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Self-directed language learning using mobile technology in higher education

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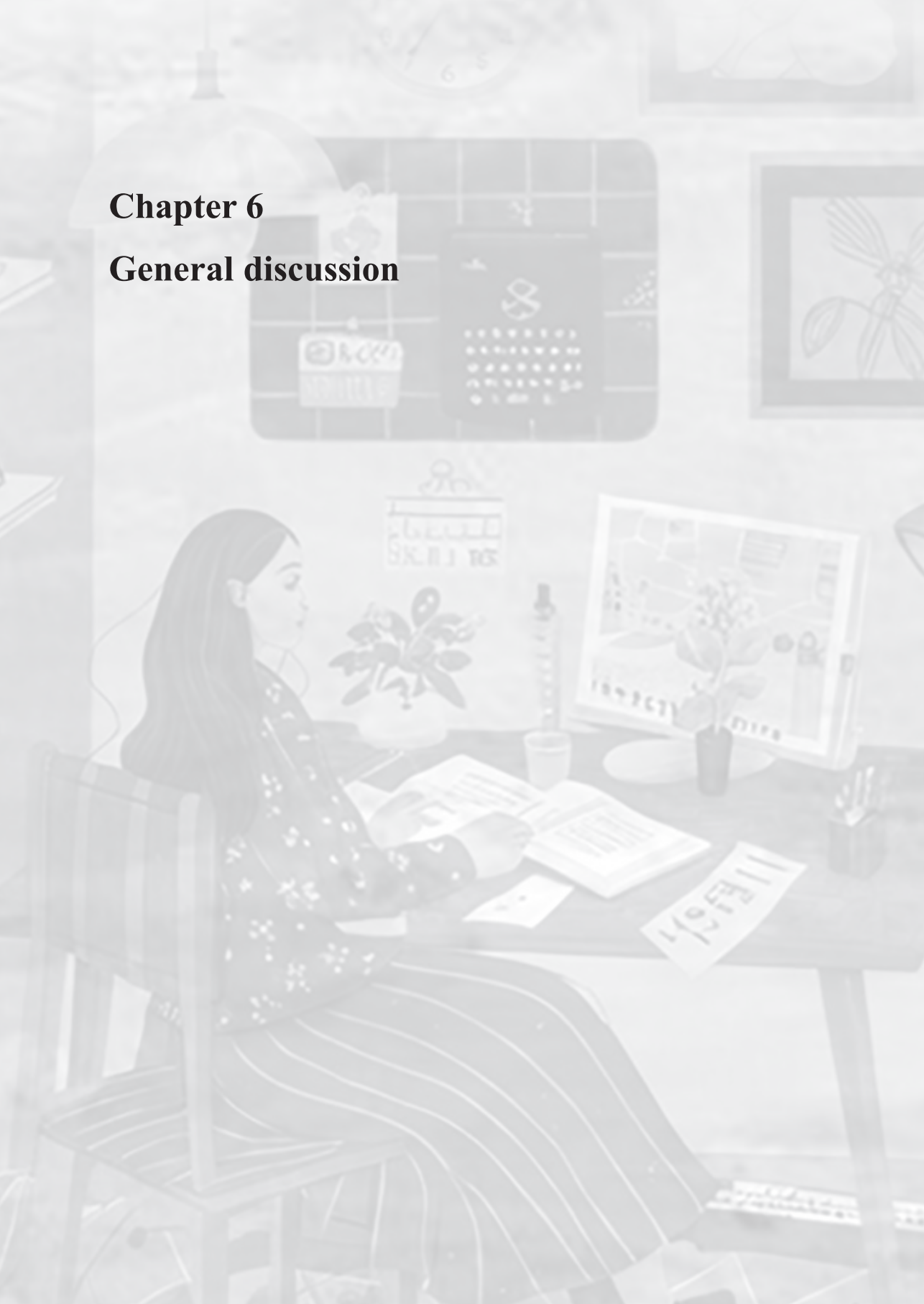
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Chapter 6

General discussion



6.1 Introduction

The dissertation aimed to contribute to theoretical and practical knowledge of self-directed language learning using mobile technology outside the classroom in higher education. The research aims of the dissertation were twofold. First, it was aimed at increasing our understanding of the learning experience of learners' self-directed learning process while preparing for IELTS (International English Language Testing System). Second, it was aimed at suggesting implications for improving the effectiveness of self-directed learning, with implications for learners, educators, and IT practitioners. Four studies were performed focused on (1) an overview of the learning strategies that learners used in their self-directed learning assisted by mobile technology (Chapter 2); (2) self-directed learners' learning process while preparing for the IELTS on their own (Chapter 3); (3) language learners' behavioral intention towards and actual use of mobile technology in self-directed learning (Chapter 4); and (4) language learners' engagement, satisfaction, and persistence in the context of informal, self-directed language learning using mobile technology (Chapter 5). In sum, the conclusions of the four studies will inform self-directed learners, educators, and software developers on how to effectively enhance self-directed learning with mobile technology.

In this final chapter of this dissertation, the main findings of each chapter are summarized first, followed by a discussion of the general findings. Next, the limitations and directions for future research will be provided. Finally, implications for the practice of self-directed learning are discussed to further promote self-directed learning using mobile technology, which can enhance the learning process and thereby achieve lifelong learning.

6.2 Main findings per chapter

Chapter 2. A Systematic Scoping Review of Learning Strategies in Self-directed Language Learning Using Mobile Technology in Higher Education.

