	• To understand factors that influence teachers' synergizing practices o Factors that influence teachers' pedagogical initiatives of connecting in-class and out-of-class learning o Factors that influence teachers' in-class digital behaviours	• Qualitative inquiries plus survey studies • (Longitudinal) contrastive case studies, multigroup statistical modelling, or epistemic network analysis to generate insights into the interplay of influencing factors in different teaching contexts
	• To devise professional development initiatives o To categorize synergizing practices o To identify influencing factors o To gain knowledge of students' out-of-class digital behaviours o To develop strategies to circumvent obstacles at student, material, institution, social, and ideological levels specific to a sociocultural or teaching context and to specific implementation stages	
	• To test the effects of professional development initiatives	• (Longitudinal) case studies to trace the effects

dynamic interplay of these factors can be illuminated by longitudinal case study designs, such as to trace a group of teachers over their journey of implementing synergizing activities.

Exploring the nature and influencing factors of these issues is essential, but it alone is not sufficient for developing effective professional development initiatives. Similarly, teachers' understanding of students' out-of-class learning is also essential. Bourke and colleagues (2018) observed that unpacking students' out-of-class learning experiences led primary school teachers to consciously validate and integrate students' cultural capital in teaching and learning, attend to students' voice and agency, and position students as experts in class activities. In addition to raising teachers' awareness, professional development initiatives need also to familiarize teachers with potential hindering factors. According to Lai (2023), students' autonomous digital behaviours are shaped by the interplay of various interrelated factors across multiple layers: at the student level (e.g. digital literacy, digital habits, and self-regulation skills), material level (e.g. issues related to resource abundance and language accuracy), institutional level (e.g. school culture and validated forms of literacy practice), social/structural level (e.g. social inequality, power relationships, and cultural differences in digital practices), and ideological level (e.g. language learning ideology and educational ideology). Equipping teachers with strategies to overcome various obstacles at these levels specific to particular sociocultural or teaching contexts, as well as to specific implementation stages, is absolutely critical (Lai, 2023).

We then can put devised professional development programs into testing, and examine both short-term (e.g. changes in teachers' perception of, engagement in, and nature of digital bridging activities) and long-term effects (e.g. spill over into teachers' teaching behaviours in general). We anticipate that findings from this line of inquiry will shed light on the design of effective professional development programs that support teacher synergizing initiatives across sociocultural contexts. Table 5 summarizes the suggested research tasks.

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2.6. Research theme 6: Contextual variations

Learning context defines the quantity and quality of language learning experiences learners have access to. Consequently, contexts play an essential role in the synergizing efforts. The nature and effects of out-of-class digital language learning and the influencing factors thereof may also vary across contexts. For instance, Lee and Sylvén (2021) found that while the overall frequency of informal digital English activities significantly predicted L2 willingness to communicate for both Swedish and Korean secondary school English students, the frequency of receptive and productive activities were significant predictors only for Korean students, not for Swedish students. The authors attributed the observed contextual differences to the limited access to English in daily life among Korean students, which might have amplified the impact of informal digital experiences on their L2 willingness to communicate. De Wilde et al. (2022) found that listening to music, using social media, and speaking were significant determinants of Belgian Dutch-speaking primary school children's English vocabulary knowledge, but not for French vocabulary knowledge. They attributed the differences to greater exposure to out-of-class learning for English. They further found that linguistic differences concerning cognates made a difference in the effects. Moreover, optimal synergizing models and critical design elements in different contexts, and the constraints that teachers and students need to circumvent therein may also vary. For instance, Schurz and Sundqvist (2022) found that teachers' practices in connecting in-class and out-of-class learning varied across countries with different levels of appreciation of extramural (i.e. outside the classroom walls, Sundqvist, 2009) English exposure in national English curricula and differential levels of extramural English exposure in daily life. As teachers' teaching priority is shaped by sociocultural circumstances, we expect teachers' synergizing efforts may further diverge in different sociocultural and teaching contexts. Thus, it is meaningful and imperative to examine the sociocultural and linguistic contextual variations in the above five research themes.

