Fachbereich Erziehungswissenschaft und Psychologie der Freien Universität Berlin

# Students' self-directed use of technology in language learning out of classroom in Chinese secondary context

Dissertation

zur Erlangung des akademischen Grades

Doctor of Philosophy (Ph.D.)

vorgelegt von

(MA) Liu, Qi

Berlin, 2022

Erstgutachter

**Prof. Dr. Harm Kuper**

Titel Vorname Nachname

Zweitgutachter/in

**Prof. Dr. Steffi Pohl**

Titel Vorname Nachname

Date of Dispute

**1st June 2022**

# Abstract

With the explosion of technological language learning resources, there is a need to provide a guide for students, educators, and providers of learning resources on how to effectively choose, recommend and design those available resources. The guide should cover the current situation regarding students' self-directed use of available technology-based resources for learning, the factors that influence their choices, and the learning outcomes that result from their different choices. The current study presented such a guide on these three aspects. I was inspired by a previous study a classification framework in technological learning experiences (Lai et al., 2017) to investigate students' actual use of technology in language learning beyond classroom. Thus, I partially replicated their methodology and provided more solid theoretical support, and referred to all the other literatures behind, adapting their three-type classification (1. instruction-oriented; 2. entertainment-and information-oriented; 3. social-oriented) of students' self-directed technological language learning experiences to a new context - Chinese secondary school students.

The study adopted exploratory sequential mixed methods and began with interviews with 15 students, followed by a survey (n=429) designed from interview results. The classification framework derived from the interviews undergone some changes in the factors after exploratory factor analysis (EFA). Taking into account the findings of the qualitative study as well as the EFA, I discussed the potential reasons for the changes and tentatively identified a four-category classification framework to differentiate various types of students' engagement in their self-directed language learning with technology beyond classroom. The difference of the four-type classification from the previous three-type one was that the second category was divided into two types in current research (1. Instruction-oriented; 2. Entertainment-oriented; 3. Information-oriented; 4. Social-oriented). This division was approved to be meaningful, as influencing factors and the learning output of these two types were approved to varied. This reliable and valid classification framework in current study was approved to be replicable into other contexts. Moreover, among four types, information-oriented technological leaning experiences was the only one that significantly predict learning outcomes. Thus, the results encourage students to utilize both affective and cognitive strategies in their self-directed language learning with technology, provided guidance to educators and educational product provides to choose or design engaging and authentic learning materials to best facilitate students in achieving better learning outcomes.

## Zusammenfassung

Angesichts der explosionsartigen Zunahme technologischer Ressourcen für das Sprachenlernen besteht die Notwendigkeit, einen Leitfaden für Schüler, Lehrkräfte und Anbieter von Lernressourcen zu erstellen, der aufzeigt, wie diese verfügbaren Ressourcen effektiv ausgewählt, empfohlen und gestaltet werden können. Der Leitfaden sollte die aktuelle Situation in Bezug auf die selbstgesteuerte Nutzung verfügbarer technologiebasierter Lernressourcen durch die Schüler, die Faktoren, die ihre Wahl beeinflussen, und die Lernergebnisse, die sich aus ihren verschiedenen Entscheidungen ergeben, abdecken. In der vorliegenden Studie wurde ein solcher Leitfaden zu diesen drei Aspekten vorgestellt. Ich habe mich von einer früheren Studie inspirieren lassen, in der ein Klassifizierungsrahmen für technologische Lernerfahrungen (Lai et al., 2017) entwickelt wurde, um die tatsächliche Nutzung von Technologie durch Studierende beim Sprachenlernen außerhalb des Klassenzimmers zu untersuchen. Daher habe ich ihre Methodik teilweise übernommen, eine solidere theoretische Grundlage geschaffen und mich auf die gesamte übrige Literatur bezogen, indem ich ihre Drei-Typen-Klassifizierung (1. unterrichtsorientiert; 2. unterhaltungs- und informationsorientiert; 3. sozialorientiert) der selbstgesteuerten technologischen Sprachlernerfahrungen von Schülern an einen neuen Kontext - chinesische Sekundarschüler - angepasst habe.

Die Studie verwendete explorative, sequenzielle, gemischte Methoden und begann mit Interviews mit 15 Schülern, gefolgt von einer Umfrage (n=429), die aus den Interviewergebnissen entwickelt wurde. Der aus den Interviews abgeleitete Klassifizierungsrahmen erfuhr nach der explorativen Faktorenanalyse (EFA) einige Änderungen in den Faktoren. Unter Berücksichtigung der Ergebnisse der qualitativen Studie sowie der EFA diskutierte ich die möglichen Gründe für die Veränderungen und ermittelte vorläufig einen Klassifizierungsrahmen mit vier Kategorien, um verschiedene Arten des Engagements der Studierenden beim selbstgesteuerten Sprachenlernen mit Technologie außerhalb des Klassenzimmers zu unterscheiden. Der Unterschied zwischen der Vier-Kategorien-Klassifizierung und der früheren Drei-Kategorien-Klassifizierung bestand darin, dass die zweite Kategorie in der aktuellen Forschung in zwei Typen unterteilt wurde (1. unterrichtsorientiert; 2. unterhaltungsorientiert; 3. informationsorientiert; 4. sozialorientiert). Diese Unterteilung wurde als sinnvoll erachtet, da die Einflussfaktoren und der Lernoutput dieser beiden Typen als unterschiedlich eingestuft wurden. Dieser verlässliche und gültige Klassifizierungsrahmen wurde in der aktuellen Studie als übertragbar auf andere Kontexte befunden. Darüber hinaus war unter den vier Typen die informationsorientierte technologische Lernerfahrung der einzige, der die Lernergebnisse signifikant vorhersagte. Die Ergebnisse ermutigen die Studierenden, sowohl affektive als auch kognitive Strategien beim selbstgesteuerten Sprachenlernen mit Technologie zu nutzen, und geben Pädagogen und Anbietern von Bildungsprodukten eine Orientierungshilfe bei der Auswahl oder Gestaltung von ansprechendem und authentischem Lernmaterial, um den Studierenden bessere Lernergebnisse zu ermöglichen.

## Acknowledgement

Completing a PhD can be a challenging and interesting process. Although there were many setbacks, I am glad that I persevered and finally completed this worthwhile project. I would like to thank all those who have helped me on this journey.

Firstly, I would like to thank my supervisor, Prof. Dr. Harm Kuper. for accepting my initial application and providing me with the platform to complete this project. Most importantly, throughout the process I was constantly reminded of the importance of the methodology and process of doing research, which not only inspired me strategically for this thesis, but will have a profound impact on any future research I do. So, a big thank you to you!

Meanwhile, without financial support from China Scholarship Council, this research idea would not have been possible to come true. Thank you to the CSC reviewers for approving my research idea and agreeing to award me a scholarship to enable me to conduct my research without financial pressure.

Furthermore, I would like to thank Prof. Dr. Steffi Pohl and Dr. Robert Krause for the quantitative research seminars, which provided me a deeper understanding of research methods and a systematic introduction to the practical application of R programming language in the field of educational research. In addition, I would like to thank you for your advice on my dissertation outside of the course. I'd also like to thank Dr. Sara Reiter for providing insightful feedback on my first draft.

I appreciate all the assistance to the colleagues in the team especially Eva-Maria Edskes. Although you have retired, I never forgot the help you provided me. For the other colleagues whose names are not mentioned, I would also like to thank you for the help and encouragement you have provided to me during this journey.

Last but not least, I would like to thank my dear family. Thank you to my mum-Suping and dad-Yuchao and the rest of my family for your love and support, which has been with me through this not-so-easy journey. Thank you to my husband, Xiao. I would never be able to overcome the difficulties during my PhD without your support and companionship. I am grateful for the arrival of my lovely son during this period – Baobao (Kaihuai), you are the most precious treasure to mummy and daddy.

## Declaration of Authorship

I hereby confirm that this dissertation and the work presented in it is entirely my own. All statements taken literally from other writings or referred to by analogy are marked and the source is always given. This paper has not yet been submitted to another examination office, either in the same or similar form.

Place, Date: Berlin, 22/02/2022 Original Signature

# Contents

# Appendices

# List of Tables

# List of Figures

# Chapter 1. Introduction

## 1.1 Background of the research

Self-directed learning is considered as the essential to effective learning and has attracted the attention of educators and educational policy makers since the end of the last century (Mok et al., 2007). The learning process grounded in the theory of constructivism emphasizes the necessity for self-directed learning (Simons, 2000). Constructivism theory emphasized that knowledge is constructed by the learner via the active interaction with new information and the incorporation with existing cognitive constructs (Bruner, 2020), so that it is important to promote students' self-direction in their ongoing process in order to boost their cognitive knowledge.

Moreover, the value of self-directed learning in informal settings has been recognized in recent years (OECD, 2001). In-class and out-of-class ways of accumulating knowledges have strengthened each other reflectively on one's holistic learning (Malcolm et al, 2003; Lai et al, 2015). Engaging in highly qualified out-of-class self-directed language learning is found to enhance students' in-class test scores (Lai et al, 2015). Students who perform well in school perceive to utilize a wider variety of autonomous learning beyond classroom (Richards, 2015). It has also been found that the effect size of students' language learning on their learning achievement is greater when they are involved in informal language learning settings rather than formal settings (Sung et al, 2015). Although the majority of previous research focused on formal settings, self-directed learning in informal context is drawing great attention with the emergence of learning technologies (Song and Bonk, 2016). Various online

resources on mobile devices have boosted informal learning by supporting people to learn individually and collaboratively beyond time and place limitation (Cavanaugh et al., 2015). With the facilitation of technology, learning itself has shifted from instructor-oriented to an informal and learner-centered setting, which requires students to be motivated and self-directed (Lee, 2000). Research has shown that students tend to use technologies in informal learning settings even more than in schools (Cox, 2013) and effective links between outside- and in-school learning can enhance the achievement of students, especially for young learners (Passey, 2000).

Furthermore, self-directed learning in informal settings has attracted great attention in language learning filed, which can be the result of widespread of communicative language learning theories in second language acquisition and foreign language acquisition (Lai, 2017). The learning of language, as a mediation of communication, requires even more emphasis on informal learning setting than other kinds of learning. In the context of language learning, self-directed learning is especially crucial. This is because learning a language, particularly a second/foreign language, entails not only the acquisition of linguistic knowledge such as grammar and vocabulary, but also the acquisition of the ability to communicate in the target language, and success in acquiring that language is largely dependent on the learner himself (Gan, 2009). Communicative competence is regarded as the goal of 21st-century second/foreign language learning in different learning contexts (Savignon,2018). Communicative language learning emphasized extensive and authentic language exposure including resources and interaction, which is hard to be achieved solely in limited formal class

time (Lan, 2007; Moskovsky and Alrabai, 2009). The development of educational technologies has strengthened the implementation of communicative approach by providing contextual-meaningful and authentic learning contexts to language learners (Liton, 2012; Almekhlafy, 2016). Thus, communicative language learning approaches emphasized the importance of language learning in informal setting whereas the emerging of instructional and learning technologies have created such technology-enhanced learning environments, which made it easier to implement communicative language learning theory, especially in informal settings (Lai, 2017).

Benson (2011) suggests that after a long period of research on student learning behaviors within the classroom, it is essential to pay more attention on language learning outside the classroom where students have greater potential to achieve self-directed learning with technology. Adequate understanding of student language learning outside of the classroom with technology is necessary and will complement in the holistic learning of the student to a greater extent (Passey, 2000). Thus, current research aimed to uncover the important insight in the field of self-directed use of technology in informal language learning context.

**1.2 Purpose of the research**

While being aware that the vast amount of information that technology provides to make self-directed language learning outside the classroom easier, another aspect to consider is how to make this informal way of technology-based learning more effective. In order to increase the quality of technology-assisted language learning brought about outside the classroom, it is important to explore self-directed language learning from

different aspects. This research has three main aims.

Firstly, it is essential to understand the phenomenon of self-directed language learning itself. Understanding students' actually use of technology in their language learning outside the classroom is the first step in order to provide guidance for the educators to enhance the quality of such learning recourses. To get a more detailed picture of students' technological language learning, a classification framework is needed. It is not only to present a category of different technologies, but also consider how students experience within individual technological tools. The comprehensive consideration of different aspects in the use of technology in language learning was defined by Lai et al (2017) as technological language learning experiences. The current research aims to establish a classification framework of different types of technological language learning experiences. Moreover, the context in which the initial classification framework is established is also important. Out-of-class language learning activities can vary dramatically in different learners, considering their different level of language proficiency and distinct instructional and social contexts. It is found that proficient language learners often utilize greater range of out-of-class learning opportunities than non-proficient learners, especially in countries where in-school teaching is relatively form-based (Benson et al, 2003). Therefore, in order to establish a classification framework to understand students' different type of using technology to support their self-directed language learning beyond classroom, it is essential to consider a context with form-based teaching approach in school and with more proficient language learners.

China, as a country taken almost half English learners around the world (Liu et al, 2016), is a typical country where English is taught grammatically oriented, especially in secondary schools (Butler, 2014; Gao, 2020). Secondary students in Mainland China are under pressure of Gaokao (Chinese college entrance examination), in which English assessment is a vital component and tend to be grammar-based (Peng et al, 2014). Chinese secondary students are well-suited group to explore the classification of different types of learning experiences, as they are proficient language learner with more than 5 years of learning experiences and extremely form-focused taught in school, thus assumed to attend a wide variety of technological learning beyond classroom (Benson et al, 2013). The current study explores Chinese secondary students' use of technology in their self-directed language learning, in order to provide a complete classification framework of technological learning experiences.

The second step is to what factors influenced students to engage in different technological learning experiences. It is important to discuss the influential factors based on the classification framework discussed in the first step. By doing so, educators can adapt the influencing factors to promote different types of extra-curricular language learning experiences with technology in different contexts, depending on the needs. It helps educators and parents to identify students' obstacles in language learning outside the classroom and to provide help as needed, thus to construct an effective link between home and school in this specific context (Passey, 2000). Moreover, the influencing factors can suggest a guideline for students to perform better in their self-directed learning (Song and Bonk, 2016) and also provides educational product providers with

the guidance to enhance the quality of their products. Thus, once the classification framework is established, the study also aims to explore the influential factors that affect students' tendency of using technology in their language learning beyond classroom, in order to provide in-depth insights for educators, parents, providers of technological leaning products, and students.

Lastly, there is a need to explore the relationship between students' engagement in different types of technological learning and their learning outcome. The goal is to present learners and teachers what benefits greater. It also expects to give educational interventions some advice on how to produce extracurricular learning materials that better meet the needs of students. More importantly, it would add valuable evidence of the validity when different types of technological learning can predict varying level of learning outcomes. Therefore, not only educational interventions and leaners are able to benefit from the finding when selecting out-of-class technological learning activities, the classification framework generalized from step one can also be further assessed in this step.

In summary, I borrowed the terminology 'technological language learning experiences' from Lai et al (2017)'s study, as it comprehensively considers students' use of technological types, their interaction with individual technology and their motivation. I perceive it as a useful concept for studying the deeper phenomenon of students using technology to learn English outside the classroom. The current study aims to explore students' perceptions in Chinese secondary context and adapts the classification framework from Lai et al (2017) in current context, in order to test

whether the classification framework would change or remain the same in another context. The results can approve whether this kind of classification of technological language learning experiences can be replicable and generalized into other contexts. I also aim to explore the influencing factors and impact on learning outcomes of different types of learning experiences based on this classification framework - the results of the first question, trying to present the reasons and results of such technological use in students' out-of-class language studies, providing educational interventions a comprehensive picture of this phenomena for them to better facilitate and guide students outside formal learning context, providing learners guidance when selecting the appropriate experiences to boost their learning outcomes.

### 1.3 Technological learning context in China

As China has a unique technological environment comparing with the mainstream countries, it is necessary to introduce the technological context in China before the introduction of methodology. As self-direction is context and circumstance dependent, measuring technology-assisted self-directed language acquisition should be domain-specific (Wang and Zhan, 2020). For example, previous research shows that YouTube, Facebook and Twitter are commonly-used environments for English language learners to get authentic materials and opportunities to communicate with native speakers (Farr and Murray, 2016). However, unlike most EFL societies, Chinese residents do not have open access to many English-medium Web 2.0 technologies commonly-used elsewhere (e.g., Google, Facebook, Twitter, YouTube, etc.).

There is widespread access to many indigenous Chinese Web 2.0 technologies (e.g.,

Weibo by Sina, WeChat by Tencent, and Yunpan by Baidu) (Mei et al, 2018). The lack of foreign competition has undoubtedly aided the rapid rise of Chinese online service providers in general, as well as the dramatic success of Chinese equivalents of Facebook, Twitter, and YouTube (Liu, 2010). English teachers and some native speakers have delivered a variety of authentic or instructional materials using Chinese Web 2.0 technologies. Weibo is a Chinese micro-blog platform, mixed the features of Twitter and Facebook, and is actively used by over 40% of Internet users in China (CNNIC, 2020). Some educators post regularly on Weibo in target language for instructional purposes (Tian, 2015). WeChat is another networking application that is widely used in China. Almost every student has an account. It has various functions can be used to support language teaching and learning, such as mobile text and voice messaging (like WhatsApp), broadcast messaging, video conferencing (one to one and one to many), file sharing, group chat and many useful mini applications (Mei et al, 2018). For example, students can subscribe to official accounts tailored for English learning on WeChat (Ling et al, 2016). The learning group can be established on WeChat for communication and necessary notice of an online course. When the learning platform temporarily loses network connection, WeChat can provide timely feedback. To compensate for the capacity limitations of Weibo and WeChat, Yunpan is a mobile cloud-based file storage and sharing system similar to Dropbox or Google Drive, which can be used for quick access to learning materials. These products are typical applications that allow extensive interaction among Chinese residents and are especially popular among young people (Mei et al, 2018). There are also many recently

emerging local technologies or applications which were designed for language learners, such as applications to remember vocabularies, applications providing short videos in target language, online instructional courses (CNNIC, 2020). Although without access to Facebook and YouTube, Chinese students never face the problem of limited technologies that can be implemented in their self-directed language learning. However, the great obstacle cannot be ignored when students are willing to enter an authentic social network that English native speakers often engaged in. These differences on technological environments for language learners may have influences on the patterns of their self-directed use of technology in English language learning.