In Chapter 2, a systematic scoping review was performed to examine the learning strategies that self-directed learners use with the support of mobile technology in language learning. The research questions that guide this scoping review were (1) What cognitive strategies did students use during their self-directed language learning using mobile technology?; (2) What metacognitive strategies did students use during their self-directed language learning using mobile technology?; (3) What affective strategies did students use during their self-directed language learning using mobile

technology?; and (4) What social strategies did students use during their self-directed language learning using mobile technology?

Regarding the first research question, Bloom's revised taxonomy was employed as the framework to measure cognitive strategies to determine the level of students' thinking (Anderson et al., 2001; Crompton et al., 2019). Appendix B shows the definition of each strategy. At the *remembering* level, the lowest cognitive level, eight kinds of learning strategies were identified. *Imagery, auditory representation and contextualization* were the most frequently identified in the reviewed articles, followed by *repetition, recombination, note-taking, resourcing and grouping*. Seven kinds of strategies were identified at the *understanding* level, including *resourcing, auditory representation, imagery, translation, repetition, inferencing and summarizing*. *Deduction and recombination* were identified at the *applying* level. No strategies were identified at the *analyzing* level, and *resourcing* was the only strategy examined at the *evaluating* and *creating* levels. In summary, 16 out of 20 articles reported learners employing cognitive strategies, with more strategies at the *remembering* and *understanding* levels than at *applying, analysing, evaluating* and *creating* levels. This indicates that language learners mainly conduct more low-order learning strategies than high-order learning strategies. Moreover, there were 12 strategies identified in the cognitive learning processes. Table 6.1 shows that the strategies that were identified most are *resourcing* and *auditory representation*, which are low-level strategies.

With regard to the second research question, the widely-accepted cyclical self-regulatory phases proposed by Zimmerman (2000, 2008) were selected as the framework to categorize metacognitive strategies to show how students regulate their learning process. Four kinds of strategies were examined in the *forethought phase: resource management, organisational planning, environment management and advance organisation*. Eight kinds of strategies were found in the *performance phase*, the second phase of the cyclical self-regulatory phases, including *comprehension monitoring, production monitoring, time management, selective attention, directed attention, resource management, effort management, and problem identification*. *Monitoring* encompassed *comprehension monitoring* (checking whether learners understand) (Lai, 2019) and *production monitoring* (checking whether learners' language output is correct) (Lai et al., 2018; Lai & Zheng, 2018). The only learning strategy in the *self-reflection phase* was *self-evaluation*. In summary, 13 out of 20 reviewed articles were associated with metacognitive strategies in self-directed language learning. Table 6.2 shows the number of reviewed articles involving *forethought*

phase was the most, followed by that in the *performance phase* and the *self-reflection phase*, and only two articles involve using metacognitive strategies in all three phases.

Concerning third and fourth research questions, three kinds of affective strategies were examined including *self-motivation*, *self-reinforcement*, *self-encouragement* and *self-talk*. Social strategies reported include *cooperation* and *questioning for clarification* (O'Malley & Chamot, 1990), and *help-receiving*. 14 out of 20 of the reviewed articles reported social strategies used in the self-directed language learning process.

Table 6.1 Number of reviewed articles involving in learning strategies in six cognitive categories.

Strategies	Remembering	Understanding	Applying	Analysing	Evaluating	Creating
Resourcing	1	9	-	-	3	2
Auditory representation	6	4	-	-	-	-
Imagery	6	1	-	-	-	-
Repetition	4	1	-	-	-	-
Contextualisation	5	-	-	-	-	-
Note taking	3	-	-	-	-	-
Recombination	3	-	1	-	-	-
Grouping	1	-	-	-	-	-
Inferring	-	1	-	-	-	-
Deduction	-	-	1	-	-	-
Summarising	-	1	-	-	-	-
Translation	-	1	-	-	-	-

Note. “-” denotes no article involving in the learning strategies here.

Table 6.2 Number of reviewed articles involving in metacognitive strategies in the three phases.

Strategies	Forethought phase	Performance phase	Self-reflection phase
Advance organisation	1	-	-
Selective attention	-	1	-
Directed attention	-	2	-
Organisational planning	4	-	-
Problem identification	-	1	-
Production monitoring	-	2	-
Comprehension monitoring	-	1	-
Environment management	2	1	-
Time management	-	2	-
Effort management	-	1	-
Resourcing management	8	1	-
Self-evaluation	-	-	5

Chapter 3. A netnography study on self-directed language learning experience using mobile technology

Chapter 3 was a qualitative study, exploring the learning experience of language learners in the context of self-directed learning using mobile technology. Four research questions were formulated: (1) How do language learners initiate their learning in the context of self-directed learning using mobile technology?; (2) What do language learners do in the forethought phase in the context of self-directed learning using mobile technology?; (3) What do language learners do in the performance phase in the context of self-directed learning using mobile technology?; and (4) What do language learners do in the self-reflection phase in the context of self-directed learning using mobile technology? The netnography approach was used to guide the data collection and analysis. The netnography process started with saving all online text posts related to preparing for IELTS in a self-directed way on Zhihu, an online platform for knowledge exchange.