However, existing literature has been primarily conducted in resource-abundant regions, such as in Europe, Hong Kong, and Korea, and on English language learning. We hence suggest the following research task:

Research task 10

To investigate how contextual factors (sociocultural contexts; linguistic contexts) influence synergizing efforts

To undertake this task, we recommend greater research attention to underprivileged populations, such as rural and indigenous communities, and low socio-economic status students, and under-resourced regions with poor digital infrastructure at school, such as Bangladesh, India, Mexico, and South Africa. Students in these sociocultural contexts face the following challenges in language learning: 1) they often suffer from low quality in-class language learning experiences and low motivation in language learning (Kormos & Kiddle, 2013); 2) they are found to exhibit digital or learning habits and skills that are not conducive to informal digital learning (Zhao et al., 2022); and 3) they are constrained by various factors in the sociocultural milieu, such as discursive and social resources, ideology towards language and language learning, parental expectations and digital surveillance, and home literacy practices (Lamb, 2013). To this group of populations, pedagogical initiatives that connect in-class and out-of-class language learning might be particularly beneficial in ameliorating the inequalities in their language learning experiences. But at the same time, influencing factors on the effects of synergizing efforts might also be different given their sociocultural circumstances. Similarly, research attention needs to be given to the learning of different languages. Linguistic characteristics (e.g. the availability of cognates and the logographic vs alphabetic written systems), the nature of digital resources available, the social status of the language, and the habitus of the professional communities may all contribute to a myriad of factors that result in differential findings across various

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Table 6. Research theme 6 and related tasks

Research theme	Tasks	Method
Contextual Variations	• To investigate sociocultural factors that influence teachers' and students' engagement in synergizing in-class and out-of-class learning	• Replication studies across different sociocultural and linguistic contexts, followed by qualitative inquiries to reveal the underlying reasons
	• To examine teachers' and students' engagement in synergizing in-class and out-of-class learning and the influencing factors in underprivileged regions and contexts	• Multigroup statistical modelling or contrastive case analyses to contrast the effects
	• To compare teachers' and students' engagement in synergizing in-class and out-of-class learning and the influencing factors across sociocultural contexts	• Qualitative inquiries to identify influencing factors across different contexts, followed by model testing
	• To compare teachers' and students' engagement in synergizing in-class and out-of-class learning and the influencing factors across linguistic contexts	

language learning contexts. For instance, Kurata (2024) revealed differences in learner-initiated synergizing initiatives among Australian learners of Japanese and Chinese due to the availability of digital resources in the target languages and the lack thereof. Table 6 summarizes the research tasks.

As a first step, replication studies need to be conducted across different sociocultural and linguistic contexts to examine the nature of out-of-class digital language learning and its effects. Such studies need to be complemented with qualitative inquiries to explain the potentially contrastive findings. We may also contrast the influence of out-of-class digital practices and the effects of pedagogical models that integrate in-class and out-of-class learning on various outcomes among well-resourced and less-resourced populations, as well as across different languages, by conducting multigroup statistical modelling or contrastive case analyses. More importantly, qualitative inquiries are needed to explore the myriad of factors that influence students' informal digital learning initiatives, their responsiveness to pedagogical models that synergize in-class and out-of-class learning, and the factors affecting teachers' pedagogical practices in different sociocultural and linguistic contexts. These inquiries can be followed up with model testing of the conceptualized influences across varying research contexts. We anticipate that this body of research will help the field to test the generalizability of existing research findings in different contexts and obtain context-sensitive insights into learners' informal digital experience and influencing factors.

3. Conclusion

With the proliferation of everyday technologies, augmented by the advent of GenAI, out-of-class digital learning is increasingly gaining attention in the field of language education. The language education community must confront the urgency of synergizing in-class and out-of-class language learning. The mixed blessings of technologies challenge the traditional classroom-centric paradigm of language education, prompting a reimagining of the roles of in-class and out-of-class learning in language development, and necessitating strategic coordination of the two to empower learners. Achieving this requires a thorough understanding of the interplay between in-class and out-of-class digital language learning to inform the conceptualization and implementation of relevant curriculum and pedagogy. However, research in this arena is lagging behind, as language education research has been fixating on the instructional contexts in the past decades. This Thinking Allowed piece charts a research agenda with six grand research themes, each demanding a large volume of research work.

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We hope this paper serves as a starting point for reimagining and strategically leveraging in-class and out-of-class learning experiences for language development.

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