The outbreaks of Coronavirus since 2020, to some extent, have boosted students' use of technology in both formal and informal learning settings. Following the outbreak, the Chinese government banned all types of school-based and institution-based learning, offering an innovative curriculum framework based on online and live TV classes. Over 1.5 billion learners around the world were not allowed to access to school or university because of the spread of COVID-19 as of April 4th, 2020 (UNESCO, 2020). Students and teachers were forced to be familiar with instructional technologies to facilitate learning. During lockdown, the Chinese Ministry of Education proposed 'Ensuring learning undisrupted when classes are disrupted' by reforming the entire educational system and replacing face-to-face classes with online component (Huang et al, 2020). Many online education platforms and institutions have expanded their market in a short period of time. Over time, China's social media platforms and large advertising venues such as short-form video platforms have been dominated by ads for these online

learning platforms. For example, Yuanfudao, the first unicorn company in the field of K-12 online education in China, boosted its market during covid-19, achieving over 400 million accumulative users (Peng, 2020). In this context, Chinese students have greater access to well-designed online educational resources, which offers the richness of their technological experiences in language learning outside of the classroom and provided a rich source of reference data for current research.

### 1.4 Choose of the methodology

I began the study, taking into account the purpose of this study, the richness of technology-based learning resources in China, and the state of home learning in China further promoted by covid-19 at the time of data collection. This study was conducted after four-month lockdown period due to Covid-19 in China, trying to receive a rich data from the students after they experienced a long-period learning with technologies. The research was implemented via exploratory sequential mixed methods, as such methods provide opportunities to combine qualitative and quantitative study in a sequence of phases (Flick, 2018). This fits in with the need in current study that some of the analysis can only be done based on the results of previous analyses, and provides a clear path for my research.

Firstly, regarding the types of technological language learning experiences, qualitative research was designed, as it provides deep insights in the perspectives of participants. Narrative inquiry interviews with guidance provided deep and natural thoughts from Chinese secondary students to create the comprehensive narratives of their actual learning experiences with technology beyond classroom (Barkhuizen et al,

2013). I analyzed the data by coding the interview transcription based on theoretical framework and abstracting constructs from the conversation. It is an interpretive and naturalistic approach to help understand the phenomena that participants bring to the researcher (Denzin and Lincoln, 2011).

The link between qualitative and quantitative study is called the point of interface. In current study, the link was the development of instrument in quantitative study based on the results of interview responses. The validity and reliability of the instrument was further tested with a larger sample in quantitative research. Exploratory factor analysis was adopted to extract factors. Final classification framework was finalized after considering factor analysis results and the qualitative findings. As for investigating influencing factors and the relationships with students' achievement, structural equation modeling was conducted, as it is a multivariate technique for testing and evaluating multivariate causal linkages that is increasingly being used in social science studies (Shaheen et al., 2017).

In summary, this experiment was divided into three steps. The first step was a qualitative analysis to explore the adaptations that may arise in the present context to the analytical framework proposed by Lai et al (2017). Secondly, the questionnaire was designed to apply to the present context in order to answer specific research questions in current study. Lastly, the results of the quantitative study further assess the validity and reliability of the questionnaire and ultimately combined with the findings from the qualitative analysis to provide a final interpretation. The design of quantitative research was supported by the constructs generalized in interview results and also aimed to check

the results from qualitative research, constructing an exploratory sequential mixed approach (Lodico et al., 2010).

### 1.5 Layout of the dissertation

The dissertation included nine chapters: introduction, literature review, theoretical foundations, methodology, qualitative research, point of interface, quantitative research, findings and discussion and conclusion. This chapter has discussed the background and the purpose of the research to exploring students' use of technology in language learning beyond classroom, and provides a general introduction of the methodology design. Chapter two presents a detailed literature review to discuss what have been researched in relevant fields and how this research is embedded in the existing literature and can add value for future research in self-directed language learning with technology. Chapter three provides a comprehensive theoretical background related to this topic, including terms clarification, framework introduction considering three research questions.

In chapter four, I illustrate the methodology in details including research design of exploratory sequential mixed methods, the context clarification. It displays why the study was done like this and how this has been done step by step in order to answer the research questions. I present an outline of the research method in this chapter with detailed description of qualitative study, point of interface and quantitative studies in chapter 5, 6 and 7. Participants, instruments, procedures and data analysis of qualitative research are described in chapter 5. A classification framework with four types of technological language learning experiences was generalized from qualitative study.

Based on the results from interview, I present the point of interface in chapter 6, introducing the process of developing instrument for quantitative study and the adaptation of theoretical framework according to the results from qualitative study. The details of quantitative study are included in chapter 7, in which I describe the participants, data collection, validity and reliability of the instrument, and hypothesis and main analysis procedures.

In chapter 8, I discuss the results from the research referring to the theoretical foundations in chapter three and a debate with previous literature review. The main findings are presented and interpreted combining results from both qualitative and quantitative research. It also presents how the results of this research contributes in existing literature including the consistency and the contradictions with detailed interpretation based in theories. In the final chapter, I summarize the research and discussion, provide implication from this research, and conclude the limitation and guide for future research.

## Chapter 2. Literature Review

This chapter reviews previous literature related to the three general aims of current research: technological language learning phenomenon, the influencing factors, and the relationship between technological experiences and learning outcomes (see section 1.2). The chapter aims to provide a critical literature review and explains how the current research emerges as a gap in the existing literature framework of self-directed language learning with technology beyond classroom. I firstly present literature related to the technological language learning experiences, including discussion based on

classification types with regard of different aspects. Lai et al (2017)'s study is particularly highlighted in a separate section as it is highly relevant to the current study. I then discuss the influencing factors on students' tendency of different technological learning experiences. In addition, I review the relationship between out-of-class technological use and learning achievements. Lastly, I summarize the gap from the literature review and propose my research questions for the current study.

## 2.1 Literature related to technological language learning experiences

Although the current study is largely based on the classification of technology-based language learning in Lai et al (2017), a review of the more comprehensive literature is still necessary. This is because they provide the most basic exploration of students' use of technology-based learning of English outside of the classroom. These previous findings are valuable for establishing the specific research questions for this study, as well as for the discussion of the results. I therefore begin with a general discussion of the literature in the area of research on students' use of technology for English language learning outside the classroom. They provide ideas for analysing students' learning phenomena from different aspects. Next, I discuss in depth the article by Lai et al (2017) to analyse the theoretical framework they propose and what are the limitations of these findings.

### 2.1.1 Different aspects to understand technological language learning experiences

Researchers have attempted to discover students' use of technology in their out-of-class language learning setting from different aspects.

Firstly, various studies have found that technology is widely used by students in

their language learning beyond school (Toffoli and Sockett, 2010; Lai, 2013; Kuppens, 2010; Wong and Nunan, 2011). Toffoli and Socket (2010) did a survey to investigate 222 students from University of Strasbourg and found that the majority of students attended regular internet activities in English. Only 6 students in the study claimed that they did not learn English via technology on a regular basis. Similarly, Lai and Gu (2011) surveyed 279 students from the university of Hong Kong and found that students engaged in language learning with technologies to varying degrees. 54% of the interviewees reported to attend in technological language learning for more than four hours per week. However, in Doyle and Parrish (2012)' study with university students from Japan, when participants were asked to list their out-of-class learning activities with open-ended questions, they reported no technological learning outside classroom. Although, the authors further found that students attended a variety of technological activities beyond classroom by collecting students' learning diaries, students still claimed that the popular resources (such as DVD in English) were rather more challengeable than helpful. The authors also concluded that students in the study preferred to use traditional ways of learning outside of the class, such as standard English proficiency tests (IELTS or TOEFL).

K-12 students were also found to spend much time on technologies in their out-of-class language learning (Lai et al, 2015; Wong and Nunan, 2011; Sundqvist, 2009). Lai et al (2015) found Chinese secondary students in their study reported an average of 2.21 hours per week to use technology and online tools in their language learning beyond classroom. Moreover, Sundqvist and Sylvén (2014) found Swedish upper-primary

students attended in out-of-class language learning with technology for approximate seven hours per week and online game was another popular resource for younger students, especially among male students.

Secondly, researchers found that students engage in a variety of different types of technology to support their language learning beyond classroom. Toffoli and Socket (2010) ‘s study explored technologies to support different language skills. Students reported to attend more listening activities than reading and writing activities with internet. The common technological resources of listening activities were films, TV series and music. In terms of resources for reading purposes, social networking sites such as Facebook and Myspace were most frequently chosen by students. Similarly, internet activities related to writing in target language occurred mostly in social networking by posting or commenting on other’s posts. Email was another resource for the production of language. As for experiences involved oral expression, 70% students in the study stated that they never used technology such as Skype or other voice-conferencing applications in English. Moreover, Lai and Gu (2011) explored the learning purposes of engaging in different technologies. Although students reported with distinct purposes to use technology such as seeking authentic materials and for pleasure, social networking such as YouTube and Facebook were commonly mentioned by students as resources in their self-directed language learning beyond classroom. Sundqvist (2009) reported that Swedish secondary students engaged in similar technological resources as university students, such as films, music, tv and social networking.

The results of previous studies showed that receptive technologies such as watching movies and listening to songs in target language are mostly employed by students (Celik, Arkın, and Sabriler, 2012; Ekşî and Aydin, 2013), whereas productive tools such as online chatting and conferencing tools are less-frequently chosen (Ekşî and Aydin, 2013; Steel and Levy, 2013). However, the innovation of educational technology boosts the potential to build productive-oriented language learning environment. Selwyn (2007) introduced an increasing implementation of 3D-virtual (i.e., Second Life) worlds as language learning in institutions such as the UK's Open University. For example, the author reported that Second Life is internet-based 3D virtual society, in which virtual characters undertake activities for pleasure and enjoyment. Such virtual environments provided EFL (English as foreign language) learners with highly immersive social environment when it was conducted in the target language (Gee, 2005), which can enhance the production of the language.

However, most of the previous research were discussing the use of technology in a surface level. Most of them discussed the different types of technologies such as YouTube or WhatsApp or general types of technological activities including watching TV or listening to English songs. There are studies discussing the different interaction within the same learning resources (Rosell-Aguilar, 2013; Sockett and Toffoli, 2012; Olmedo, 2015). Rosell-Aguilar (2013) investigated students' use of educational podcasts (iTunes University) to learn English and found 40% of language learners listened to podcasts as part of another activity. The results further stated that 10% language learners took notes as they listened. Although most students may regard the

podcasts as resources of casual learning, the minority students engaged in note-taking cannot be ignored, as it indicated different learning experiences students were engaging.

Previous studies have either analysed the phenomenon of students' independent learning of English at a single-dimension level, or they have analysed in depth the different purposes and strategies of students when using the same technological tool. There is a need to use in-depth analysis to explore the phenomenon of autonomous English learning beyond classroom. To more fully and comprehensively understand the phenomenon of students using technology for learning, some scholars have begun to experiment with other, more efficient frameworks for exploration. For example, Kearney et al (2012) proposed categorizing mobile learning according to its many learning affordances - personalization, collaboration, and authenticity. Carr et al. (2008) classified learner interactions with Web 2.0 into four categories: playful, expressive, reflective, and exploratory. Lai et al (2017) was the first to propose a comprehensive consideration of students' learning experiences, taking into account the type of technology used and the students' interactions with it, and to create a framework for classification. The following section highlights the main findings and limitations of their study and how the current study was built upon it.

### 2.1.2 Technological language learning experiences classification

Among all the literature, Lai et al (2017) provided the greatest insights on technological language learning experiences, considering three aspects including resources, interactions, students' perceptions. The authors conducted a qualitative study by interviewing 21 university foreign language learners in HK. The interview responses

were then coded and helped to construct three types of technological learning experiences beyond classroom: instruction-oriented, entertainment and information-oriented, social-oriented technological learning experiences.

Instruction-oriented technological experiences tended to implemented structured resources, or unstructured materials with skill-oriented character. Students perceived to attend such experience for the intentional language learning with regular review and note taking during leaning. Entertainment and information-oriented learning experiences included interesting themes and are perceived to be relaxing or entertaining. The experiences usually were unintentional to improve language skills and closely associated to personal life needs. Students tended to focus on meaning rather than focus on form in such learning experiences. Social-oriented learning experience in this study was perceived to be less engaged by students. Language learners stated that they were uncomfortable to use such resources online. Only a few students engaged in such experiences for the purpose of communication.

In this case, even though students engaged with the same resources, such as a YouTube video, watching for fun and taking notes while watching were considered as two different technological language learning experiences. This kind of classification framework provided an in-depth understanding of students' actual use of technology beyond classroom. Similar to previous studies, students were found to more actively engage in entertainment- and information-oriented technological experience, which perceived to be more receptive, than social-oriented experiences which tended to be more productive. Students rated highest on the engagement in instruction-oriented

experiences, which could include both receptive activities such as watching instructional videos, and productive experiences such as writing an article.

However, there are several limitations in this classification framework. Firstly, the context in the study did not provide a wide variety of different use of technologies. On the one hand, the context in Lai et al (2017)'s study was Hong Kong university students with 57% of the participants self-rated themselves as beginning language learner. On the other hand, Hongkong is a combination language environment of English as second language (ESL) and English as foreign language (EFL) where there is a higher demand for English as a communication tool in social, economic and educational life. It promotes the implementation communicative language teaching approach in classes and involves many project-based assessments in language learning. Thus, their use of technology beyond classroom might be limited due to their proficiency level and communicative teaching approach in class. As according to Benson et al (2003), high proficient language learner tends to utilize more distinct technologies in their out-of-class learning, especially when their classroom focuses on grammars. In order to establish a classification framework with wider varieties of technological learning experience, which can also be implemented in other contexts, Chinese secondary context in current research can add value.

Moreover, the different types of technological language learning experiences in Lai et al (2017)'s study were generated based on small-sample interviewees. The validity of the framework needs to be checked in survey responses. The current study follows the methodology of as Lai et al (2017)'s study, beginning with a qualitative study to

gain insights from Chinese secondary students and adapt the classification in the current context. The follow-up quantitative study analyzed in details about the validity and reliability of the constructs in the classification. Final classification framework considered results in both interview responses and survey data.

Furthermore, their study did not explore the relationship of different types of technological learning experiences and learning outcomes. This part can be included in current study, and add value to precisely identify the differences between the constructs in the classification framework, adding conceptual validity of the classification framework.

In summary, although Lai et al (2017)'s study presented a conceptual framework for categorizing self-directed language learning experiences, this framework has limitations of its own and is difficult to apply directly to other contexts. Its subject matter did not allow for a comprehensive consideration of possible technological language learning experiences, and it has not been quantitatively validated. The current study aims to fill the previous gap by providing a comprehensive and validated classification framework for the future study of self-directed technology learning experiences in different contexts. In order to validate the classification framework, I also take into account differences in the impact of influential factors on different types and the distinctions of varying types on learning outcomes. Next section lists the literature related to factors that influence students' tendency of technology use in their out-of-class setting.

## 2.2 The factors that influence students' tendency of technological experiences

In this section, I firstly discuss a range of studies in the literature that address the influences of technology-assisted learning in terms of both external and internal factors. In addition, as influencing factors were also addressed in the study by Lai et al (2017), which were based on their proposed classification framework, I also discuss their findings in detail. This can provide the most direct support to the hypothesis formulated in my study.

It has been suggested to consider both internal and external factors when understanding human behavioural intentions (Ajzen, 1985). The existing literatures have identified various factors that have affected on students' tendency of technological experiences in their language learning (Lai and Gu, 2011; Marek and Wu, 2014). As for internal factors, variables in technology acceptance model including perceived usefulness and perceived ease of use, and related constructs such as self-efficacy and computer efficacy were widely used. Zhang and Pérez-Paredes (2021)'s recent study of Chinese students in their self-directed language learning confirmed the significant influence of perceived usefulness and perceived ease of use on their use of mobile English learning resources. Wu (2012) investigated Hong Kong ESL learners' self-efficacy and found it was closely associated with perceived usefulness of technological activities. Furthermore, Lai (2013) proposed several constructs grounded in the theory of planned behaviour to investigate the relationship between students' perceptions and their use of technology outside of classroom. These constructs included perceived usefulness, attitude to technology use, educational compatibility, language learning

motivation, language learning approaches, self-efficacy, self-regulation and facilitating conditions. The conceptual model with complex interrelationship among the factors and relationship between those factors and technological use were tested using structural equation modelling. The results showed that perceived usefulness and language learning motivation directly and significantly predicted students' self-directed use of technology beyond classroom. Other variables, with distinct extents, influenced students' use of technology indirectly via perceived usefulness and language learning motivation.

External factors and social factors such as teachers, parents and peers are commonly discussed as effects on students' self-directed use of technology in their language learning (Lai et al, 2015; Sun and Yang, 2015; Mynard, 2012). Lai (2015a) found peers raised students' awareness of potential use of technology by sharing useful technological resources among friends and classmates. Sun and Yang (2015) analysed the postings in a virtual community of informal language learning environment, and found students actively posted to share personal learning experiences and to distribute teaching. Students got cognitive and affective support from their peers in the virtual community through feedback. Moreover, parental influence is another important factor which affect students' use of technology. In Lai et al (2015)'s study with Chinese secondary English learners, participants reported to be influenced by the parents in terms of implementation of learning strategies, choose of language learning activities, access to technological devices, and arrangement of learning resources. Furthermore, teacher plays a vital role in shaping students' use of technology. Mynard (2012) stated

three aspects that teacher could affect students' self-directed learning outside classroom: 1) to raise the awareness of metacognition during learning process; 2) to provide them with information for appropriate resources and strategies; 3) to provide affective support. Lai (2015b) and Lai et al (2017) also raised he important influence of teacher on students' engagement and quality of autonomous language learning beyond classroom in the similar aspects.