The results showed how learners performed in four self-directed learning phases, which include learning task initiation, forethought phase, performance phase, and self-reflection phase, as indicated in table 6.3. *Learning task initiation* involves *motivation for English learning* and *self-directed learning*. Motivation for English language included studying abroad and professional development and motivation for self-directed learning included avoiding paid training courses and enjoying the sense of achievement after completing this self-directed learning. Forethought phase included *goal setting*, *strategic planning*, *task value* and *self-efficacy*. Regarding *goal setting*, eight participants reported having target scores, with two of them also setting smaller goals. Moreover, participants 1 and 32 mentioned setting their goals according to their personal needs. Participants developed *strategic plans* by gaining an *understanding of the test*, *selecting appropriate learning resources* and *making study plans*. About *task value* of self-directed learning, thirteen participants acknowledged the feasibility of self-directed learning as an effective means for IELTS preparation. Another participant referred to their prior self-learning experience to gauge their *self-efficacy*. The *performance phase* consists of *task strategies*, *help seeking*, *management*, *interest incentives*, *self-consequences*, *self-recording* and *self-monitoring*. In this study, sixteen different task strategies emerged from the data, comprising twelve cognitive strategies and four metacognitive strategies. Based on our data, participants *sought support* from teachers, peers, internet, native speakers and parents. The Internet was the most common source of help, with 19 participants using it to search for learning tips and resources. Participants *managed their time* by allocating specific hours for

four language domains, setting a minimum study time, and using spare time for learning. For the *environment management*, one participant stated that changing the learning environment, such as studying in a different place, made them motivating. One participant also mentioned the need to *screen learning materials* to ensure their relevance and effectiveness. With regard to *interest incentives*, participants mentioned several methods to make them motivated and persistent, including making daily to-do-lists, using learning platforms with high interactivity, which is easier to stick with, uninstalling the recreational mobile apps, and employing the concentration apps (e.g., Forest). In addition, only one (Participant 17) reported they used the *self-consequences* in the process. They bought a gift or went to see a movie as a reward after completing a major goal. This study identified four types of *self-recording*: new or useful vocabulary and expressions, point-losing parts, helpful learning tips, and orally practicing audio recordings. Production monitoring, comprehension monitoring and other monitoring were identified in this study. Moreover, *self-evaluation* and *self-reaction* were identified in *self-reflection phase*. Participants used their final grades as a metric to *self-evaluate* their performance. Regarding *self-reaction*, learners made suggestions and concluded the difficult parts when reflecting on the whole learning process.

Table 6.3 Codes in self-directed learning phases and their summary.

Phases	Code	Sub-code	Summary
Learning task initiation phase	Motivation for English learning		<ul style="list-style-type: none"> • Study abroad • Professional development
		Motivation for self-directed learning	<ul style="list-style-type: none"> • Avoid paid training courses • Enjoy the sense of achievement after completing this self-directed learning
Forethought phase	Goal setting	Target score	<ul style="list-style-type: none"> • Target scores • Smaller goals
		Understand the test	<ul style="list-style-type: none"> • Acquire the basic information about the test, useful learning tips, and the key parts of the test • Through the IELTS website, textbooks, online question-and-answer platforms (e.g., Zhihu), or online introductory videos
	Strategic planning	Select appropriate learning resources	<ul style="list-style-type: none"> • Paper learning resources • Electronic learning resources • Vocabulary memorization apps was the most frequently noted category
		Make study plans	<ul style="list-style-type: none"> • The criteria of making plans: <ul style="list-style-type: none"> ○ The amount of time available ○ Their preferred learning styles, and ○ Current level of English proficiency that was determined by their grades in previous English exams or a mock IELTS test

Performance phase	Task value	Value of SDL	<ul style="list-style-type: none"> • Search for study plans online • Use Excel app • Feasibility of self-directed learning as an effective means for IELTS preparation
		Self-efficacy	<ul style="list-style-type: none"> • Way of self-assessing self-efficacy: • A self-test • Prior self-learning experience
	Task strategies	Repetition	<ul style="list-style-type: none"> • Repeat exercises to maximize their learning outcomes • Go over what they have learned or summarized • Listen to the audio materials intensively • Read the materials intensively and recite new vocabulary repeatedly during reading practice • Analyze model essays one after another in writing • Record their own speaking and listen back
		Key word	<ul style="list-style-type: none"> • Underline the keywords in the questions before listening and reading to get them prepared, and then pay extra attention to these keywords during the listening and reading.
		Note taking	<ul style="list-style-type: none"> • Keep the key words in mind in speaking practice • Take notes of the key information and the parts that caused confusion while listening to the materials.
		Grouping	<ul style="list-style-type: none"> • Group the parts where they were losing points in listening, reading and speaking practice. • Classify the new vocabulary

	Contextualization	Authentic context	<ul style="list-style-type: none"> • Guess the meaning in the context • Extensively immerse themselves in the English TV series, movies, talk shows, books, vlogs in YouTube or Bilibili, and BBC news. • Alternate between watching videos with English subtitles, Chinese subtitles and no subtitles. • Engage in self-talk in English 		
		Imitation	<ul style="list-style-type: none"> • Imitate the pronunciation and intonation after listening to or speaking along with language materials. 		
		Variety	<ul style="list-style-type: none"> • Use various expressions rather than consistently relying on the same ones 		
		Translation	<ul style="list-style-type: none"> • Translate in writing and reading practice 		
		Resourcing	<ul style="list-style-type: none"> • Use Google engine 		
		Induction	<ul style="list-style-type: none"> • Conclude the rules for writing a good essay 		
		Deduction	<ul style="list-style-type: none"> • Employ the rules or tips learned into their own essays 		
		Selective attention	<p>Give specific attention to:</p> <ul style="list-style-type: none"> • In the listening domain: <ul style="list-style-type: none"> ○ The point-losing parts ○ The difficult sections, and ○ Areas requiring extra attention • In the reading domain: <ul style="list-style-type: none"> ○ The point-losing ○ The difficult parts 		