Grounded on the above literature, in order to get a comprehensive insight of influential factors of students' technology adoption in their out-of-class language study, both external and internal factors need to be considered in current study. In Lai et al (2017)'s study, they also investigated the factors (external and internal) affecting students' choice of different types of learning experience with technology. A structural equation model was built based on technology acceptance model (Davis, 1989), including performance expectancy, effort expectancy, teacher support and peer support as the main factors. Firstly, the results showed that performance expectancy positively predicted students' technology use in instruction-oriented language learning whereas non-significant direct impact of effort expectancy was found on such experience. The authors explained it as the consequence of widely accessible instructional technological resources. Students found little obstacle to source such resources, which led to the non-significant impact of effort expectancy. However, I believe this explanation was not appropriate, as effort expectancy had significantly direct impact on students' engagement in entertainment- and information -oriented language learning experience. These types of technological resources such as English movies were actually with

higher accessibility. They also found that students' perception of value of the technology also positively affected students' involvement in entertainment-and information-oriented learning experience. As for social-oriented types of learning, no significance was found neither in students' perceived usefulness nor their perceived ease of use in such experience. It revealed that student perception on the value of and ease of accessible to such experience did not boost their involvement in such learning experiences.

In Lai et al. (2017)'s study, the three types of technological learning experiences as dependant variables were examined in separate models for their influencing factors. While it provided preliminary evidence that influences affect different learning experiences differently, it did not provide further evidence as to whether these types had different effects when regarded as independent variables. Learning outcomes are a good dependent variable to test for this differential impact.

### 2.3 The relationship between technological learning experiences and learning achievements

The most vital aim of this study is not just to provide a framework for classification of technological learning experiences, but to be valuable in providing guidance to students, educators, and educational providers. Thus, it is essential to understand what really works in enhancing students' learning outcomes. I summarized some of the main studies in discussing technology use in language learning and students' learning outcomes regarding both cognitive and affective sides.

Researchers have investigated the positive effects of technological out-of-class

learning experiences on various language learning achievement, including academic achievements (Larsson, 2012; Olsson, 2011; Sundqvist, 2011). In Larsson (2012)'s study with a group of Swedish learners, it was found that students who actively engaged in out-of-class English learning experiences tended to get higher grades in the National Test of English. Moreover, Olsson (2011) indicated the enhancement of specific language skills in his research with Swedish pupils. The study found that out-of-class English language learning, especially digital games, to be associated with student's writing proficiency and final grades in class. Sundqvist (2011) found the language learning beyond classroom positively associated with students' oral proficiency and vocabulary size.

Positive association between out-of-class language learning and learning achievement is not only restricted in cognitive aspect, but also in affective domain (Lai et al, 2015; Sundqvist an Sylvén, 2014). Language learning beyond classroom is usually viewed as compensation of the limitation in classroom, and it is one of the reasons that affective learning strategies are widely implemented in informal language learning. Students in Sundqvist and Sylvén (2014)'s study reported that out-of-class language learning experiences such as watching TV and listening to music in English enhance their enjoyment in English learning. Lai et al (2015) surveyed 82 Chinese secondary students and concluded the same results. The authors further stated the significant association between students' confidence in language learning and their engagement in out-of-class language learning.

The above research provided findings to support that out-of-class technological

language learning as a whole had positive predicted learning outcome in cognitive and affective aspects. There is a lack of discussion of how different technological language learning experiences predict different levels of learning outcomes. Although there was no comprehensive classification framework as it is in Lai et al (2017)'s study to draw on, scholars did previously examine the relationship between important components of technological language learning experiences (e.g. learning strategies and motivation) and learning outcomes.

A number of research showed that various technology-enhanced language learning strategies increased students' learning outcomes. Using data from Oxford's (1990) Strategy of Inventory for Language Learning (SILL), Chang and Chang (2014) investigated Taiwanese college students' listening comprehension strategies on the YouTube platform. They discovered that after the metacognitive educational procedure, children did much better on listening comprehension assessments. Bekleyen and Hayta (2015) looked into the role of mobile technology in Turkish undergraduate students' language learning practices. Their study employed a self-designed questionnaire to collect data on students' language learning strategies, which was also based on Oxford's (1990) classification of the language learning strategies. Their findings revealed that several forms of mobile-assisted language learning strategies were effective in helping students improve their English proficiency. An et al (2021) classified five types of technology-based self-regulated language learning (SRLL) strategies as motivational regulation strategies, goal setting and learning evaluation, social strategies, technology-based English song and movie, technology-based vocabulary learning strategy. They

also explored the relationship among the categories, self-efficacy and language learning enjoyment, showing that English language self-efficacy and English language enjoyment were both related to technology-based SRLL strategies. However, although Schmidt and Watanabe (2001) revealed the significant association between language learning strategies and motivation, Lin et al (2017) found that online learning outcomes were not predicted by intrinsic or extrinsic motivation, but only via learning strategies.

It is important to note that considering learning strategies alone does not necessarily provide a complete picture of the student's learning experience. Applying the same learning strategies to different learning resources can also lead to different learning outcomes. For example, the same memorisation strategy will improve learning outcomes if the content itself is of interest to the students. In section 2.1.1, I also discussed that previous studies revealed the different strategies students used in dealing with the same technological resources. I can assume that a student listened to podcast alongside other works would achieve different learning outcome comparing a counterpart who took notes while listening podcast. This seems inadequate if one considers only technological resources.

Thus, intricate results were obtained in the previous results, raising the complexity in understanding how to really guide students to engage in the learning experience that boost their learning efficiency. An investigation of relationship between types of technological language learning experiences considering multiple dimensions (e.g., resources, students' interactions with technology) can be a good way to solve such complex issue.

## 2.4 Summary of literature review and research questions

In this chapter, I reviewed literatures related to students' technological experiences, the influential factors which might affect their tendency of specific learning experiences, and the relationship between out-of-class language study and various learning outcomes. Lai et al (2017)'s research was the one with most relevant pattern as in the current research. Their study provided a useful guidance to discuss the actual learning experience with technology based on students' perceptions and interactions with technology, which can be referred to in the current study. The authors called for further research about technological learning experiences in other learning environment to assess. There is a need to test whether there are more types that had not been generalized in their study context.

The current research uses the term 'technological learning experience' from their study and adapt the categories in secondary context in China, investigating students' different technological language learning experiences beyond classroom. In a strong form-based instructional context like China, I would expect some kind of stronger differentiation of the experiences they engaged in out-of-class language learning. With a broader variety of technology use, a more comprehensive classification framework could be established in this study, which aims to be applied in a wider range of contexts, with validity and reliability. Based on redefined technological learning experience, the related influential factors and learning outcomes were also investigated. Such research not only provides valuable data in the context of Chinese secondary school students to guide their learning beyond classroom, but also provides data to support future use of

this classification framework, as well as a discussable basis for its adaptation.

Therefore, I identified the gaps in previous literature review (see section 2.1, 2.2, 2.3) with regard to the three main aims (see section 1.2) in current study. In order to set up a comprehensive classification framework to understand students' use of technology, research question one was proposed as to explore different types of technological language learning experiences. The influencing factors and relationship between technological learning experiences and learning outcomes were investigate based on results from research question one. I summarize the three questions as:

1) What types of self-directed technological language learning experiences do Chinese secondary students engage in?
2) What are the factors that influence student's tendency of technology use in self-directed language learning in Chinese secondary context?
3) How does students' tendency of technological learning experiences predict their learning achievements?

Instead of a full replication of Lai et al. (2017)' study, theoretical input is essential to get sensible for the complexity of defining technological language learning experiences. Thus, to start with the current study, the theoretical framework needs to be introduced to provide a solid theoretical foundation for this research.

## Chapter 3. Theoretical foundations

This chapter identifies the related terms and introduces the theoretical foundation of the research to help understand self-directed use of technology in language learning beyond classroom, the influencing factors and the relationship with students'

achievement, aiming to present a theoretical framework addressing three research questions in current study. The phenomenon of self-directed language learning with technology beyond classroom is too intricate and complex to be fitted within a single theory. In order to understand its complex nature, I discuss the main components in this phenomenon including self-directed learning and autonomy, computer-assisted language learning, and informal learning. As concepts in various research fields interact with each other internally, this section starts with identifying terms in related fields. Moreover, I discuss the theories supporting each of the research questions and finally build the holistic theoretical framework for the current study.

## 3.1. Some important terms

### 3.1.1 Self-directed learning (SDL) and autonomy

Although autonomous learning originated from the political and philosophical literature whereas self-directed learning is routed in adult education literature, these two concepts share many similarities in terms of their nature, dimensions and goals.

Autonomy and self-directed learning are both based in the learning theory of constructivism, which emphasis the role as active learner in the learning process and in humanistic and cognitive psychology, which highlight the facilitation to activate learners' full potential in achieving further knowledge based on social, psychological and behavioral resources (Benson, 2013). Within various definitions of autonomy, the most commonly accepted is by Holec (1981), who gave the definition as 'the ability to take charge of one's own learning' (p. 3). The concept of capacity of autonomy stated by Benson (2013) consistently considered autonomy as the competence to control of

learner's own learning. Dickinson (1987) further constructed the aspect of situation, describing autonomy as 'the situation in which the learner and the implementation of those decisions' (p. 11). Situational freedom was also mentioned in Benson (2008)'s review of previous literature of autonomy in language learning field. Moreover, socializing consideration was added to the conceptualization of autonomy by Dam et al. (1990), defining it as 'capacity and willingness to act independently and in cooperation with others, as a social, responsible person' (p. 102). The capacity is also associated with human sociality such as collaboration and communication abilities and so on, which may be different in various learning context and learning times (Benson, 2013; Lewis, 2013). Autonomy exists in both dependent and independent learning context. Thus, autonomy is conceptualized in multi-dimensional aspects including capacity, situational freedom and socialization.

Self-directed learning shares the similar multi-dimensional conceptualization as autonomous learning, including personal attribute, process and context (Candy, 1991; Brockett and Hiemstra, 1991; Garrison, 1997). Candy (1991) identified the two personal attributes as self-management and personal autonomy. The former is used to describe the ability to be self-directing in learning within given constraints and the latter to describe the propensity to exercise freedom on a broader scale. This is consistent with capacity and situational aspects in learning autonomy. He also identified two processes as learner-controlled instruction and the second autodidaxy. Learner-controlled instruction is used to describe self-directed learning which takes place in instructional situations inside formal institutions and the latter describes self-directed

learning which takes place outside formal institutions, which is also the consideration in different contexts. Garrison (1997) also emphasized that learner control did not mean independence, but rather collaboration with people in different context. This collaborative aspect is consistently explained the social concept in autonomous learning.

Based on previous literature, Benson (2008) conceptualized the term autonomy in language learning field to entail both capacity and situation freedom. He further illustrated three components to describe a potential autonomous action: the ability to engage in self-directed learning, the desire for self-directed learning and the freedom to engage in self-directed learning. Firstly, learners need to not only grasp a skill, but also have adequate knowledge to employ a learning task in target language. Secondly, learners need to be motivated to engage in self-directed tasks. Finally, the learners need to be permitted to control their learning to a large degree. The first two components contribute capacity dimension and the last one relates to situational dimension. Thus, in general, autonomous learning and self-directly learning share the similar capacity, process and social dimensions, and they are interchangeable to a large extend.

Self-directed learning and autonomous learning also share similar learning goals. The goals of self-directed learning are conceptualized as three aspects: Firstly, it aims to develop learners' competence to be self-directed and supports learner with the initial ability to engage in self-directed learning (Lai, 2017). Secondly, it assessed the process of knowledge construction grounded with learning theory of constructivism and conducts transformational learning. Finally, it promotes the social freedom of situation or context (Merriam et al., 2007). Littlewood (1996) defined autonomy as aiming to

build capacity for thinking and acting independently in any context, which includes independent decision-making and action in language learning, independent use of target language, and use of target language to behave in society. Lai (2017) summarized it as autonomy as language learner, autonomy as language user and autonomy as person. Comparisons of self-directed language learning and autonomous learning in terms of conceptual dimensions and goals are summarized in Figure 3.1.1.

As autonomous learning and self-directed learning share similar conceptualizations and goals, this research will use the concepts interchangeably in the following parts.

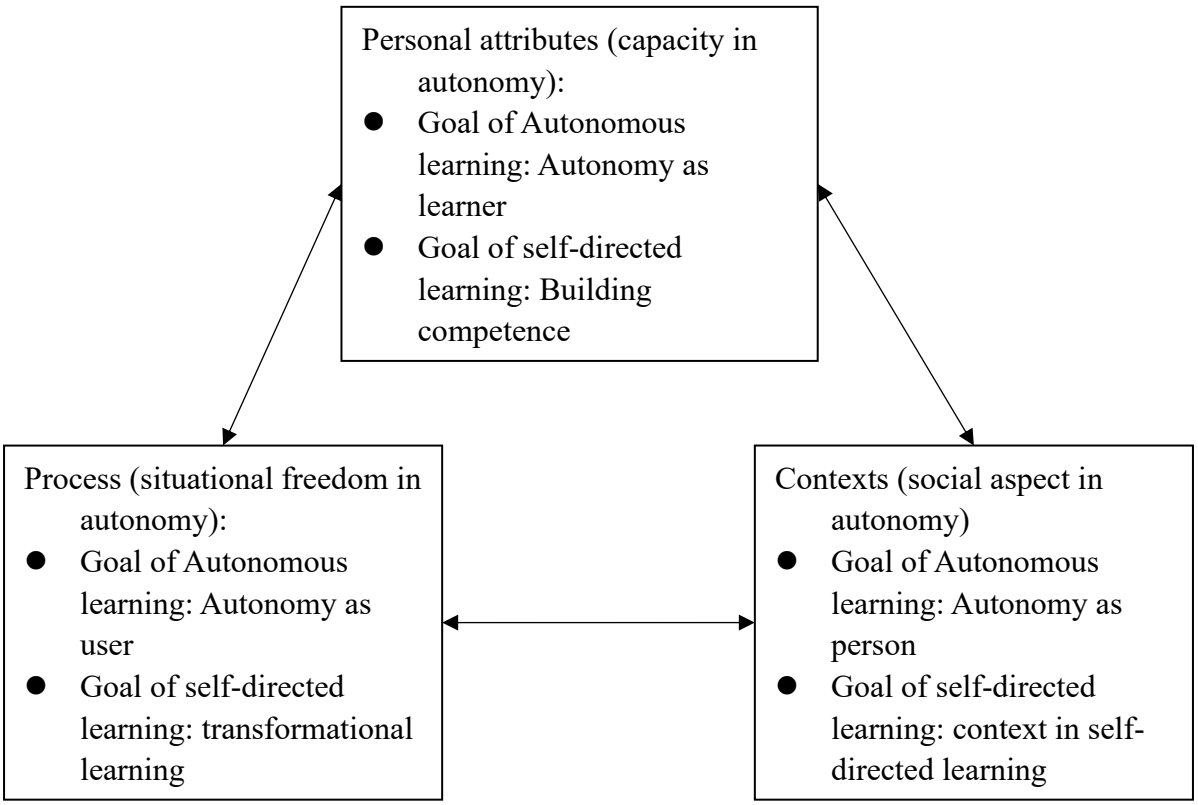


Figure 3.1.1 Comparisons of self-directed language learning and autonomous learning in terms of conceptual dimensions and goals - Adapted from Lai (2017: 16) and Song et al. (2007: 31)

### 3.1.2 Formal and Informal learning

As the current research only considered self-directed language learning beyond

classroom, it is important to clarify the differences between formal and informal settings. The concepts of formal, informal, nonformal and self-directed learning are complex and to some extend interdependent (LaBella, 1982; Melnic and Botez, 2014). Two common-used categories are introduced to provide a general background in the discussion of formal and informal learning, including lifelong learning model (Mocker and Spear, 1982) and Malcolm et al (2003)'s four-dimension categories. The introduction of the background of the previous definitions aims to clarify what exactly is included in the informal setting in this research.

The systematic lifelong learning model has involved all the concepts and clarified them in terms of what is to be learnt and how to learn (Mocker and Spear, 1982). Lifelong learning emphasizes that learning process continues throughout one's life, not identified by a specific age group or within a specific institution, thus offering distinct forms of learning. Mocker and Spear (1982) described four generic types of learning forms as formal learning, informal learning, nonformal learning and self-directed learning. In lifelong learning mode, the four types were identified in two dimensions: the means of learning and the objectives of learning (see figure 3.1.2).

| | | **WHAT to be learnt (Learning Objectives)** | |
|---|---|---|---|
| | | Institution | Learner |
| **HOW to learn (Means)** | Institution | Formal Learning | Nonformal Learning |
| | Learner | Informal Learning | Self-Directed Learning |

Formal Learning: learners have control over the objectives or means of their learning.
Nonformal Learning: learners control the objectives but not the means.
Informal Learning: learners control the means but not the objectives.
Self-directed learning: learners control both the objectives and the means.

Figure 3.1.2. Lifelong learning model (Mocker and Spear, 1982: 4)

In this lifelong learning model, self-directed learning was defined separately from informal or formal learning. As discussed above, the recent developing concept of self-directed learning involves self-directed approach in both formal and informal settings, which goes beyond the learning types in Mocker and Spear (1982)'s lifelong learning model.

Researchers clarified the concepts in different ways. Bella (1982) was one of the early researchers who suggested the interdependent nature between formal and informal learning. Malcolm et al (2003) suggested to differentiate between formality and informality, regarding the two learning forms as separate, waiting to be integrated. Nonformal learning is somehow in the middle stage of such integration in some specific learning situation. As Malcolm et al (2003) stated to distinguish formal and informal learning that is fitted in all learning situations, the term nonformal learning was not considered. There are four aspects to differentiate formality and informality: process, location and setting, purposes, and content.

Formal learning includes teacher-centered pedagogy with structured tasks and summative assessment in the process. The physical location of formal learning is in a school or college. Formal learning always happens with time restrictions, specific curriculum to follow, intentional learning objectives, and final certificate when the objective is fulfilled. The prime and deliberate purpose of the activities that a learner engaged is learning itself and the learning design is to fulfil the needs of a dominant teacher, an examination board, an employer or the government. The content of formal learning is established expert knowledge. In contrast, informal learning involves

learner-led everyday activities (Bernstein, 2000) without assessment or with predominantly assessment. The physical location of informal learning tends to be workplace, local community or family. It is with little time restrictions, no specific curriculum to follow, no predetermined learning objectives and no external certificate. The activities a learner engaged aim at other purposes (such as workplace productivity) rather than learning itself and learning happened as an unintended outcome. The content of informal learning is the development of something new within everyday practices.

Researchers intended to propose a generic model to distinguish these terms beyond the restriction of ages and learning situations (Mocker and Spear, 1982; Malcolm et al, 2003). The two typical ways discussed above have provided us some important aspects, including what, where, how students learn. The differences among the concepts should be considered with these aspects in the specific learning situation the research is conducted (Melnic and Botez, 2014).

Dewey (1996) is one of the few scholars who started to emphasize the importance of informal learning. He argued that although schools are important, they are only one means of learning, not the only way. Learners can establish their own learning in various formal and informal contexts over time and spaces. Spaces is not only consisted with formal and in formal institution, but also intercorrelated with the influence of time. As in Bronfenbrenner (1986)'s chronosystem model suggested, change or consistency over time not only in the characteristics of a person but also of the environment that person lives in. Moreover, scholars have also found the combination of learning experiences in different learning settings brings complementary sets of students' achievements. The

cognitive skills extracted from formal learning and non-cognitive skills interact complement and influence each other to maximize the potential of the learner (Barron, 2006). Thus, in order to achieve effective learning and motivate students' potential in their holistic learning, it is important to consider informal learning outside classroom (Thornton, 2013). Given the fact that different age groups of learners have been found to be associated with their construction of personality, learning opportunities and resources, it is crucial to get insight of informal learning in order to better facilitate students' learning and help them to effectively achieve different learning goals in their holistic learning settings (Barron, 2006).

Technology is especially essential in informal learning settings. As the current research focuses on language learning with technology, it is crucial to discuss the related terms in the area of computer-assisted language learning. In order to illustrate the use of technology in language learning, several terms will be clarified in the following section.

### 3.1.3 Computer assisted language learning environments (CALL environments)

Advances in technology have opened up unexpected opportunities for language learning and have made it more complex at the same time. (Waeschauer and Kern, 2000). There is currently no uniform terminology for the use of technology in language learning. Academics use a variety of synonyms to discuss the topic (See table 3.1.1).

| | | | |
|---|---|---|---|
| CALI | Computer-Assisted Language Instruction | MALL | Mobile technology-Assisted Language Learning |
| CALL | Computer-Assisted Language Learning | NBLT | Network-Based Language Teaching |
| CELL | Computer-Enhanced Language Learning | TELL | Technology-Enhanced Language Learning |
| CMC | Computer-Mediated Communication | WBI | Web-Based Instruction |

Table 3.1.1: Acronyms in computer-assisted language learning (Lamy and Hampel, 2007: 8)

Some scholars have attempted to distinguish between these synonyms, with computer-assisted language learning (CALL) being the most frequently used of these terms in practice. (Lamy and Hampel, 2007). A comprehensive perspective of CALL in order to show the linkages between computer, learner, and language learning objectives by Levy and Hubbard (2005). (See figure 3.1.3). Although the boundary overlaps sometimes, the generic stages of CALL will first be reviewed. The broad definition of CALL will be used in this research to demonstrate the interaction between language learning, technology, teacher, peer and so on.

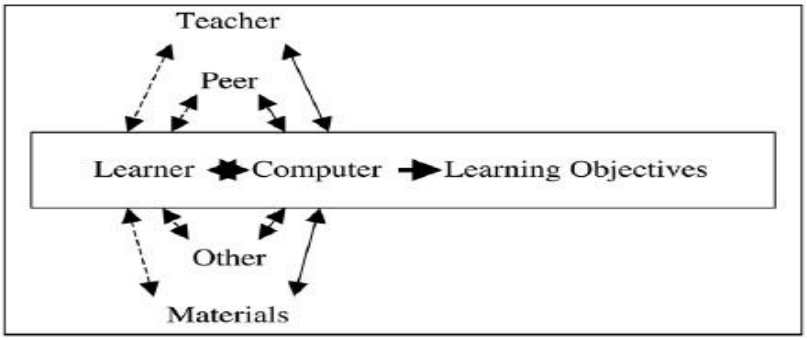


Figure 3.1.3. Connections among learner, computer and learning objectives from a broad view of CALL (Levy and Hubbard, 2005: 146)

From a theoretical standpoint, researchers have described three major stages in CALL: structural CALL, communicative CALL, and integrative CALL (e.g. Crook, 1994; Ullmer, 1994 and Warschauer, 2000).

The first stage of structural CALL began in the late 1960s and grew dramatically in the 1970s. Grammar-translation and audio-lingual methods, which needed regular drills of grammar and vocabulary, were the major methods of language teaching throughout this decade. Students are given grammar and vocabulary lessons by the computer, which acts as a "tutor" (Levy, 1997). They worked according to instructor-created programs that specified the drills' objective (Crook, 1994). Teacher took the role as a mediator to keep the process smoothy.

The focus of applied linguistics application and theory shifted from structural skills to communicative competence in the 1980s. In communicative CALL, rather than grammatical exercises, the computer assisted students in stimulating communicative interactions. It included resources for both repeated practice and conversation in order to improve both accuracy and fluency in the target language (Ullmer, 1994). The exercises in communicative CALL were designed to provide an interactive environment in which students might cognitively generate rather than passively receive target language information (Warschauer, 2000). Teachers continued to act as a mediator between students and computers, ensuring that they understood the instructions and responded appropriately (Abraham and Liou, 1991).

While the preceding phases were primarily conducted without the use of the internet, Integrative CALL was promoted in the twenty-first century when the World Wide Web was developed to link both local and worldwide networks. Personal computers were widely used and served as a centralized information manager (Levy, 1997). Learners could quickly get authentic materials by watching target language

videos on the internet (Çelik et al, 2012). To build social-cognition, students were urged to work together rather than individually. Teachers were encouraged to take on less invasive work in this phase, and the language learning process became more learner-centered.

The summary of CALL history indicate that current phase of computer-assisted language learning is playing an essential role in informal settings. Recent popular topics such as mobile-assisted language learning, game-based learning and technology-enhanced collaborative learning are all considered as different aspects in CALL learning environments (Thomas et al, 2012). The CALL learning environments have become broader via the rapid development of instructional and learning technologies. This research includes self-directed use of technology in language learning, which considers not only learning with computers, but also all parts of CALL learning environments with current technology. Thus, current research uses CALL learning environments to represent language learning with technology. In order to gain more insight into self-directed use of technology beyond classroom, it is necessary to review the theoretical foundations in self-directed learning models and its interaction within CALL environments, which will be introduced in next part.

### 3.2. Theoretical foundation considering self-directed language learning with technology beyond classroom (Research Question one)

This section aims to provide the background of theoretical model of self-directed learning, and clarifies constructs which will be used to design the research instrument to answer research question one in current research. Three elements (resources, learning

strategies and motivation) in self-directed learning model are considered to construct students' technological learning experiences in their self-directed language learning beyond classroom. This section discuss self-directed learning model in general, and specifically in resources, learning strategies and motivation, which are important elements in SDL model. Finally, it will clarify resources, learning strategies and motivation in the context of language learning with technology in this research.

### 3.2.1 Self-directed learning models

Scholars have proposed different perspectives on self-directed learning, mainly regarding SDL as personal attribute, process and context (Song et al, 2007). Learning resources, learning strategies and motivation are three main elements in personal attribute. Three most-cited SDL models (Candy, 1991; Brockett and Hiemstra, 1991; Garrison, 1997) are introduced and I explain how these classic models fitted into these dimensions.

*Candy's model*

Candy (1991) conceptualized self-directed learning with four dimensions, including personal autonomy, self-management, learner-control and autodidaxy. Personal autonomy and self-management are considered as two personal attributes. The former indicates the tendency to learn on a broader scale whereas the latter states the capacity to be self-direction within a given context. Learner control and autodidaxy are regarded as two process. The main differences between them are that learner control is discussed in formal instruction whereas autodidaxy describes self-directed learning in informal settings. The limitation of Candy (1990)'s model is the lack of deep discussion

of the social aspect in self-directed learning.

*Brockett and Hiemstra's Model*

Brockett and Hiemstra (1991) proposed two orientations to develop the understanding of self-directed learning, including process and goal. On one side, Self-directed learning is described as a procedure of learning in which the learner is in charge of planning, implementing, and assessing the learning process. On the other side, Self-directed learning is a goal that focuses on a learner's desire or preference for taking charge of their own education. This is consistent with the process and personal attribute aspects in the previous perceived dimensions in SDL. Social perspective is also considered by discussing the role of institutions and polices in SDL. However, in recent research, the model has its limitation in terms of social perspective, as it discussed only physical institutions, which is inappropriate in the booming of online learning, especially in informal learning.

*Garrison's Model*

Garrison (1997)'s model of SDL considers interactive dimensions including self-management, self-monitoring and motivation. The perspective of process was raised by the explanation of self-management, as not only independently, but rather learner control in the process of collaboration with others. Social perspective is also recognized by him when describing self-management as use of resources within specific learning context. Garrison (1997) further explained that the main components in his model are use of resource, use of learning strategies and motivation to learn. Although social perspective was mentioned in the model, there was still lack of discussion in terms of

the interaction between self-directed learning and different learning contexts (Song and Hill, 2007).

The dimensions in existing SDL models are summarized in table 3.2.1. Despite the different description of different terms, the models are well embedded in the previously discussed dimensions.

| **Perspectives** | **Candy (1991)'s model** | **Brockett & Hiemstra (1991)'s model** | **Garrison (1997)'s model** |
|---|---|---|---|
| **Personal Attributes** | Personal Autonomy / Self-management | Goal orientation (personal attribute) | Self-management (Use of resources) Motivation |
| **Process** | Learner control / Autodidaxy | Process orientation (learner control) | Self-monitoring |
| **Context** | Self-direction is context-bound Goal orientation (personal attribute) | Social context: role of institutions and policies | Self-management in specific context |

Table 3.2.1: Perspectives on Self-Directed Learning (Song and Hill, 2007: 28)

### 3.2.2 SDL in online context

Based on the review of existing classic SDL models, Song and Hill (2007) has constructed a theoretical framework to understand the development of self-directed learning in online context (see figure 3.2.1).

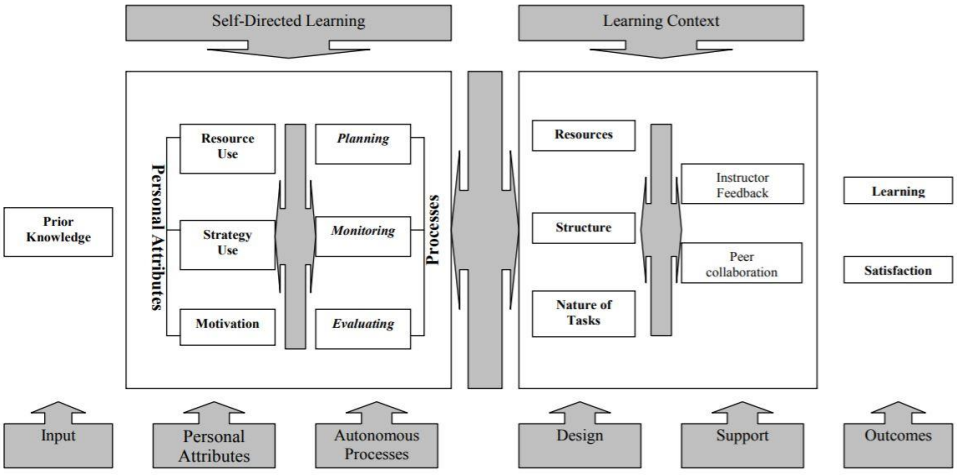


Figure 3.2.1. Theoretical framework of SDL in online context (Song, 2007: 31)

*Personal attributes*

The online learning context has influenced personal attributes in terms of resource use, strategy use and motivation. Human resources and information resources are examples of online resources (Hill and Hannafin, 2001), which provide easier access to get in touch with experts outside their own school or institution and a wide variety of structured and unstructured knowledge. It also faces limitation in terms of delayed feedback from instructors (Hara and Kling, 1999) and uncertainty of the peers in the collaborative learning community (Petrides, 2002). Such limitations may restrict students' use of online human resources such as an expert or learning partners. Gathering information from the variety of online knowledge can be another challenge in online context (Tobin, 2004). Students need to assess the validity and reliability before using the resources. Moreover, it is important to educate students to use appropriate learning strategies in online learning settings (Hannafin et al, 2003), as online context may provide challenges that students have not experiences in traditional learning settings (Song et al, 2007). For example, as feedback from peers and instructors cannot be as instant as it is in face-to-face learning, time-management strategy tends to be important in online context. Furthermore, the motivation in online learning is challengeable due to the easy-to-procrastinate nature in online settings (Elvers et al, 2003). One of the advantages of online learning is learning without time constriction. However, it results in more frequent procrastination than face-to-face classes (Elver et al, 2013). Considering learning resources, learning strategies and motivation, personal attributes in online context face some challenges that learners

never experienced in traditional learning context. Thus, the current research refers to the three aspects when investigating students' personal attributes (their perceptions of technological use) in self-directed language learning in Chinese secondary context.

*Process*

Song et al (2007) also provided three aspects to explore the impact of online learning on self-directed learning process: planning, monitoring and evaluating. Online learning has provided students with much control to plan what and when to learn. The delayed feedback from instructors also forces learner to monitor their learning process on their own (Shapley, 2000). The type of assessment also tends to be peer-viewed, which provides challenges in students' evaluation of their learning outcomes in online context (Petrides, 2002). Thus, in online context, planning, monitoring and evaluation are, to a large extent, learner-centered (Shapley, 2000).

*Learning context*

According to Vonderwell and Tuner (2005), learners' level of self-direction can be improved by engaging in self-directed learning. Learner's capacity in self-directed learning can be trained in specific learning context (Song et al, 2007). As this research investigated self-directed learning in the learning context of language learning with technology beyond classroom, the following section will introduce the interaction between personal attributes, process in SDL within this learning context.

### 3.2.3 SDL in CALL environments in informal learning

Personal attribute is the first construct in SDL model, consisting of resources, learning strategies and motivation, which is discussed in CALL environments in

informal context in this section.

*Resources*

As discussed above, CALL learning environments in current research represent all kinds of instructional and learning technologies related to language learning fields, not restricted to computer. The development of technology has provided a wide range of access to technological language learning resources (Haidari et al, 2019). Previous research has studied the technological use in language learning in several dimensions, including the types of technology, the computer-mediated communication (CMC) in language learning (Golonka et al, 2014; Smith et al, 2003).

In language learning beyond classroom, both structured and unstructured resources exist. Structured technological resources for informal language learning can be online courses provided by online learning platforms other than school. Chinese online education has a huge market, which focus on B2C online learning platforms, and English training, especially in K-12 level occupies a great partial (Peng, 2020). Yuanfudao, for example, as one of the leading online educational platforms in China, provides various English language courses beyond classroom. Some courses aim to strengthen the knowledge from school, which is based on the government curriculum, whereas other courses emphasize the important skills such as speaking skills, as complementary elements to school learning. Another type of structured online resource is structured online materials with a learning purpose. These materials are also provided as complementary materials on online educational platforms or instructional materials from personal blogs (e.g. Weibo) of instructors (Tian, 2015). As for unstructured

materials, various information or pieces of knowledge provided by distinct technological devices can be utilized for the purpose of language learning, even it is not designed for learning purpose. For example, network-based social computing including virtual world or serious game, online chat, social networking, blogs, internet forum or message board, wiki and so on (Golonka et al, 2014). In China, the popular social computing are WeChat, Weibo as discussed in chapter 1. These materials can be provided by various mobile and portable devices, such as tablet PC, iPod and smartphone.

As technological tools in language learning have specific affordances and constrains, it shapes what instructors and learners can do with them (Chun et al, 2016). Computer-mediated communication (CMC) is an important dimension to discuss such affordances in language learning with technology (Smith et al, 2003). Smith et al (2003) suggested four aspects to distinguish CMC tools: temporality, anonymity, modality and spatiality. Temporality discusses if the communication or interaction is synchronous or asynchronous, which has considerable impact on the learner behavior. Anonymity in CMC was stated to create critical receptivity (Kern, 1998) and decrease inhibition (Herring, 1996). Modality includes the modes of resources such as texts, graphs or videos, which have influenced the potential for a CMC tool to achieve specific goals. Spatial distance also has impact on students' behavior with distinct CMC tools.

Thus, technology has provided both limited opportunities and potential challenged resources for language learners to utilize in their informal learning settings. It is essential how students are able to use them with various learning strategies.

*Language learning strategies*

Language learning strategies are "specific actions, behaviors, steps, techniques [or thoughts] – such as seeking out conversation partners, or giving oneself encouragement to tackle a difficult language task – used by students to enhance their own learning" (Scarcella and Oxford 1992: 63). Language learning strategies can help learners improve their own perception, reception, storage, retention, and retrieval of language information.

Oxford (1990) devised a six-part strategy system for learning a second language. This system is built on the idea that the learner is a 'whole person' who employs intellectual, social, emotional, and physical resources and is thus more than a cognitive/metacognitive data processor. The system includes these strategy groups: (a) affective, such as fostering positive emotions via self-affirmation; (b) social, such as communicating with native language speakers; (c) metacognitive, such as paying attention and monitoring errors; (d) memory-related, such as grouping and imagery; (e) general cognitive, such as reasoning and summarizing; and (f) compensatory (to make up for limited knowledge), including inferring meanings from context and employing synonyms. Based on this framework, Oxford and Burry-Stock (1995) presented the Strategy Inventory for Language Learning, a questionnaire with comprehensive items reflecting various learning techniques in different circumstances (SILL). SILL is a popular tool for investigating students' language learning techniques in quantitative studies. This research implements items in SILL as reference in follow-up questions of the interview.

Oxford (2008) generalized this system further into four categories: cognitive strategies like observing, analyzing, combining, and categorizing; metacognitive strategies like planning, monitoring, and evaluating; affective strategies like establishing good motivation and handling with negative feelings; and social-interactional strategies like communicating and collaborating.

Most learning strategies mentioned above can be supported in CALL learning environments. For example, memory-related strategy can be enhanced by using applications designed for vocabulary memorization. Such applications support memorizing with pictures, sentences, or even pieces of movies. The choice of learning strategies can be associated with students' motivation in specific learning context (Chang and Liu, 2013). Thus, language learning motivation needs to be discussed.