	<ul style="list-style-type: none"> ○ The titles, first and last sentences of every paragraph • In writing practice: <ul style="list-style-type: none"> ○ Essay structure ○ The use of liaison ○ Nouns of locality • In speaking, <ul style="list-style-type: none"> ○ Pronunciation ○ Intonation ○ Liaison • Preview the questions before engaging in the listening and reading activities • Generate a plan before writing an essay • Identify their problems during learning, and then implement targeted training to address these issues • Ask for listening tips, feedback • Turn to high-scoring peers and English-major friends for feedback • Established learning groups • Search for learning tips and resources • Essays evaluation and coaching on speaking skills • Monitor the learning progress • Changing learning environment. • Setting the phone's system in English. 		
	Advance organization		
	Organizational planning		
	Problem identification		
	Teacher support		
Help seeking	Peer support		
	Internet support		
	Native speakers' support		
	Parent support		
Management	Environment management		

	<ul style="list-style-type: none"> • Extensively listening to English videos while walking and commuting, and • Writing English blogs and posts on Quora • Allocate specific hours for four language domains • Set a minimum study time, and • Use spare time for learning • Screen learning materials • Adjust their study plans by • Revising subplans that were not completed on time • Incorporating targeted training for weak areas that were identified during the learning process • Make daily to-do-lists • Use learning platforms with high interactivity • Uninstall the recreational mobile apps, and • Employ the concentration apps • Exercise • Meditation • Yoga • Socialize with friends, and • Watch movies • Buy a gift or went to see a movie as the reward after completing a major goal 		
	Time management		
	Resource management		
	Plan adjustment		
	Self-motivation		
Interest incentives	Emotion adjustment		
Self-consequences			

Self-reflection phase	Self-recording	Self-recording of new or good expressions	<ul style="list-style-type: none"> • Make records of new or useful vocabulary and expressions
		Self-recording of point-losing parts	<ul style="list-style-type: none"> • Reasons for losing points in reading: • Inability to understand the article • Inability to find the answers even when understanding the article • Inability to understand the questions; and • Not knowing the correct answers even when the questions are understood
		Self-recording of useful learning tips	<ul style="list-style-type: none"> • Make recordings of useful learning tips
		Self-recording of oral practice audio recordings	<ul style="list-style-type: none"> • Make their own oral practice audio recordings using cell phone or specific apps
		Production monitoring	<ul style="list-style-type: none"> • Look up listening materials • Compare with the reference answers in reading and listening practice • Compare their revised versions in writing, and • Self-correct their mistakes after listening to audio recordings or receiving feedback from others in speaking
		Comprehension monitoring	<ul style="list-style-type: none"> • Keep asking themselves questions while reading articles
		Other monitoring	<ul style="list-style-type: none"> • Track their grades
		Final grades	<ul style="list-style-type: none"> • IELTS grades
		Suggestions	<ul style="list-style-type: none"> • Practice listening and speaking insistently
		Self-evaluation	
Self-reaction			

			<ul style="list-style-type: none"> • Summarize consciously, and • Use helpful mobile devices or apps 	
		Challenges	<ul style="list-style-type: none"> • Speaking, especially pronunciation and fluency • Maintaining a positive mood during the learning process 	
		Conditions for successful SDL	<ul style="list-style-type: none"> • Self-discipline and self-control • Effective learning methods • Emotional control • Planning and executing capabilities • The ability to access learning materials and information 	
		Disadvantages of SDL	<ul style="list-style-type: none"> • Time-consuming • Less feedback and materials • Easy to give up 	
		A sense of satisfaction	<ul style="list-style-type: none"> • Feeling a sense of satisfaction 	
		Improved SDL ability	<ul style="list-style-type: none"> • Improved self-directed learning ability 	

Chapter 4. Factors influencing university students' use of mobile technology in self-directed language learning.

The objective of Chapter 4 was to investigate which factors drive or hinder university students' use of mobile technology for self-directed language learning outside the classroom. The Integrative Model of Behavior Prediction (IMBP; Fishbein & Ajzen, 2010) was employed as the theoretical model. A survey was developed to collect data about demographic information, a screening question, self-regulation skills, the activities that students had participated in when using mobile technology to self-study English language, and attitude, subjective norm, self-efficacy, facilitating conditions, behavioral intention, and actual behavior. A total of 676 students completed the questionnaire. Structural equation modeling (SEM) with Mplus 8.3 (Muthén & Muthén, 2017) was employed in this study to analyze the data. Three research questions guided this study, including (1) To what extent do attitude, subjective norm, and self-efficacy relate to university students' behavioral intention toward using mobile technology in self-directed learning?; (2) To what extent do behavioral intention, facilitating conditions and self-regulation skills relate to university students' actual use of mobile technology in self-directed learning?; and (3) To what extent do self-regulation skills moderate the relationship between behavioral intention and actual use of mobile technology in self-directed learning?

The descriptive statistics indicated that over 50% of participants learned English in a self-directed way to pass language tests and get better work or study opportunities in the future. Another two participants reported that they conducted self-directed English learning because they wanted to improve their poor basic language ability. Regarding the activities that they participated in, most participants used mobile technology to learn vocabulary and translate, compared to practicing listening, speaking, reading, writing and other activities. Furthermore, students' attitude and subjective norm were positively related to their behavioral intention. Behavioral intention and self-regulation skills positively and significantly predicted their actual behavior. No significant relationship was found between self-efficacy and behavioral intention. In addition, Self-regulation skills significantly and positively moderated the relationship between behavioral intention and the actual use of mobile technology in the self-directed learning process. This means the higher the students' self-regulation skills were, the stronger the relationship between students' intention and actual use of mobile technology.

Chapter 5. Factors influencing university students' persistence and satisfaction towards self-directed language learning using mobile technology.