*Language learning motivation*

Csizér and Dörnyei (2005) proposed seven components in order to understand language learning motivation from an internal perspective: integrativeness, instrumentality, vitality of second language community, attitudes toward second language speakers/community, cultural interest, linguistic self-confidence and milieu.

Integrativeness suggests the intension that a learner wants to integrate into the second language cultural and becomes similar to the target language speakers. This is an essential part in Gardner (1985)'s influential conceptualization of second language motivation. Instrumentality refers to the usefulness as an instrument of the target language. The perceived pragmatic benefits of the language by the learner provides the greatest intention to learn. Attitudes towards second language speakers/community is

another central element in Gardner (1985)'s motivation theory. It stated that a learner's attitudes to the speakers or community of target language have essential influence on his/her learning motivation of the language. The validity of the community is also important in terms of socio-structural perspectives, such as economic, political, size of the group. Cultural interest reflects the preference of cultural products such as films, music, produced by the media. Milieu aims to point out the perceived importance of others, such as parents, friends.

CALL learning environments provide various possibilities, especially in informal setting, for learner to perceive their language learning motivation. Online news, forums help to gain more insight of the second language society whereas films, TVs offer opportunities to learn the culture and actual lives in the community of target language.

Technological language learning resources, learning strategies and motivation construct students' personal attributes in CALL learning environments. I discussed how these components contributes to learners' capacity in self-directed learning. Song et al (2007)'s self-directed model summarized the important components in previous SDL models, and was adapted particularly in online context. This study finally chose SDL model from Song et al (2007) and pickup important components from the model. As stated in Song et al (2007)'s SDL model, the specific learning context has influenced on learners' control of SDL process of planning, monitoring and evaluating. In informal setting in this study, students are the main control of such process by utilizing metacognitive strategies. How they process with personal attributes in SDL constructs their specific technological learning experiences. In other words, technological learning

experiences in research question one in this research aim to represent students' active interaction between process and personal attributes in Chinese secondary context by discussing the three aspects in the SDL model: technological resources, language learning strategies, motivation.

As the SDL model (Song et al, 2007) also suggested to investigate the interaction with the context, in the next section, we will discuss the social-psycho factors that influence students' tendency of technological learning experiences.

### 3.3 Theoretical foundation considering factors that influence technological learning experiences (Research Question two)

In order to discuss the factors that influence students' technological learning experiences, I extended technology acceptance model (TAM) with external factors including teacher, parent and peers, as previous literatures suggest the three aspects are most important external surroundings of secondary learner (Lai et al, 2015; Sun et al, 2015; Mynard, 2012).

TAM is a useful model to understand the technology adoption in learning with technology (Salloum et al, 2019). It represents user's perspectives to discuss the acceptance of technology. Technology Acceptance Model is based on Theory of Reasoned Action (TRA) model (Fishbein and Ajzen, 1977). TRA is used to explain the 'reasoned action' by identifying causal relations between beliefs, attitudes, intentions, and behavior (Kwon and Chidambaram, 2000). Technology Reasoned Action (TRA) also has been applied to clarify the adoption of various technologies and applications (Liker and Sindi, 1997). Over the years, the original version of

technology acceptance model (Davis, 1989) was widely implemented in dynamic contexts and proofed validity of the variables with empirical evidences (Alwahaishi and Snásel, 2013). Some extensions of TAM such as Unified Theory of Acceptance and Use of Tecnology (UTAUT) (Venkatesh et al, 2003), were criticised to include too many variables and were easy to lead theory chaos (Bagozzi, 2007).

Davis (1989) proposed technology acceptance model (TAM) including three attitudinal factors: perceived usefulness, perceived ease of use and attitude towards technology. Perceived usefulness is 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Davis, 1989: 320). Perceived ease of use refers to 'the degree to which a person believes that using a particular system would be free of effort' (p. 320). The model hypothesized that perceived usefulness and perceived ease of use have influence on learners' behavioral intentions through attitude towards behavior.

Meanwhile, perceived usefulness and perceived ease of use are interrelated and are both influenced by external factors. The learning psychologist may see from social psychology that constructing meaning with the support of significant persons is critical (Simons, 2000). Learning, in other words, is a socially engaged process in which learners connect with one another and with other people. This interaction-perspective should be considered in any theory of self-direction in learning. Levy and Hubbard (2005) suggested to consider students' interaction with teacher, peer, and materials in computer-assisted language learning environments. Researchers in previous literature also provided evidences to hypothesize external factors including parents, teacher, peer

in the current research (Lai et al, 2017).

Thus, the current research, grounded in TAM, considers perceived usefulness, perceived ease of use in TAM and the external factors including support from teacher, parent and peer as the influential factors of students' tendency of technological learning experiences.

### 3.4 Theoretical foundation considering language learning achievement with technology (Research Question three)

Learning achievement in self-directed learning in informal context should be measured in both cognitive and affective perspectives (Lai et al, 2015; Sundqvist, 2011). Cognitive perspective mainly focuses on the enhancement of cognitive language skills and the improvement on academic achievement in school (Suhail and Bargees, 2006). Academic score is an important indicator to students' achievement in both formal and informal learning. However, if academic grade is regarded as the only indicator to students' achievement in informal learning, it distorts the ways of various strategies and approaches that can be implemented outside formal learning environment and may lead to less effective learning beyond classroom. Considering the objectives in self-directed language learning mentioned above (autonomy as learner, autonomy as user, and autonomy as person) (Lai, 2017), English skills represent the learning goal as a learner. In order to measure achievements towards learning goals as a user and a person, affective perspective needs to be involved, as informal learning environment is both educational and enjoyable (Downes, 2010).

Positive emotions such as enjoyment, pride, and flow have been shown to be

effective to facilitate learning (MacIntyre and Gregersen, 2012; Lake, 2013). Among the positive emotions, enjoyment has been identified as the most common positive feeling experienced by foreign language learners, and it has attracted increased attention from educational psychology experts (e.g., Csikszentmihalyi, 1990; Dewaele and MacIntyre, 2016, Dewaele et al., 2017; Li et al., 2018). Enjoyment was defined as a feeling of fulfillment and reward derived from activities or the accomplishment of activities (Ainley and Hidi, 2014). In the context of foreign language learning, feeling delight entails concentration, setting clear goals, and receiving immediate feedback that might assist learners in building resources (Li et al., 2018). Individual learners who were more proficient than their classmates and finally acquired a greater degree of competency in the target language displayed a considerably higher level of enjoyment than their colleagues, according to Dewaele and MacIntyre (2016).

Enjoyment in language learning is commonly used to measure learning achievement from an affective perspective, especially in learning beyond classroom (Lai et al, 2015). The broaden -and-build theory suggests that positive emotions such as enjoyment can broaden people's through-action repertoires and build resources for the future (Fredrickson, 2004). Enjoyment is the emotion that learner felt when they not only meet their needs, but also to accomplish something unexpected (Csikszentmihalyi, 2008). Enjoyment encourages learners' behaviors such as creativity and curiosity, which is beneficial in learning (Boudreau et al, 2018).

Moreover, confidence in language learning includes both affective aspect and cognitive aspect (Onwuegbuzie et al., 2000). Self-confidence is widely used in second

language research as a measurement perceived by the learners that they are with lack of anxiety and highly-evaluated language proficiency. It indicates students' confidence in using the language not only in learning tasks, but also in social context (Clément, 1980).

Therefore, three aspects were chosen for current study as to represent learning outcomes: academic achievement, enjoyment and confidence.

**5. Summary**

This study synthesizes different theoretical frameworks and links them together as a theoretical basis for answering the research questions. For research question one, SDL model from Song et al (2007) provide a comprehensive foundation in understanding students' actual learning experiences. Technological language learning experience in current study aims to present the dynamic phenomenon considering students' personal attributes to be self-directed and how the capabilities been processed in a certain context. Students' perceptions of the three main components in personal attribute (use of resources, use of learning strategies, and learning motivation) can provide the dynamic interaction between their self-direction and the process in their learning. This means that students' self-reported actual use of resources, adoption of learning strategies, and motivation construct the technological language learning experiences in current study. The choice is also consistent with Lai et al (2017)'s study, in which they consider students' use of technology, the interaction, and initiatives. As for the influencing factors, technology acceptance model is the essential theoretical foundation to build the model, as it studies students' perceptions about technology use and also considers

external factors in the CALL environment. Based on TAM, the hypothesized influencing factors are perceived usefulness, perceived ease of use. I further hypothesized the main external factors as teacher parent and peer based on Levy and Hubbard (2005)'s broad view of CALL to demonstrate the connections among computer, learner and language learning objectives. These factors were also confirmed with interview responses in current study before constructing the model in quantitative study. Finally, as for learning outcomes, in order to construct the holistic learning achievement, both cognitive and affective sides are considered.

Based on the above theoretical foundations, I attempt to provide a framework to the design of the instruments in current research. Figure 3.5 presents a clear relationship among three research questions. The study started from research question one, considering the learning resources, strategies (Oxford, 2008) and motivation (Csizér and Dörnyei, 2005) in SDL model (Song et al, 2007) to build the classification framework of technological language learning experiences. Next, based on technology acceptance model (TAM), I looked at what led to different choices for students in this classification. Finally, research question three focused on understanding what different choices would lead to different learning outcomes for students, taking a holistic view of both cognitive and affective. The following section introduces the methodology in current research, explaining how the research was done step by step.

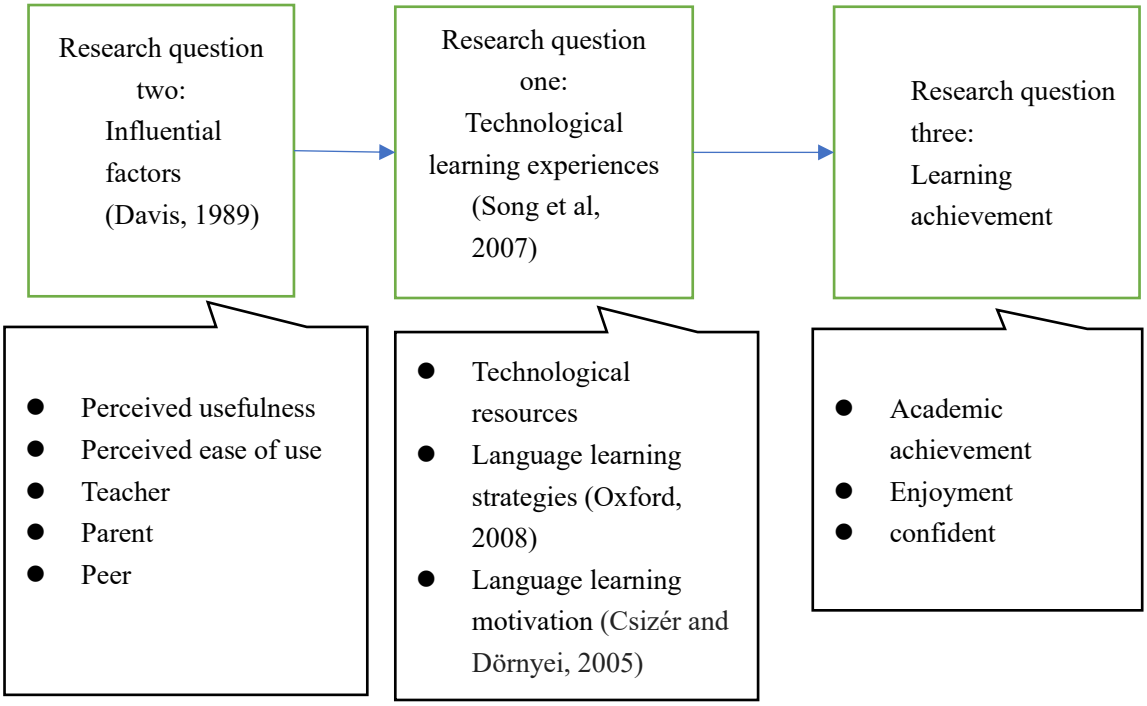


Figure 3.5: The relationship among research questions in current research

## Chapter 4. Methodology

The purpose of this study is to investigate what types of technological experiences students are engaging in considering their self-directed language learning (informal) beyond the classroom in order to set up a classification framework, and also to include the influencing factors and students' achievement in a Chinese secondary learning environment. The research should inform the educational interventions and parents about the directions to guide and facilitate students' self-directed English learning beyond classroom. This research fills the gap in the existing literature framework of self-directed language learning with technology beyond classroom in the specific learning context - Chinese secondary school, and also expects that this particular context will complement previous research on technology-based language learning experiences beyond classroom (Lai et al, 2017).

In this chapter, I present information about the research design and methodology used to accomplish the aim of the research and answer the research questions. Specifically, the chapter consists research design with a rationale of mixed sequential research method, the context of the research.

## 4.1 Research design

The research questions of the current study are:

1) What types of technological learning experiences are students engaging in considering their self-directed (informal) language learning beyond the classroom in a Chinese secondary context?
2) What are the factors that influence student's tendency of technology use in self-directed language learning in Chinese secondary context?
3) How does students' tendency of technological learning experiences predict their learning achievements?

An exploratory sequential mixed method was used in order to answer these research questions. This kind of mixed method begins with an exploratory, qualitative study, moving sequentially to a quantitative phase which refers the conceptual themes or constructs derived from the qualitative research (Creswell and Plano Clark, 2018). This methodology especially suits the current study, as the first step in current research aims to structure a classification framework that is suited in Chinese secondary context. There was no data about such classification in this context. Thus, starting from qualitative study helps to explore in-depth insights from the students in this specific context. Specifically, the current research consists two phases: 1) interview data

collection and coding in order to explore new constructs – different types of technological learning experiences (Research question one); 2) questionnaire based on the constructs derived from interview data and qualitative analysis (research question two and three), with a point of interface – to link the two phases.

The qualitative phase is regarded as "exploratory" as it is driven by interview data rather than a conceptual framework (Creswell, 2015). In research question one, the purpose is to explore different types of students' technological learning experiences in Chinese secondary context. Although Lai et al (2017) have provided insights of three-class constructs in technological language learning experiences beyond classroom, the authors indicated that these constructs were lack of validity check in survey responses and may change in different learning context. As Chinese secondary context was determined to be valuable in terms of expanding the classification framework built by Lai et al (2017), the current research adopted a narrative inquiry approach with guided questions in selected sample in Chinese secondary context in order to generalize or redefine the constructs in technological learning experiences in this specific context (Barkhuizen et al, 2013). However, data-driven approach does not mean that researcher is not allowed to use information from the literature review (Mihas, 2019). The theories and literature review provide general understanding of a topic whereas qualitative data helps to better understand the research problem in the specific context. General guiding questions should be prepared in advance of narrative inquiry interviews (Barkhuizen et al, 2013). The prepared guidance in current study was determined based on the theoretical model of self-directed learning (Song et al, 2007), addressing students' use

of technological resources, language learning strategies and motivation in their English learning beyond classroom. Unlike semi-structured interview in which the pre-determined questions are normally asked of each interviewee in the same way and in a systematic order (McIntosh and Morse, 2015), the prepared questions in this study were not asked in a specific order, but rather as a guideline to guarantee all aspects to be covered throughout the narrative inquiry interviews (Clandinin, 2006). The aim of the narrative inquiry interview is to allow students telling stories of their own experience freely in order to get the most insightful narratives of their actual language learning experiences (Barkhuizen et al, 2013). The follow-up questions were tailored to the different responses of each respondent, aiming to cover all three aspects in the prepared guidance based in SDL model. During coding phase, I also refer to Lai et al (2017)'s coding methods as well as new constructs generalized from my specific research.

The key element in mixed methods research is the combination of qualitative and quantitative work at some level (Gorard, 2015). In this study, after extracting the patterns of technological learning experiences, the second phase of the mixed method begins with the design of questionnaire based on the constructs from phase one. The meaningful quotation helps to build survey items, the useful code can be transferred to variables (Mihas, 2019). The connective point between qualitative and quantitative phase is called "point of interface" in mixed methods research (Creswell and Plano Clark, 2018). The point of interface in this research was the interrelationship between interview results and design of questionnaire and the adaptation of theoretical framework in Chinese secondary context based on interview findings. The

classification in research question on was set up combining the findings from both qualitative and quantitative studies. Research question two and three were mainly answered by quantitative data in the survey using the constructs derived from the qualitative study, whereas the interview responses also indicated the potential reason for the quantitative results. The quantitative study, with a larger sample, was also an assessment of the constructs which derived from qualitative data. The findings from quantitative study were reported with meaningful quotations from qualitative study to get deeper insights.

Figure 4.1 describes the research design with the implementation of exploratory sequential methods in current research adapted from the structure provided by Creswell (2015). Chapter 5, 6, 7 sequentially introduce the two phases and how they interactively mixed by the point of interface. Before the description of the study, it is important to clarify the context in which the current research conducted.

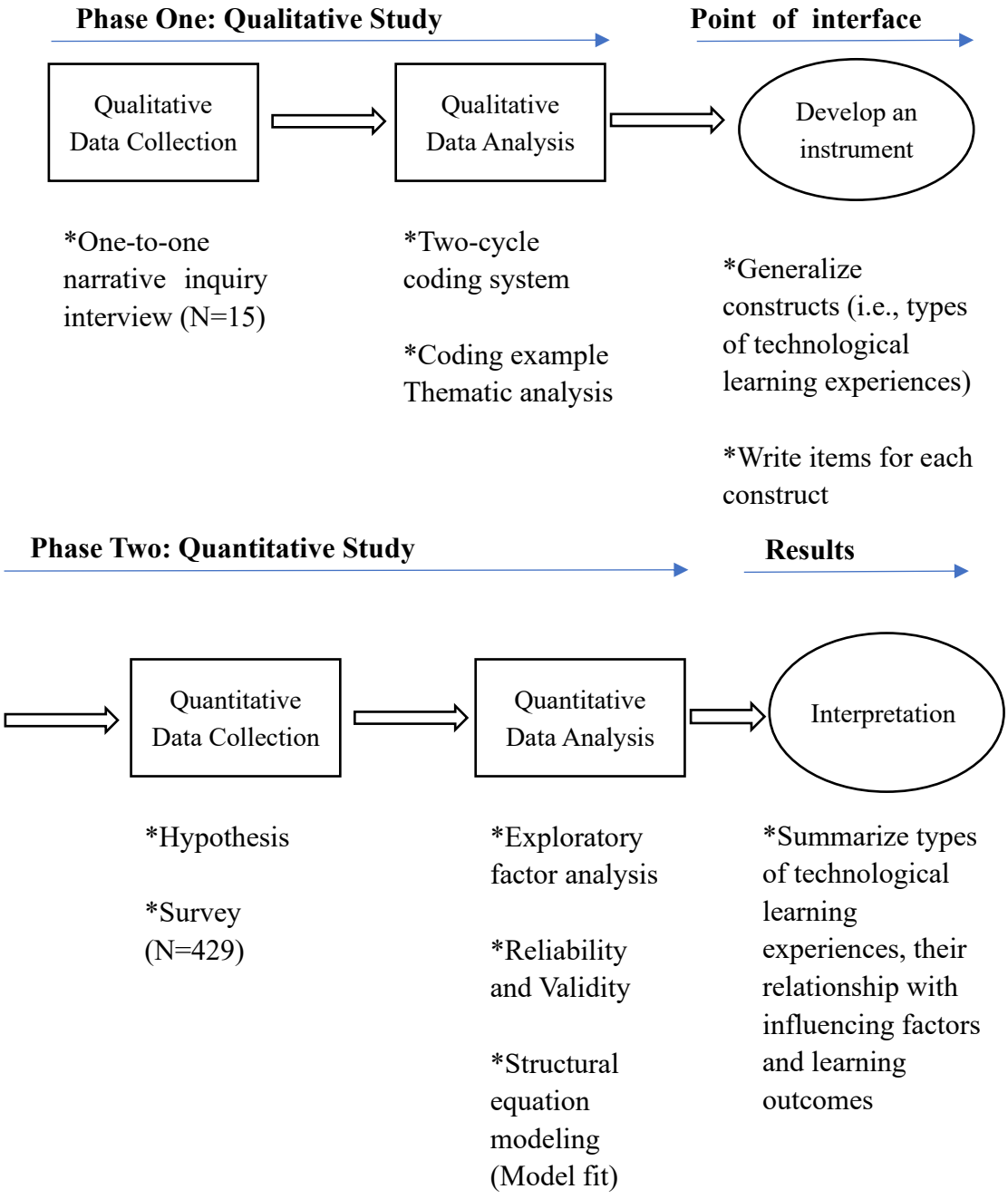


Figure 4.1. The research design using an exploratory sequential mixed method

## 4.2 Context

To begin with the research procedure, it is essential to introduce what exactly are included and excluded as out-of-classroom self-directed language learning in this research. In the current research, the clarification of context of self-directed language

learning beyond classroom (informal) is considered in the four aspects in Malcolm et al (2003)'s criteria, discussed in section 3.1.2, to distinguish informality and formality, including process, location and setting, purposes, and content.

*Process*

Students' self-directed language learning with technology in Chinese secondary context involves the learning process that is learner-led. All the assignments or activities that are directed by the school teacher, although occur outside school, is not considered as in this informal learning setting. The assessment can be included if it is student-centered rather than given by the teacher.

*Location and setting*

The physical location of the informal learning in my current research is outside school. It may also happen in school between individual courses during the spare time. However, considering the lockdown due to COVID-19 when the research was conducted, it was restricted at home. As for the setting, the informal learning occurs outside formal education provided by government or school. As discussed above, during lockdown, the government and school delivered courses via cable TV and online platforms. Although these learning happens at home, they are considered as formal learning as they are just an online form of learning within the curriculum. The informal learning should be extra-curriculum and not given assigned by the government or school.

*Purposes*

The current research distinguishes the purpose in the political perspective in

Malcolm et al (2003)'s model. When the purpose of the learning is learner-initiated rather than a learning design to meet external needs such as governmental requirements, it is considered as informal learning. In this case, the extra-curriculum courses that are chosen by students themselves are also considered as informal learning. This is identified as nonformal learning by Mocker and Spear (1982) in the lifelong learning model, as it is the learner who choose to learn via an institution outside school setting. The current research considers such structured learning provided by institution outside school as informal learning. For example, a student wants to improve English speaking skills and signs up for an online one-to-one speaking course with a native speaker. It is considered to be informal learning in the current research.

*Content*

The content in the informal setting in this research can be any of the online materials that is not initially provided by the government or their school teacher. The structured content provided by other well-known teacher or instructor from other educational institution can be considered as the content for informal learning if it is not compulsory from their school.

The above discussion helps to clarify the terms related to self-directed language learning beyond classroom that is implemented in the current research. As illustrated above, either autonomous learning or self-directed learning can occur in formal and informal settings. Learning beyond the classroom involves learning in non-formal and informal contexts, which is characterized by the possibility of the learning being emergent, contingent and opportunistic since informal learning is both 'reactive,

unintended, and also deliberative, intentional' (Hager, 2012; Rogers, 2016: 270). Informal learning includes not only pieces of information and knowledge in life experiences, but also planned, structured learning designed in various learning programs without a formal credential (Van Noy et al, 2016). This clarification of self-directed language learning beyond classroom will be used as criteria in qualitative study to distinguish technological learning experiences.

### 4.3 Summary

This chapter provide a detailed process of how the current research was conducted. As this design covers both qualitative and quantitative research, and the latter needs to be based on the findings of the former to begin with. I am therefore unable to present more details about each of the stages in the current chapter. In order to present the whole process more clearly, I have separated the qualitative research (chapter 5), point of interface (chapter 6), and quantitative research (chapter 7) into separate chapters for detailed discussion.

## Chapter 5. Qualitative Research

The qualitative research in this exploratory mixed methods research aims to provide an initial version of classification framework of students' self-directed technological language learning beyond classroom. According to Morse (2016, p:24), 'The theoretical drive is the overall induction or deduction direction of a research project'. Considering the theoretical framework in this study, the starting point to answer current research questions is to explore the phenomenon of students' use of technology in Chinese secondary context by setting by initial classifications. Rich qualitative data from

narrative inquiry interviews considering students' use of technological learning resources, language learning strategies and motivation can help to classify the initial types of technological language learning experiences. In this chapter, the instrument, participants and the process of data collection and analysis in qualitative study are introduced.

## 5.1 Instruments

The main purpose of qualitative phase is to explore the phenomenon of students' self-directed technological learning experiences beyond classroom, aiming to generalize an initial classification framework to support instrument structure in quantitative study. The current research investigated students' experiences and their reflections on those experiences through their own storytelling. Narrative inquiry is a qualitative research method than helps to study experiences narratively via personal storytelling (Clandinin and Connelly, 2000). This relatively new method has been increasingly adopted in educational research through various instruments such as interviews, providing researchers with rich understanding of the learning process (Bell, 2011).

The subject responses to be explored in current research aim to uncover the phenomenon (students' self-directed technological language learning experiences beyond classroom) in the specific context (Chinese secondary students). The guideline in the interview is based on the components from self-directed learning model (Song et al, 2007): resources, language learning strategies and motivation (see details in section 3.2.3). I aimed to cover all aspects in the guiding questions if they were not mentioned

in students' stories of their technological language learning beyond classroom. Firstly, I made a list based on the technical resources often mentioned in the literature review. If a resource in the list was not mentioned in the student's narrative, I would ask further questions about the reasons for not engaging with that resource. It was also possible that students did not consider this resource as a resource for English language learning, such as listening to English songs. Secondly, I would have referred to Oxford (1996)'s Strategy Inventory for Language Learning (SILL) before the interviews so that I could always check if the strategies the student adopted corresponded to the appropriate categories, and if I could remind the student by asking them some of the strategies in the list that they did not mention. Finally, the student's motivation was also used as a reference according to the motivation categories mentioned in chapter 3 (Csizér and Dörnyei, 2005) to provide guidance in the follow-up questions.

## 5.2 Participants

Fifteen students who learn English as compulsory subject at school were selected to participant in the interview, including 10 female and 5 male students. The students were from two junior high schools, ranging from grade 7 to 9. The schools are located in Shanghai and in a small city in northern China, which can provide date from perspective of students from both big and small cities, as learners from different region with different levels of social-economic background have direct influence on their daily technological usage (Bozionelos, 2004). Eight students from Shanghai started to learn English from preschool at kindergarten and seven students from northern China began from grade 3 in primary school. They have studied English for 4-8 years. The English

teachers at school helped me to select the students, trying to cover all levels of English proficiency.

### 5.3 Procedure

In order to recruit participants, Purposive Sampling was used. It's most commonly used in qualitative research to find and pick the most information-rich examples to make the most use of available resources (Patton, 2002). Purposive sampling, as a type of nonprobability sampling, has a number of drawbacks due to the subjective nature of sample selection, and thus is not a good representative of the population; however, it is useful in situations where randomization is impossible, such as when the population is very large (Etikan et al, 2016). Maximum Variation Sampling is a useful strategy in purposive sampling to examine a subject from all possible perspectives, resulting in a better knowledge of a phenomenon (Suri, 2011). The purpose of this qualitative study was to gain the greatest understanding of students' use of technology outside of the classroom. Maximum variation sampling strategy was used to help get the possible richest results from this study. With limited resources, the data aimed to cover data from different aspects: social-economic background (big and small city), age group, genders, proficiency levels, in order to greater information to understand the phenomenon.

Narrative inquiry interviews with prepared guidance were implemented with individual participant. Prior to the study, I discussed with school English teachers about the structure of the interview and the common technologies that students might implemented in their English learning. In order to be effective, all participants were

asked to list the out-of-school activities they engaged to study English beyond classroom. As the school teacher mentioned, with the pressure of heavy examinations, students may not have enough time and freedom to use mobile phones and computers. Moreover, in order to avoid students' misunderstanding about technology, interviewees were asked to list all technological and non-tech resources they used. This approach also helped to understand the proportion of technological learning experiences in their total English learning experience.

Interviews were taken individually via WeChat (a popular instant chatting tool in China, as WhatsApp). In the process, students were introduced clearly what it meant for use of technology in their English learning. Use of Web 2.0 and technology devices such as mobile phones, iPad were all be counted as technological use. Based on the lists, students were asked to telling stories about how they engaged in each of the learning resources. Participants were encouraged to reflect on their perceptions freely to create as much narrative as possible. Follow-up questions were asked only to make certain of students' intended opinion or to gain deeper insight. More elicitation methods were utilized to certain students, as they responded little without detailed questions. When students cannot describe how they used a specific technology in their English learning, I referred to Oxford (1996)'s Strategy Inventory for Language Learning (SILL) to remind them whether they used such strategies in their learning. For example, many students stated watching English movies outside school, but few could describe how they watched in details. Then I asked follow-up questions such as "Did you use subtitle? In English or in Chinese?", "Did you try to imitate the accent in the movie?".

I also refer to the prepared list of commonly-used technological resources based on literature review. For some commonly-used resources that were not mentioned by students, students were asked about the reason for not choosing them. For example, some students didn't mention listening English songs, as they didn't regard it as a part of English learning. However, with follow-up questions, they admitted that English songs did motivate their English learning and some new vocabularies in the lyrics also helped in their examinations.

Moreover, students were encouraged to express their motivation of choosing specific kind of interaction with technology, if such information was not mentioned in their narratives. Each interview lasted for approximately 30 to 60 minutes. All interviews were conducted in Chinese.

## 5.4 Data analysis and constructs

### 5.4.1 Data Analysis

The interviews were recorded and transcribed in Chinese by mobile application. Transcriptions were analyzed following two-cycle coding system. As Namey et al. (2008, p. 141) suggested, structural coding allowed researcher to "quickly access data likely to be relevant to a particular analysis from a larger data set". Thus, in the first cycle, the interview data were divided into segment following each technological and non-tech learning resources using structural coding (such as watching movies, listening to English songs). This was easy to be derived as the students were asked to write down their English learning activities beyond classroom before the interview. In each segment, sub-segments were coded with distinct aspects, such as the learning strategies (e.g.,

watching subtitles when watching movie, learn new words in lyrics), the motivation (e.g., just for fun, learn more new words). These aspects are grounded in the theoretical framework of self-directed learning model (Song et al, 2007). Each sub-segment was coded with in-vivo coding to represent students' actual perceptions (Saldaña, 2014). In the second cycle, pattern coding was used to put the codes into analytic categories, which constructed the final constructs. The analytic categories are grounded in Oxford (2008)'s taxonomy of language learning strategies and Csizér and Dörnyei (2005) 's components of learning motivation. Language learning strategies are categorized as cognitive, metacognitive, affective, and social strategies (Oxford, 2008) and Language learning motivation were categorized as integrativeness, instrumentality, cultural interest, linguistic self-confidence, milieu (Csizér and Dörnyei, 2005). These were considered as the analytic categories in the first-layer coding.

Table 5.4.1 shows the process of two-layer coding of students' technological learning experiences beyond classroom. The process started from involve coding such as 'just for fun' 'plan my study'. These codes were aggregated into analytic categories such as 'interesting and relaxing', 'monitoring strategies' which are showed in the first-layer category- the first column. As there was already a structure of different components to construct final technological learning experiences based on the SDL, the first-layer category was easily aggregated into second-layer category which were exactly the dimensions in the second column (resources, strategies, motivation) to build the final classification of technological language learning experiences.

Four technological language learning experiences were generalized based on the

three dimensions in the second-layer category. The numbers in Table 5.4.1 were counted as the times of first-layer codes emerged in these individual types of learning experiences. For example, in instructional-oriented language learning experiences, students reported 20 times that the learning resources is structured. The classification framework comprehensively considered the three aspects in the second-layer. Language learning strategies are the primary consideration to construct the four types of learning experiences whereas resource and motivation were also considered. In entertainment and information-oriented language learning experience, there were students reported 5 times using cognitive strategies. However, considering they perceived the technological resources to be interesting rather than structured and the motivation was perceived as cultural interest rather than learning grammar, these learning experiences were categorized as entertainment and information-oriented rather than instruction-oriented. Non-technological learning experiences are discussed in the following section, but is excluded in the table.

| First-layer category | Second-layer category | Instruction-oriented technological language learning experiences | Metacognition-oriented technological language learning experiences | Entertainment and information-oriented technological language learning experiences | Social-oriented technological language learning experiences |
|---|---|---|---|---|---|
| Structured | Characteristics of learning resources | 20 | | | |
| Convenient | | 9 | 1 | 2 | 1 |
| Inaccessible | | | | | 3 |
| Authentic | | | | 2 | |
| Boring | | 2 | | | |
| Drill | | 3 | | | |
| Monitor and plan | | | 5 | | |
| Interesting and relaxing | | 3 | 2 | 21 | 1 |
| Cognitive | Learning Strategies | 32 | | 5 | |
| Metacognitive | | | 8 | | |
| Affective | | | | 26 | |
| Social | | | | | 2 |
| Integrativeness | Motivation | | | 18 | |
| Instrumentality | | 29 | 2 | | |
| Cultural interest | | | | 17 | 1 |
| Linguistic self-confidence | | | | | 1 |
| Milieu | | | 1 | | |

Table 5.4.1: Summary of two-layer coding system (Only technological experiences)

### 5.4.2 Initial classification framework (Constructs)

Based on the result of the interview, the initial classification framework of language learning experiences in Chinese secondary context was reidentified as four different experiences as followed: Instruction-oriented learning experiences, metacognition-oriented learning experiences, entertainment and information-oriented learning experiences, and social-oriented learning experiences. Comparing with the types in Lai et al (2017)'s study, one additional type – metacognition-oriented technological language learning experience emerged. I describe in details of the four types in current qualitative study in terms of different dimensions (learning resources, learning

strategies, motivation), and also some of students' perceptions of influencing factors. In addition, I include a paragraph in each learning experience to discuss students' engagement of non-tech activities in such learning experience, in order to provide a general impression whether students were more active in such experience with or without technological use. The basic structure of explaining the types are technological learning resources, non-tech activities, motivation, strategies, and impacting factors.

*Instruction-oriented learning experiences*

Participants engaged in instruction-oriented learning experiences mainly to expect strengthen on vocabulary and grammar, aiming to receive direct improvement on their grades at school. They learnt the target language for the purpose of utilization as an instrument, thus can be regarded as the motivation of instrumentality (Csizér and Dörnyei, 2005). The technological resources included online structured English courses, online reading with practices that are designed for high school students, instructional posts on Apps and online, videos that were made for instructional purpose, vocabulary Apps, mobile flash cards, grammatical analysis on instructional Apps. Most students preferred to involve technology to engage in instruction-oriented experience when learning vocabulary, specific grammar and structured course. They stated that it was flexible to use vocabulary Apps. "I don't want to take vocabulary books all the time, it's heavy… I can add the words in customized online vocabulary list, it's very simple… I don't need to write them down. I can repeat them Whenever I want, and it's always with examples and pronunciation". This indicated the convenient characteristics of instruction-oriented technological resources to support vocabulary learning. One

participant also mentioned that she was only using the function of "vocabulary history". "When I look up a new vocabulary in the App, I always have a quick look at the history words" "They are just there, it's very convenient". I coded this as 'convenience' in first-layer category as well to represent the characteristics of technological resources in the second layer, as it was another aspect of convenience that a vocabulary book cannot achieve. Learners are not necessary to mark or write down the unfamiliar vocabularies, the search history in vocab APP made it easier for leaner to review quickly every time when they opened the application. Some interviewees also reported the use of mobile flash cards. It offered a variety of approaches to randomly review the lexis, such as choosing the correct translation, explanation or relevant picture of the vocabulary. As a participant said, "With vocabulary book, I'm always staying at 'abandon' (which is in the first page of vocabulary book to prepare high school entrance examination)". A few participants stated that they read grammatical post on vocabulary Apps. "They introduce a specific grammar in one post. They also have practices. They (the question types) are exactly what we do in school tests" There were also other instructional Apps that provided well-designed articles or videos that introduced different aspects of topics. Based on students' level, unfamiliar lexis were highlighted in order to facilitate students' reading. Grammatical knowledge was also introduced with the background of the article or video. One student mentioned that although she did not finish the structured online course, she utilized some part of the courses as the resource to enhance specific language needs.