Chapter 5 was also a quantitative study, which examined the factors affecting learners' persistence and satisfaction when conducting self-directed language learning using mobile technology (SDLLMT). It also sought to investigate whether differences in SDLLMT existed between students with high and low language proficiencies. A total of 446 respondents visited the questionnaire website and 352 successfully completed the questionnaire. Four stages of analyses were performed, including an independent sample *t*-test, The measurement model, the structural model, and a mediation analysis. The research questions that guided this study were (1) Is there any difference in SDLLMT between students with high and low language proficiency?; (2) How is learners' satisfaction explained by teacher support, learners' mobile readiness and engagement in SDLLMT?; (3) How is learners' persistence explained by teacher support, learners' mobile readiness and engagement in SDLLMT?; and (4) How do mobile readiness and engagement mediate the relationship between teacher support and both outcome variables of SDLLMT?

In terms of the first research question, the findings showed that students with high and low language proficiency did not show a statistical difference in learners' mobile readiness, engagement, satisfaction, persistence, and teacher support they received. For the second and third research questions, teacher support had a significant effect on mobile readiness. Mobile readiness and teacher support were significantly associated with engagement in SDLLMT. Mobile readiness was directly related to satisfaction. Mobile readiness and engagement had a direct relationship with persistence in SDLLMT. Concerning the third research question, only one mediation relation was found in this study. The effect of teacher support on engagement was significantly mediated by mobile readiness.

6.3 Enhancing learners' learning experience and effectiveness in the context of self-directed language learning using mobile technology

The studies outlined in this dissertation aimed to enhance our comprehension of informal and self-directed learning with mobile technology in the subject of foreign language in higher education. In this section, we elaborate and discuss how learners navigate their self-directed learning process with the aid of mobile technology and how to enhance the effectiveness of this learning approach in higher education settings.

6.3.1 Learning experience in self-directed language learning using mobile technology

The imperative of delving into the intricacies of students' learning experiences is paramount. It provides insights into factors that influence students' motivation, engagement and performance. By incorporating elements that resonate with students' interests, preferences, and learning styles, educators can create more engaging and interactive learning environments. Moreover, every student has unique learning needs and preferences (Starks & Reich, 2023). Understanding how students learn helps educators not only tailor teaching methods, curriculum design, and classroom environments to enhance learning outcomes (Kumar et al., 2023), but also personalize instruction to meet individual students' requirements, strengths, and weaknesses. This approach fosters a more inclusive and supportive learning environment where all students can thrive. The studies described in Chapter 2 and 3 increased our insights into students' learning experience in the context of self-directed learning using mobile technology by investigating the learning strategies that learners used and what they did in the self-directed learning process. This section focuses on learners' self-directed learning phases, and affective and social perspectives.

6.3.1.1 Self-directed learning phases

This part reveals learners' self-directed learning phases, and their interaction with mobile technology usage and language domains. Based on the results of Chapter 2, few empirical studies examined all self-regulatory phases. For this reason, Chapter 3 aimed to investigate the learning experience from the perspective of self-regulatory phases. Self-directed learning is a learning process that emphasizes individuals as autonomous, independent, and responsible managers of their own learning. As stated in Chapter 3, the initiation of learning tasks signifies the beginning of self-directed learning for learners and can be, considered an integral part of the self-directed learning process. Additionally, reflecting on Knowles's (1975) conceptualization of self-directed learning as "the process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (p. 18), Jossberger et al. (2010), Saks and Leijen (2014) and Lai et al. (2023) regarded self-regulation as an essential part of self-directed learning. Moreover, the quality of self-directed learning is closely linked to the process of self-regulation (Long, 2000). For these reasons, the self-directed

learning process involves learners initiating their language learning tasks and regulating the learning process. Therefore, Chapter 3 explored learners' learning experience from the learning task initiation phase and Zimmerman's three-phase model of self-regulation (Zimmerman, 2000), namely forethought, performance, and self-reflection phases.

Mobile technology enables learning through its accessibility, offering resources like apps and online courses accessible anytime, anywhere. Its interactivity, including quizzes and games, fosters engagement and skill reinforcement. Personalization tailors learning experiences based on individual goals and proficiency levels. Synchronization across devices ensures seamless learning progression, while social features facilitate interaction with peers and native speakers. In essence, mobile technology empowers learners by providing diverse, interactive, and personalized language learning experiences, regardless of time or location. Despite the affordances of mobile technology in learning, little research focuses on how it was used in the self-directed learning process. For this reason, Chapter 3 investigated how mobile technology assisted self-directed learning phases. The findings showed that mobile technology was involved in two self-regulatory phases, but not in the self-reflection phase. This partly echoes the results from Yang et al. (2023) claiming that technology has been used in the performance phase instead of the forethought and self-reflection phases. Given the potential of mobile technology in the entire self-directed learning phases, future research is recommended to explore the feasibility and application of employing mobile tools for self-evaluation and the self-reflection phase, and also pay attention to examining self-directed learners' outcomes, not just their behavior.

Chapter 3 also explored the interaction between self-directed learning stages and four language domains: speaking, reading, writing, and listening. While most self-directed learning stages did not exhibit significant differences across these domains, two notable distinctions emerged. Firstly, in the aspect of creating study plans, it was observed that devising plans for reading and listening was relatively straightforward, as their proficiency levels could be evaluated by comparing individual responses to standardized benchmarks. Conversely, crafting plans for writing and speaking presented greater challenges due to the more complex nature of assessing proficiency levels in these skills. Secondly, a difference was noted in help-seeking behaviors, with more learners seeking support for writing and speaking compared to fewer seeking help for reading and listening. The possible explanation for this discrepancy could be the relatively higher degree of difficulty in writing and speaking practice. Therefore, self-directed learners could devote more

time and effort to preparing for the writing and speaking practices, such as trying to acquire high-quality learning information and resources on the two domains. Moreover, external assistance is particularly needed in writing and speaking parts.