However, most of the participants reported to involve in out-of-class instruction-

oriented learning experiences without technology, especially when they were doing drills and taking structured courses. They practiced with popular extracurricular practicing books. For example, examination paper from Huanggang secondary school is a well-designed practicing book. Huanggang secondary school is a Chinese high school that is famous for its qualified teaching resources and large proportion of students entering schools of a higher grade. The school teachers published the test papers at school, which were widely recognized as good practicing materials for students. Participants also reported weekly newspapers as a main practicing resource in their out-of-school English learning. Weekly English language newspapers were uniformly subscribed to by most schools. They were designed for high school level with some hot topics, reading and relevant drills. The question types are similar to the school tests. Some students also mentioned that they practiced with high school entrance examination (SEE) papers of last five years and the mock exam papers, aiming to get familiar with the question types in the SEE and to practice the speed of doing the questions. In Chinese SEE, speed is also a vital part, as sometimes students cannot finish all questions if they were slow. One participant mentioned, “I don’t have time to finish the writing part.” Participants reported that they, including their classmates, were commonly engaging in huge number of practices in paper, in order to improve their abilities in exams. Many participants remarked that although technology provided a various of resources with flexibility, they had huge pressure of SEE which was the only way for them to enter high school and it was taken in paper. Students need to be familiar with the reading and writing in paper in order to pass it. Several interviewees also stated

that they attended out-of-school English tutorials in institutions, most of which were reinforcement of what is being taught in school. They preferred on site tutorial mainly because of the atmosphere. “It’s comfortable, I can communicate with students and teacher directly”. And it was also influenced by parents, who trust on site institutions more than online resources. “My mom does not want to pay for an online course. She would like to pay more for an institution. She would like to see that I really go somewhere to study…It’s real for her.”

Interviewees frequently mentioned terms such as “learn”, “drill”, “test”, “teach” to strengthen the motivation dimension in instruction-oriented learning. The contents were designed to adapt to junior high students’ English level, which were a more targeted approach to improve middle school students' performance. As exemplified in an interview quote “Some articles (in the weekly newspaper) were even written by students”, “It’s not like authentic newspaper, It’s simple. It’s designed for us”. Phrases such as “enrich my vocabulary”, “enhance my reading skills”, “strengthen my knowledge” were frequently mentioned by participants when talking about instruction-oriented learning experiences. They characterized it as conscious and intentional learning. Participants engaged in such learning when they had strong intention or specific purpose, which was consistent with the motivation of instrumentality. It relates to the target language's utility as an instrument. The learner's perceived pragmatic benefits of the language give the strongest motivation to learn.

As for participants in the interview, most of them reported to use more technology for the purpose of vocabulary and grammar learning. “I found that I frequently did not

understand important words in reading. This costed me some scores every time. Then I found that I have to learn vocabulary. I began to use Baicizhan (a vocabulary App)". Interviewees remarked non-tech instruction-oriented learning in order to do reading, writing and general practices. This generally related to the motivation of as instrumentality in Csizér and Dörnyei (2005)'s motivation category (see section 3.2.3).

As for the learning strategies, students reported to use strategies such as memory related, compensatory and general cognitive. Memory related strategy were utilized when learning grammar and vocabulary whereas compensatory and general cognitive were sometimes involved in practices. The instruction-oriented learning resources were generally recommended by teacher or friend or parents. Some interviewees also reported that they collected the resources themselves.

*Metacognition-oriented learning experiences*

Participants engaged in metacognition-oriented learning experiences mainly focusing on planning, self-evaluating, and monitoring in the process of English learning. Similar to the resources above, the technological resources of metacognition-oriented learning include vocabulary Apps, graded reading Apps, instructional Apps. However, the experiences were established due to the utilization of specific functions. For example, the set-up function in some vocabulary Apps constructs a plan for memorizing new words. Students could set up the number of new vocabularies they intended to learn each day or control the total length of time to study specific entire vocabulary book such as SEE vocabulary book published by new oriental school. Firstly, the App provided a detailed plan and reminded students to finish the everyday tasks. "I have to

finish the task in order to remove the notification, otherwise it's there to remind me that there are new words to be memorized". The reminders motivated students to plan and continuously follow the plan during learning process. Moreover, the checkpoint feature encouraged students to track their activity and achievement, and to share with other learners on the Apps or with friends on social media such as "moment" in WeChat. The App also monitored students' process of learning by recording wrong answers and repeating unfamiliar lexis. As participant stated, "(The App) is very clever. If I chose the wrong translation or picture (for a vocabulary), it will come out again and again…This is what vocabulary book cannot offer me". The innovation of such feature facilitated students to monitor their learning process.

Graded reading was also mentioned by some participants as the technical resource of metacognitive learning due to the pre-test and checkpoint function. Students were recommended with different levels of reading materials by pre-test of vocabular size. The pre-test was implemented with the reference of lexical big data with the division of "simple" and "difficult" Lexis. The sample in pre-test changed based on students respond. As a student reported, "If I'm wrong several times with difficult words, it offered me with simple ones". After pre-test, the app recommended relevant English books and set up a plan based on users' schedule. Similar to vocabulary App, the checkpoint function in graded reading App also motivated students to track their learning process, and to share with their friends who pushed learner to discipline themselves.

Participants also remarked metacognition-oriented learning experiences without

technology by organizing notebooks with wrong topics and new lexis in practices and tests. Students stated that handwriting when sorting out the notebook is also an effective method to memorize, as an interviewee said “I can find the question in my notebook quickly, as I remember the general location in paper.”. Students who reported to have such notebook mentioned that they reflected on their weak language skills after examinations and intended to exercise more on specific skills, but few of them made specific plan on paper to monitor their English learning. One participant reported, “I don’t write down the plan on paper, I just follow a general guide”. It seems that technological metacognitive learning experiences are more visualized by data. Though participants engaged in metacognition-oriented learning without technology, most of the experiences were implemented in mind rather than a portfolio.

Participants frequently mentioned terms such as “plan”, “monitor”, “level” to strengthen the characteristics of metacognition-oriented learning experiences. The technological functions in mentioned Apps were not a must in the design, but a highlight to facilitate students’ metacognition, which forced students to be aware of the plan, the process and self-evaluation. Some App even reduced prices on students who regularly share the learning process in WeChat moments, which also influenced students’ self-discipline.

Participants reported to utilize metacognitive strategies when engaging in metacognition-oriented learning experiences. Unlike instruction-oriented learning experience and entertainment- and information-oriented learning experiences, although the resources were recommended by teacher, friends, and classmates, students choose

to use the functions mostly by themselves.

However, a very significant commonality in the reports of interviewees was that the metacognition was mainly considered with an instructional purpose. Students engaging in metacognition-oriented learning experiences shared the same motivation of instrumentality as those who were involved in instruction-oriented learning experiences. Within the limited mention of metacognition-oriented learning experiences, students mentioned two times that they were engaged in such learning with pragmatic purpose of enhancing test scores. It is clear to understand metacognition in the framework of goals of autonomy. Metacognition, as a learning strategy to plan and monitor the utilization of other individual learning strategies, is based on the goal of autonomy as learner, rather than as a user. It is a necessary component to reflect and promote the capacity in self-directed learning as a learner (Oxford, 2008). In this specific context of Chinese secondary students, the main objective as a learner is to enhance their performance in school tests, rather than to improve the holistic competence in target language as a user or as a person. Thus, it is not hard to understand that few students reported metacognition-oriented learning experience to enhance their ability in target language in a social-freedom context. They implemented such strategy of monitoring and planning to enhance specific language skills such as vocabulary, grammar, reading skills grounded in the needs within the existing educational system.

In general, it can even be regarded as a complementary of instruction-oriented learning experiences. It is introduced as an individual learning experience to emphasize the importance to reflect and promote students' foundation of self-directed learning.

However, the validity to categorize it dependently from instruction-oriented learning experience in this specific setting for Chinese secondary students needs to be further assessed by survey responses.

*Entertainment- and information-oriented learning experiences*

Participants engaged in entertainment- and information-oriented learning experiences mainly referred to their interests or needs for specific information. They chose these kinds of experiences when they were interested in the culture or want to be familiar with the authentic language and lifestyle of the community of the target language. The technological resources included listening to songs and news or entertainment podcasts; watching movies, watching American drama, reading e-books, watching cartoons; playing online games; reading online news. Songs and movies were most commonly reported by the participants and they are commonly remarked as entertainment. “It’s not for study. I like the movie”. Even though some students mentioned they intended to learn English using American drama “six friends”, they insisted on watching because of interest. As a participant stated, “I cannot understand everything without subtitles. Normally I read Chinese subtitles in order to catch up with what it happening…When I come across an interesting expression, I go back and watch it again with English subtitles.” No participants reported to regular use movie or lyrics of the songs to learn vocabulary or grammar. Several participants reported the instructional App (little English), which is consisted of resources for instruction-, entertainment- and information learning. For instruction, it provides well-designed videos and movie clips together with highlighted vocabulary and practices for various

level of language learners. Several interviewees used it in order to learn vocabulary and grammar, which was considered as instruction-oriented learning experiences. As for entertainment and information, it contains huge number of entertaining videos, authentic news, science and a variety of hot topics, which can be used as resources for entertainment- and information-oriented learning. “It’s all mixed, I can choose what I want to watch. It’s flexible, I can get some grammatical knowledge and also just for relaxing. (They are) All on one App.”

However, many of interviewee did not regard these as a part of English learning. A participant said “yes, I like to listen to English songs, but I don’t think it’s helpful to my English study”. When asking if English songs motivated her interest in English study, she said “well, yes. It enhanced my interest, as the rhythm is good. I learned to sing the song and sometimes remembered some new words. Ah, I sometimes even saw a few words in my test. But it did not happen frequently”. Students admitted that they actually leant unconsciously when involving in interesting and relaxing language activities, which they did not aware until asked in the interview. One participant learned vocal music in her spare time. She stated that this also indirectly helped her English study. “Before we began to learn a new song, the teacher always introduces the background of the song. The story, the emotion…I learned a lot unconsciously. And I also learn new vocabulary from the lyrics”. In the interview, most of the participants did not recognize the indirect help from this kind of learning experiences, as the improvement of English ability in their perspectives is the direct gain of test grades. Many of them have admitted that entertainment- and information-oriented learning had

impact on their English study, especially on their motivation. One participant insisted that listening to English songs had no influence on her English study. Participants remarked to gain knowledge that was useful in culture, daily lifestyle, science in target language, which indirectly motivated their interests to learn English.

Unlike instruction-oriented learning experiences, technology consisted a large proportion in entertainment- and information learning. Non-tech resources were only reading books and newspapers. Although e-books were stated by some interviewees as "convenient and cheaper", some students preferred to read paper books. "I like the feeling of turning pages, and the smells of the books." Said a participant.

Unlike the pressure of SEE in instruction-oriented learning, students reported as entertaining and useful information in this learning experiences. Descriptions such as "like", "interest", "fun" were frequently mentioned when describing entertainment- and information-oriented learning experiences. Participants stated to general understanding the resources, not taking notes to analyze the vocabulary and grammar. A student likes to read articles about science fiction. He said, "When I encounter new words, I guess. Just to understand the article generally". Another participant also stated, "I don't care about the lyrics, I'm just humming along to the melody." When engaging entertainment- and information- oriented learning, Interviewees reported that they focused on information, storyline and melody more than the meaning of the vocabulary and grammar.

As for learning strategies, participants reported to utilize affective and compensatory strategies (part of cognitive strategy) when engaging in entertainment-

and information-oriented learning experiences. Similar to instruction-oriented learning experience, the resources of entertainment- and information-oriented learning were also recommended by teacher, friends, and classmates, but few by parents.

However, there are some slightly differences between entertainment and information-oriented learning experiences based on the report from the interviewees. One distinct perspective is the initial goals of learning. Although entertainment-oriented learning experience was categorized as language learning experiences, some students reported that they did not perceive this kind of experience as a process of English learning. They conceive of the specific experiences as part of the daily routine that happened to be in the target language rather than as intentional English learning process. The other aspect of the distinction was that despite of being interest-driven, the incentive to involve the target language as mediation was slightly different. Students perceived a greater degree of intention to employ English as tool to pursue interest-based information, as topic-specific information could be obtained by either native language or target language. Whether intentional or not, students considered, to some extent, as a process of target language learning when they utilized English as mediation for their information access. The motivation could be that they wanted to be integrated into target language society. In contrast, the entertainment-oriented experiences happened in target language in its nature. For example. Their favorite singers sang songs in English and the movies they love were made in English. It was more about he cultural interest, no the language itself. Although we cannot completely exclude a tendency to learn the language to begin with such experiences, this bias was obviously

lower than in the case of information search. Thus, although these two learning experiences were categorized as one based on the interview, the validity need to assessed in the survey response, as the sample sizes is small in the qualitative research. It was also suggested to test the validity with survey responses in Lai et al (2017)'s study.

*Social-oriented learning experiences*

Unlike the above learning experiences, only a small portion of participants reported to engage in social-oriented learning experiences., which emphasized on problem solving, social exchange and daily life communication. One student attended an online one-to-one tutorial with an English native speaker. The course was designed partially for the purpose of instruction with grammatical introduction and new vocabulary by the presentation, and partially designed for the purpose of socializing with English native speaking tutor. "Each course has a specific topic, but we can talk about everything." The participant reported to receive cultural and lifestyle knowledge from the tutor rather than some grammar and lexis. Unlike in entertainment- and information- oriented learning experiences which focused on the interaction with the resources, social-oriented learning is to communicate with native speaking people. None of the students mentioned to search for opportunities to connect native speakers on social media, which was generalized to be led by the following reason. On the one hand, students were under high pressure of abundant examinations, in which speaking was not included. In Chinese SEE, the question types include grammar, reading, writing, but not speaking. Students did not focus on speaking practices. On the other hand, due to the limitation

of access to international social media, students did not have opportunity to connect native speakers via commonly-used Facebook and twitter. Participants described the experiences using phrases such as “no time”, “cannot connect”, “never think of it”. Although such one-to-one online tutorial with native speakers is not rare in Chinese educational market, the cost for such course is high, which is not accepted by many parents. An exemplified quote was “My mom prefers to pay for institutions (which teaches grammar and helps to consolidate knowledge at school) It can help me to get higher grades.”. The participant who attended the course also mentioned the intention for overseas study: “I would like to go to the UK for university study”. This demonstrated the distinct needs of students for English social interaction. Some students reported to involve in a WeChat group that was established by school teacher. Students were encouraged to share approach and resources to English learning which can be utilized by other students to solve their problems.

As for social-oriented learning experiences without technology, one participant stated that he did not search for opportunity for such social-oriented learning, but he will not be discomfort when he had the chance. He said, “Sometimes I met foreigners asking for direction, I helped them, but I don't go out of my way to intentionally find a foreigner and talk to him.” A limited number of students also mentioned that they were unconfident to communicate with native speaker. But less opportunities to get in touch with native speakers either by technological resources or with face-to-face connection is the main reason for the lack of social-oriented learning experiences. Another participant mentioned that she communicated with her brother in English regularly, as

her brother also had the needs to practice English. She stated that the topics were flexible, arranging from news to daily life. Some students also reported that school teacher regularly organized topic-related drama show in class, which provided some opportunities for them to communicate with classmates in the target language. One student also mentioned that she had more opportunities to speak in groups in extra-curriculum courses in institution than at school. Similar to the WeChat group mentioned above, classmates and other language learners accounted for the most portion of social-oriented language learning.

Participants reported to utilize social strategies when engaging in social-oriented learning experiences. They asked questions, solved problems, communicated with native speaker and other language learners, and becoming aware of intercultural communication. The social-oriented language learning experiences were mainly supported by classmates, friends and parents.

### 5.4.3 Summary

In summary, according to the participants, instead of the three-type classification in Lai et al (2017)'s study, the current study generalized four types of technological language learning experiences. Two insightful differences were found in Chinses secondary context comparing with Lai et al (2017)'s study. Firstly, metacognition-oriented language learning experience was added. I discussed metacognitive learning experiences as more than one student have mentioned the use of vocabulary app to monitor and plan their study of vocabulary. Although the main purpose of this kind of plan was still instruction-oriented rather than a holistic language competence

enhancement, it was worthy to test in a larger sample whether metacognitive learning experiences can be divided separately from instruction-oriented learning experiences. Another distinction was the minor difference found between entertainment and information-oriented learning experiences. Students perceived a greater degree of intention to employ English as tool to pursue interest-based information whereas the entertainment-oriented experiences happened in target language in its nature. Thus, such difference highlighted the needs to assess further the validity of the combination of these two learning experiences into one pattern with the survey data.

Figure 5.4 summarizes the main features of the four distinct language learning experiences generalized from interview in current study. Students reported to involve a large portion of technology in entertainment-and information-oriented learning experience and a small percentage of technology use in instruction-oriented language learning. The figure summarizes not only the three dimensions mentioned in table 5.4.1 (the characteristics of learning resources, language learning strategies, motivation), but also presents students' perceptions of influencing factors and gains from the learning experiences. A specific influencing factor impacting social-oriented language learning experiences is the accessibility to commonly-used English social medias. Except for that, the interview results confirmed what has been discussed in the technology acceptance model, in which teacher, parent, and peer could be considered as the main external factors (see section 3.3). With this initial classification framework and insights for influential factors and learning outcomes, and it provided the basis to construct the instrument in quantitative study. The detailed steps of developing the instrument are

described in the next section.