6.3.1.2 Affective aspects

The affective aspect is crucial in self-directed learning as it includes learners' emotions, and motivation, significantly influencing their engagement and success (Dewaele, 2022; Kukulska-Hulme et al., 2023; Shen, 2021). Emotional well-being enhances cognitive functioning and information retention. Motivation, both intrinsic and extrinsic, drives learners to initiate and sustain their learning efforts. Recognizing and addressing the affective aspect ensures learners maintain enthusiasm, confidence, and a sense of ownership over their learning journey, leading to more meaningful and sustainable outcomes. However, Viberg et al. (2023) stated that few research focused on the affective part of self-regulation in mobile-assisted language learning. Moreover, Chapter 2 showed that affective strategies received little attention in research regarding self-directed language learning using mobile technology. Considering the significance of affective aspects in self-directed learning, therefore, more research is called to explore this field. Even though using mobile technology is widely acknowledged as a means to motivate students to learn (e.g., Poçan et al., 2023), it is temporary, and learners are easily giving up due to distraction and interruption by the recreational apps on it such as mobile apps, boredom, lack of useful materials (Crescente & Lee, 2011; Kacetl & Klímová, 2019; Wolter & Rosenthal, 2000). To solve this issue, Chapter 5 investigated how to improve learners' persistence and satisfaction from the perspectives of self-directed learners and teachers. The findings suggested that learners should be equipped with mobile learning readiness when conducting self-directed learning, and support from teachers as facilitators is extremely important. However, how to better utilize mobile technology and avoid its negative influence on the educational purposes is not covered by this dissertation. Thus, this direction also deserves attention.

6.3.1.3 Social interaction

Social interaction is crucial as self-directed language learning is viewed as a social endeavor (Alvi & Gillies, 2015; Heil et al., 2016). Moreover, mobile technology can play a pivotal role in facilitating social interaction within the language learning process. It provides learners with the

ability to share files, data, or simple messages, as well as authentic opportunities to practically apply what they have learned by collaborating and communicating with peers, native speakers, or instructors (Troussas et al., 2014). These capabilities support sustained language practice, thereby fostering motivation and enhancing language proficiency over time (Kukulska-Hulme & Viberg, 2018). The findings of Chapter 2 revealed that students rarely utilized technology for social interaction and harbored skepticism towards it. This skepticism stemmed from their lack of confidence in their proficiency levels during online interactions, fear of receiving inaccurate feedback, and absence of overlap between online acquaintances and potential language partners (Lai & Gu, 2011; Lai et al., 2018; Lai & Zheng, 2018). However, Chapter 3 demonstrated that learners actively sought assistance from various sources, including teachers, peers, the internet, native speakers, and parents. Among these, the internet emerged as the primary resource learners turned to. As online learning resources continue to proliferate across different formats and platforms, however, self-directed learners face a significant challenge in discerning the quality of these materials. The accessibility of such resources for free further complicates the task of evaluating their reliability and effectiveness (Hafiz et al., 2024). As a result, self-directed learners need to be meticulous in choosing materials that match their unique learning styles and preferences to ensure optimal learning outcomes.

6.3.2 Factors influencing university students' learning effectiveness in self-directed language learning using mobile technology

While numerous university students presently employ mobile technology to bolster their self-directed learning beyond the classroom, there exists significant variability in their utilization of mobile technology outside of class (Nguyen & Takashi, 2021; Zhang & Pérez-Paredes, 2019; Luo, 2019), and learners often tend to abandon the process prematurely (Cheng & Lee, 2018). To address this problem, the dissertation has conducted two quantitative studies to uncover the underlying factors. In Chapter 4 survey data from 676 language learners was gathered and employed the Integrative Model of Behavior Prediction (IMBP; Fishbein & Ajzen, 2010) as the theoretical model to examine the drivers and obstacles influencing university students' utilization of mobile technology for self-directed language learning outside the classroom. Furthermore, Chapter 5 explored the factors affecting learners' engagement, satisfaction, and persistence, examining perspectives from both self-directed learners and teachers.

The most influential factor on students' behavioral intention and actual use was their attitude towards mobile technology. Self-directed learning, which is typically learner-controlled and takes place outside of the classroom, entails learners taking responsibility for selecting suitable learning tools (such as mobile technology) and materials (Garrison, 1997). Therefore, it is logical to infer that attitudes and beliefs play a significant role in shaping students' intentions to utilize mobile technology for the self-directed learning process. The relationship between subjective norm and behavioral intention was found to be positive and significant. However, Hartwick and Barki (1994) noted that others' opinions are not significant in voluntary settings, only in mandatory ones, which aligns with the more general claim that the context moderates the relationship between subjective norm and behavioral intention (Venkatesh et al., 2003). Additionally, Srite (2006) suggested that different cultures influence this relationship as well. In individualistic cultures, subjective norm has a weak effect on behavioral intention, whereas in collective cultures like China, social interaction is vital for information transmission, and people prioritize interpersonal relationships (Srite, 2006; Zhao et al., 2021). Although self-directed learning relies on learners' choices, in collective environments, learners are still influenced by teachers, peers and other significant agents to maintain good relationships and receive support. Consequently, self-directed learners may seek assistance from teachers when needed and study with peers to motivate each other during the learning process. Unexpectedly, self-efficacy was not found to be significantly related to behavioral intention, contradicting previous studies that have suggested a significant effect of self-efficacy on behavior intention (Buabeng-Andoh, 2021; Park, 2009; Venkatesh & Davis, 1996). Cigdem and Ozturk (2016) explain this phenomenon, suggesting that due to the pervasive use of the Internet and technology in educational settings, today's learners are digital natives who enter universities with extensive knowledge and experience with mobile technology. Furthermore, the relationship between behavioral intention and actual behaviors of using mobile technology was found to be positive and significant. Additionally, self-regulation skills were predictive of actual behavior. A significant finding emerges from the notable and positive moderation effect of self-regulation skills on the relationship between intention and behavior. This indicates that the impact of behavioral intention on actual behavior strengthens with an increase in self-regulation skills. Put simply, students possessing higher self-regulation skills are more inclined to translate their behavioral intentions into actual behaviors compared to those with lower self-regulation skills. Evidently, students with superior self-regulation skills exhibit better abilities

to regulate their behavior, cognition, and motivation, all of which contribute to enhanced engagement and persistence in learning (Nicol & Macfarlane-Dick, 2006).

The initial adoption of the type of learning does not assure successfully acquiring a new language (Yang et al., 2019). Learners must persist throughout the learning journey, as mastering languages is a long-term endeavor that takes years, not just a few days (Fryer, 2019). According to the results in Chapter 5, learners' mobile readiness was discovered to strongly contribute to engagement in SDLLMT. Given that self-directed learning outside the classroom via mobile technology is entirely driven by learners (Lai et al., 2022b), they possess complete autonomy over their learning. Consequently, learners' characteristics exert considerable influence on their engagement (Kuo et al., 2021). It is reasonable to assume that learners who are well-prepared for mobile learning are more likely to actively engage in the learning process. Furthermore, teacher support exhibited a significant yet negative relationship with learners' engagement. However, it demonstrated an indirect and positive impact on engagement, with mobile readiness mediating this relationship. The negative association between teacher support and engagement can be interpreted as students in environments characterized by student-initiated and controlled learning being more inclined to relish the feeling of having full control over their learning process, possibly feeling discontented with excessive teacher involvement. Importantly, in the context of China, teachers remain highly significant for learners, even within self-directed and out-of-class settings. Direct teacher involvement may impose mental or emotional pressure on self-directed learners, subsequently diminishing their engagement in the learning process. The mediating role of mobile readiness can be comprehended as follows: learners who received greater teacher support tended to have higher levels of mobile readiness, consequently leading to increased engagement in SDLLMT. While many self-directed learners may prefer minimal teacher support in SDLLMT, some may not feel adequately prepared to navigate the learning process independently. In such cases, they still rely on teachers to guide them through their self-directed learning journey. Besides, mobile readiness significantly and positively predicted learners' satisfaction and persistence. Some researchers have highlighted partially significant relationships between mobile readiness and persistence. For instance, Chen et al. (2013) showed that technology readiness positively influenced users' persistence with mobile services. Conversely, Leung and Chen (2019) reported different findings, noting that while innovation -one of the drivers of technology readiness- significantly predicted continuance intention, optimism -another driver- did not. Due to the

ambiguous nature of the relationship between mobile readiness and persistence, coupled with the limited research in this area, future studies must delve deeper into this aspect. Moreover, teacher support was not found to significantly influence either learners' satisfaction or persistence in SDLLMT, contradicting findings from previous studies (e.g., Caskurlu et al., 2020; Yang et al., 2016) that revealed significant and positive relationships between teaching presence and students' satisfaction and persistence in online courses. In learner-initiated and -directed learning environments, as mentioned earlier, learners might prefer having full control over their learning process and may feel discomfort and dissatisfaction with excessive teacher involvement. Additionally, due to the emotional pressure exerted by Chinese teachers with high authority (Guo & Xu, 2021), learners may be hesitant to directly seek help and guidance from teachers. Therefore, future studies should aim to elucidate the intricate relationships among these variables in the context of self-directed learning.

Furthermore, learners' engagement was not found to be related to satisfaction but had a direct effect on persistence. The absence of a significant relationship between engagement and satisfaction is unexpected, considering that other studies have indicated that learners' engagement could predict satisfaction (Fisher et al., 2021; Rajabalee & Santally, 2020). As mentioned earlier in Chapter 5, we initially utilized three dimensions of learners' engagement (cognitive, emotional and behavioral engagement) but ultimately combined these subconstructs into one overall measure. Importantly, Lane et al. (2021) and Gao et al. (2020) both demonstrated that cognitive engagement failed to explain learners' satisfaction in blended learning contexts. Specifically, Gao et al. (2020) suggested that students were satisfied only when they were emotionally and fully engaged, as emotional engagement positively impacted satisfaction, while cognitive engagement did not. Lane et al. (2021) also found that emotional engagement was the primary predictor of student satisfaction across various courses, with cognitive engagement only explaining satisfaction in the computing science course. Thus, we hypothesize that the non-significant relationship between engagement and satisfaction observed in our study may be due to the inclusion of cognitive engagement items. Further research is warranted to examine the relationships between subdimensions of engagement and satisfaction and to explore explanations for these relationships through interview analysis.

6.4 Limitation and directions for future research

This dissertation provides insights into learners' learning experience in self-directed language learning using mobile technology, and the factors influencing their actual use and persistence in using mobile technology. When interpreting the results of this dissertation, some limitations need to be acknowledged.

The first limitation relates to data that was collected, which restricts the findings of the studies in the dissertation. In the studies presented in Chapter 4 and 5, self-reported questionnaires were used to collect the data about learners' perceptions, actual usage, and persistence, which might lead to bias due to subjectivity. In order to acquire more specific implications on how to improve students' learning, multiple methods of data sources could be introduced. For example, recorded data to track learners' actual usage, engagement, and persistence can be included, and recorded comments and reviews to extract learners' emotional perceptions through sentiment analysis techniques can be used as indicators of satisfaction. Additionally, qualitative methods can also be employed to gain deep knowledge about learners' perceptions. Moreover, along with learners' ever-changing attitudes, behavior, mobile readiness, and persistence usage, the cross-sectional nature of this study did not allow conclusions about students' development in actual usage, persistence, and satisfaction over time. Longitudinal research may be designed to exploit these changing factors at different points and see whether other variables such as prior experience affect students' continuance use of mobile technology.

The second limitation relates to the lack of insights into learning outcomes. Although the dissertation involves students' learning experience, perception, actual use, and learning satisfaction and persistence, no study was included to investigate their learning outcomes. It would be beneficial to not only examine the relationship between the factors that we have included in the dissertation and learning outcomes. Therefore, it also warrants attention to delve into this aspect in self-directed learning.

Thirdly, the conclusions drawn from all the studies are context-specific, as the participants in the four studies were native Chinese-speaking English language learners. Consequently, the findings cannot be easily extrapolated to other countries with distinct cultures. For this reason, future studies could be conducted in other cultural contexts to examine the use of self-directed language learning with mobile technology. Additionally, such studies should investigate the impact of language proficiency and various environmental factors on the utilization of self-directed

technology in language learning. By broadening the scope of research beyond a singular cultural context, we can gain a more comprehensive understanding of the dynamics involved in self-directed language learning with mobile technology.

6.5 Implications for practice

The dissertation has several implications for empowering self-directed learners, educators/teachers, and software developers.

6.5.1 Implications for self-directed learners

The findings of Chapter 2, 4, and 5 suggest that self-directed learners engage in preparatory activities prior to embarking on self-directed learning endeavors. Moreover, it appears that self-directed learning is more suitable for intermediate and advanced language learners compared to beginners (Sakai & Takagi, 2009; Ünal, Çeliköz & Sari, 2017). Beginners in language learning may find self-directed learning feasible only after achieving a basic proficiency level. Inspired by the result of moderation analysis in Chapter 4 and the direct and indirect effect of mobile readiness in Chapter 5, self-directed learners should attach great significance to their own mobile readiness. According to our findings, individuals with proficient self-directed learning skills and a favorable attitude towards mobile technology, coupled with confidence in its utilization, are inclined to experience satisfaction and persistence throughout the self-directed language learning process. Consequently, this leads to effective and successful learning outcomes. To enhance their proficiency as self-directed language learners, therefore, individuals should aim to attain a basic level of proficiency in the language, enhance their self-directed learning capabilities, and cultivate a positive outlook towards this learning approach.

6.5.2 Implications for language educators/teachers

Teachers play a pivotal role in fostering independence and self-direction in learners. They achieve this by providing clear objectives, appropriate resources, and effective learning strategies (Thornton, 2013). Self-directed learners often have limited knowledge of strategies and technology use, as highlighted in Chapter 2. Therefore, teachers can bridge this gap by offering a diverse array of technological resources, imparting metacognitive and cognitive strategies to maximize resource utilization, and encouraging active engagement with technology to enhance language learning

(Zhang & Pérez-Paredes, 2019). Chapter 3 underscores the importance of teachers and other facilitators offering specific cognitive and emotional support to self-directed learners whenever possible. Moreover, the positive impact of subjective norms, as evidenced in Chapter 4, suggests that teachers should engage students in discussions related to self-directed language learning using mobile technology. Educational institutions also bear the responsibility of nurturing students' self-regulation skills to facilitate self-directed learning, thereby fostering lifelong learning. Given the significance of learners' mobile readiness in informal learning and the critical role of teacher support, teachers can influence learners' self-directed learning skills and their perception of the advantages and their own capability of using mobile technology. Specifically, teachers can cultivate self-directed learning skills by gradually allowing students to take charge of their learning processes (Francom, 2010). They can also elucidate the benefits of mobile technology by designing mobile-based activities that highlight its positive functions in the foreign language classroom and encourage its extension to out-of-class and self-directed learning. Furthermore, teachers can enhance learners' proficiency in using mobile technology by offering technical guidance, suggesting useful online language resources, and providing explicit demonstrations of effective resource utilization (Hoi & Mu, 2021; Morris & Rohs, 2021). Through these interventions, teachers can empower learners to navigate the landscape of self-directed language learning with mobile technology effectively.

6.5.3 Implications for software developers

To enhance the personalized learning experience on mobile devices, software developers could integrate adaptive learning features into their applications. In both online and mobile learning environments, learners often disengage when they experience negative emotions such as fear, anxiety, and worry (Liu et al., 2022). High levels of anxiety can significantly dampen students' motivation, making it crucial to consider emotional states, as they profoundly influence learning outcomes (Wang et al., 2021). Therefore, it's essential for software developers to include affective monitoring and intervention features in language learning apps. For example, Benta et al. (2015) came up with a multimodal affective monitoring tool which used data from the sensors in a quest to acquire users' emotion for more precise affective states assessment in a foreign language learning application. These features would help learners mitigate negative emotions and sustain motivation and engagement throughout the self-directed learning process. By

addressing learners' emotional needs, software developers can create a more supportive and conducive learning environment, ultimately enhancing the effectiveness of mobile language learning applications.