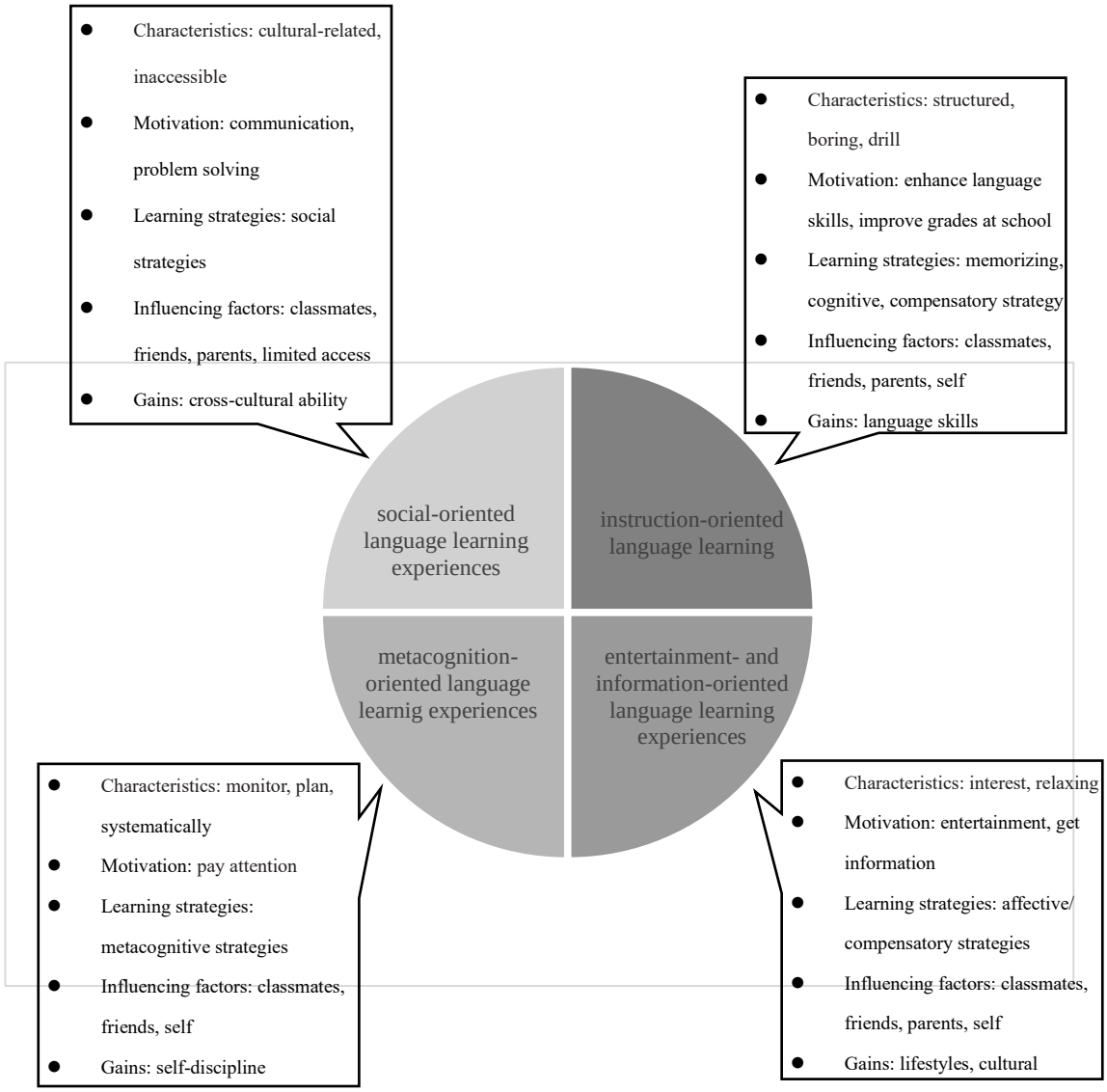


Figure 5.4. Summary of technological learning experiences from qualitative data

## Chapter 6. Point of Interface – Adaptation based on Qualitative study

The point of interface is the important element in mixed methods research to effectively link the qualitative and quantitative study (Morse and Niehaus, 2009, Bian, 2016). The two phases are mixed at this point, hence called the mixed methods designs. The term "mixing" is misleading, as the components must be thoroughly integrated

rather than merely blended (Schoonenboom and Johnson, 2017). Firstly, as the point of interface in this mixed sequential research, I introduce how the constructs developed in the qualitative study were combined with literature and theories to support developing the instrument for the quantitative study. The selection of items for the main measures are described in details. Moreover, theoretical framework based on literature review and theoretical foundations was adapted after retrieving results from qualitative data. The initial classification framework was integrated into the adapted theoretical framework.

### 6.1 Instrument development

The instrument intended to address the three research questions, attempting to collect data about types of technological learning experiences, influencing factors, and learning outcomes. Firstly, the questionnaire was designed to assess the above four distinct language learning experiences with technology: instruction-oriented technological learning experiences, metacognition-oriented technological learning experiences, entertainment- and information-oriented technological learning experiences, and social-oriented technological learning experiences. Secondly, the questionnaire also explored several factors which were mentioned to be influential to their use of technology in their English language learning, including teacher, peer, parents, perceived usefulness, perceived ease of use. Finally, the questionnaire aimed to survey student's learning outcomes.

#### 6.1.1 Structure

The survey was accordingly constructed by three parts. In the beginning of

questionnaire, it was clarified the definition for self-directed English learning and it's clarified again in some items with examples (not including assignment from school). The types of technologies were also defined in the instruction of the questionnaire and also in each item with examples to remind students. Some general information was collected, including gender, years of English learning, language proficiency, time of our-of-class English learning. Part one consisted thirteen items, indicating four language learning experiences with technology. This part aimed to test the four learning experiences I generalized in the qualitative research and to present an answer for research question one (What types of technological learning experiences are students engaging in considering their self-directed (informal) language learning beyond the classroom in a Chinese secondary context?). Part two consisted sixteen items, aiming to measure five influential factors, including teacher, peer, parents, perceived usefulness, perceived ease of use. It intended to answer research question two (What are the factors that influence student's tendency of technology use in self-directed language learning in Chinese secondary context?). All items in part one and part two were measured with 5-point Likert scale with 1 being strongly disagree and 5 being strongly agree (see appendix). Finally, the learning outcome were also assessed: confidence and pleasure in English learning, and their score for before- and after-lockdown tests. This aimed to provide statistics to analyze research question three (How does students' tendency of technological learning experiences predict their learning achievements?)

### 6.1.2 Measures

I present the process of item design for the latent variables in this section. They were designed with the reference of Lai et al (2017)'s survey, and the interview responses in the qualitative study in the current research. The nine main latent variables in the questionnaire were four types of technological learning experiences including instruction-oriented, metacognition-oriented, entertainment and information-oriented, and social-oriented technological learning experiences, and five influencing factors including teacher, peer, parent, perceived usefulness and perceived ease of use. Items representing each construct are described below:

*Instruction-oriented technological language learning experiences*

Three items were chosen to measure instruction-oriented technological learning experiences according to the survey items in Lai et al (2017)'s study (See table 6.1.1). These items were approved to be the representing according to the response of interviewees in the current qualitative study. Learning grammar and vocabularies were most frequently reported by participants in the interview. Students also stated that they did extra drills and practice on what the teacher taught in class. Moreover, structured individual learning was also reported by some of the interviewees. I explained in details about different types of technological language learning experiences in section 5.4.2. Thus, three items regarding learning of grammar and vocabularies, extra drills, and individual learning were chosen to measure instruction-oriented technological learning experiences.

| Construct | Definition | Items |
|---|---|---|
| Instruction-oriented technological language learning | mainly to expect strengthen on vocabulary and grammar, aiming to receive direct improvement on their grades at school | to learn new vocabularies and grammar |
| | | to do extra drills and practice on what the teacher has taught in class |
| | | to do individual learning |

Table 6.1.1. Items of instruction-oriented technological language learning experiences

*Metacognition-oriented technological language learning experiences*

Three items were chosen to measure metacognition-oriented technological learning experiences according to interviewee's response in qualitative study (see table 6.1.2). Three main situations were reported by participants in the interview when they implemented metacognitive strategies in their English learning beyond school with technology. Firstly, students mentioned the use of vocabulary app and graded reading to test their ability in vocabulary and reading skills. Accordingly, I use the item - to test vocabulary and other English skills in order to arrange learning for specific skills. Secondly, students reported that some technologies can recommend learning materials that suits for their level after a self-assessment. One participant said, "After a vocabulary test, I was recommended an English novel that fits my level and interests." During the vocabulary assessment, the algorism adaptively provides new vocabularies to be tested according to students' answer. Many of current educational applications are focusing on not only the delivery of well-structured knowledge, but also adaptive information that fits students' actual needs and interests (Kritikou et al, 2014). Therefore, finding appropriate learning material according to English skills level is another item. Thirdly, students mentioned some applications have the function of plan and monitor learning progress. They can set up goals of vocabulary learning by choosing a book and set up days of learning. The application can automatically provide

daily plan and adjust according to the performance. Thus, a sentence considering goals and planning was chosen to be another item.

| Construct | Definition | Items |
|---|---|---|
| Metacognition-oriented technological language learning | mainly focusing on planning, self-evaluating, and monitoring in the process of English learning | to test vocabulary and other English skills in order to arrange learning for specific skills. |
| | | To identify my English level and find appropriate learning materials. |
| | | To set up learning goal and make a plan. |

Table 6.1.2. Items of metacognition-oriented technological language learning experiences

*Entertainment and information-oriented technological language learning experiences*

As stated in the description of this construct in qualitative study, I found some slightly differences between entertainment- and information-oriented technological learning experiences. Interviewees reported entertainment-oriented learning experiences to be incidental and unconscious when they watched English movie and listened English songs that they like. It was not because they want to learn English that they choose English movies or songs, but as these songs and movies that they like happen to be in the target language. Students admitted greater degree of intention to involve English learning when they involved in information-oriented learning. In this case, students are more interested in knowing what is the most authentic English expression for the topic. Thus, in the development of the instrument, five items were designed to represent this construct, specifically addressing these two different subgroups.

Two items were chosen to represent entertainment-oriented and three items were designed to illustrate information-oriented (see table 6.1.3). All items were aligned with the questions in Lai et al (2017)'s study. Moreover, Examples were given to facilitate

the understanding of the items. For example, interviewees reported that they did not regard listening to English songs as English learning, but regarded it as relax. Listening to English songs is therefore highlighted as an example in the item: I learn English with technology to pursue my personal interests (e.g., listening to English songs, watching English movies).

| Construct | Definition | Items |
|---|---|---|
| Entertainment and information-oriented technological language learning experiences | mainly refer to their interests or needs for specific information | To pursue my personal interest. |
| | | To learn English for the purpose of everyday use. |
| | | To find authentic material. |
| | | To enhance self-expression skills. |
| | | To seek information. |

Table 6.1.3. Items of Entertainment and information-oriented technological language learning experiences

*Social-oriented technological learning experiences*

Two items were designed to represent social-oriented technological learning experiences. Although participants in the interview did not report to frequently attend this kind of learning, they provided their perspectives which helped the design of the items. Students mentioned two common situations that they had chances to talk with people online in English. Firstly, online courses provided by native speakers were mentioned by one student who has the intention to study in the UK in the future. Although only one student mentioned this kind of one-to-one tutorial, the school teacher and other students also stated that there were other students attending this kind of course. Second situation was also designed according to interviewees who raised the situation about other students. Although the participants in qualitative study did not have experience to communicate with native speakers online, they mentioned that some of their classmates did.

| Construct | Definition | Items |
|---|---|---|
| Social-oriented technological language learning experiences | emphasize on problem solving, social exchange and daily life communication | To talk with native speakers. |
| | | To talk with other English learners or other people in English. |

Table 6.1.4. Items of Entertainment and information-oriented technological language learning experiences

*Perceived usefulness*

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". In this research, it stands for students' perception on whether the use of technologies in self-directed English learning beyond classroom would enhance their English competence. Three items were adapted from Davis (1989)'s scale. Usefulness, competence and effectiveness were chosen from Davis (1989)'s six-item scale. The three items were also assessed to be able to achieve satisfactory model fit in SEM in Lai et al (2017)'s study.

| Construct | Definition | Items |
|---|---|---|
| Perceived Usefulness | The degree that students perceive the use of technologies in self-directed English learning beyond classroom would enhance their English competence | I find technologies useful in English learning |
| | | Using technologies enhances my English competence. |
| | | Using technologies enhances my effectiveness in English learning. |

Table 6.1.5. Items of Perceived Usefulness

*Perceived ease of use*

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort". In this research, it refers to the degree that students perceive the efforts to employ technologies in their self-directed English learning beyond classroom. Three top-rated items were chosen from Davis (1989)'s scale, including easy to learn, easy to use, and easy to become skillful. Three items were

assessed in previous study to be able to achieve satisfactory model fit in SEM (Lai et al, 2017).

| Construct | Definition | Items |
|---|---|---|
| Perceived Ease of Use | The degree that students perceive the efforts to employ technologies in their self-directed English learning beyond classroom | I find it easy to select and find appropriate technological tools needed to enhance language learning |
| | | It would be easy for me to become skillful at using technology to enhance language learning |
| | | I find it easy to get technologies to do what I want them to do for language learning |

Table 6.1.6. Items of Perceived Ease of Use

*Teacher*

Four items were designed to represent the effects of teacher support on students' tendency of different technological learning experiences when they learn English beyond classroom. Mynard and Carson (2014) have raised suggestions of teacher support in students' self-directed language learning by motivating awareness to use technology, practical techniques on the use of technological tools or resources, and affective support. Lai et al (2017a) summarized that teacher behavior support, teacher capacity support and teacher affective support are three types of main support that teacher can provided in students' autonomous language learning outside school. Three items were designed according to these three types of teacher support. Moreover, interviewees' responses were also considered to represent teacher support in this specific context. For example, some students mentioned that they searched for the technological learning materials that teacher used at school. Studies have shown that teachers relatively frequently provided students with assignments that require use of technology (OECD, 2015). Interviewees in qualitative study reported the involvement of technologies in English class encouraged them to continuously implement

technology in their self-directed language learning outside classroom. Furthermore, as the survey were delivered after lockdown due to covid-19, the specific situation that students must stay at home is also considered. Students had rich time and flexibility to explore technological learning materials. The item of teacher encouragement to use technology during lockdown period was therefore added.

| Construct | Definition | Items |
|---|---|---|
| Teacher Support | The degree that teacher affects students' self-directed use of technology in their language learning | Teacher encourages us to use technology |
| | | Teacher shares us with online learning materials. |
| | | Teacher uses online materials in the class. |
| | | During the quarantine due to Covid-19, the teacher encouraged more to study with online materials. |

Table 6.1.7. Items of Teacher support

*Peer*

Three items were designed to represent the effects of peer support on students' tendency of different technological learning experiences when they learn English beyond classroom. Two items including seeking advice for effective learning and solving technical problems were adapted from previous study (Lai, et al, 2017). One additional item was designed according to interviewee's responses, in which they stated peers can share helpful online learning materials.

| Construct | Definition | Items |
|---|---|---|
| Peer Support | The degree that peers affect students' self-directed use of technology in their language learning | I have friends/classmates to whom I can go to seek advice on how to use technologies effectively for learning |
| | | I have friends/classmates to who likes to share online learning materials that they think helpful with me. |
| | | I have friends/classmates to whom I can go to seek technical help when I experiment with technologies for learning |

Table 6.1.8. Items of Peer support

*Parents*

Three items were designed to represent the effects of parents' support on students' tendency of different technological learning experiences when they learn English beyond classroom. During lockdown period in China, the influence from parents was even greater as students stays with their parents all the time. Parents' attitudes toward the use of technology are essential and can directly affect students' frequency of technological usage. The items were comment scenarios mentioned by interviewees when they talked about their parents, including encouragement (e.g., do not limit the use of mobile phone), recommendation (e.g., select online materials for students).

| **Construct** | **Definition** | **Items** |
|---|---|---|
| Parents Support | The degree that parents affect students' self-directed use of technology in their language learning | My parents encourage me to learning with technology. |
| | | My parents select and share learning material that they think helpful with me. |
| | | During the lockdown due to Covid-19, my parents encouraged more to study with online materials |

Table 6.1.9. Items of Peer support

## 6.2 Adaptation of Theoretical Framework in Chinese secondary context

The results in qualitative study provided insightful suggestions for the adaptation of theoretical framework in Chinese secondary context. The interview results played an important role to build up an initial classification framework as the constructs of the instrument in current study. The combination of previous literature review (Mynard and Carson, 2014; Lai et al, 2017) and the interview study provided a solid foundation for the quantitative study with a larger sample.

Firstly, the qualitative study confirmed that Chinese secondary students engaged in

a variety of technological language learning experiences in their self-directed learning beyond classrooms, which provided us a good sample premise to explore different types of technological learning experiences. Four initial types of technological language learning experiences were generalized based on 15 interviewees' responses. Four constructs representing the technological language learning experiences were built up and could be further assessed in quantitative analysis. The final classification and definition of different types of technology learning experiences requires a combination of qualitative and quantitative results.

Moreover, in terms of impact factors, these findings in qualitative study were consistent with previous studies, indicating that teacher (Mynard, 2012; Mynard and Carson, 2014), parent (Lai et al, 2015), and peer support (Lai et al, 2015; Sun et al, 2015) were the most vital external factors influencing students' tendency of learning experiences with technology. Thus teacher, peer and parent support were selected as the external factors based on technology acceptance model in current research.

Furthermore, although TAM defaulted to external factors that could only influence the usage of technology through perceived usefulness (PU) and perceived ease of use (PEU), the potential direct impact cannot be ignored. Several interviewees had repeatedly cited the direct influence of teachers, peers, and parents on their use of technology, either by recommending useful online resources or by limiting or encouraging the use of electronic devices. Moreover, previous studies have found that the external factors could directly influence technology use without the mediating influence of PU and PEU (Burton-Jones and Hubona, 2006). Therefore, in the model

selection in quantitative study, I included the comparison of models with and without considering the direct influence of external factors on students' use of technology in their language learning.

Finally, once the final constructs of types of technological learning experiences were validated with quantitative data, they were used as independent variables to predict learning outcomes (academic achievement, enjoyment, and confidence). In the interviews, students did not believe that applying technology to English learning had helped them significantly to improve their scores. When asked further if they thought that technology-based English learning brought enjoyment, the answers were generally yes. In addition, students mentioned that this fun approach to learning also increased their confidence in learning English and perhaps would help in the long run to improve their academic scores. Thus, the learning outcomes was considered in the three aspects: academic achievement, enjoyment, and confidence.

In conclusion, considering the results from qualitative study (see section 5.4.2) and theoretical foundation (see chapter 3), the current theoretical framework included three parts: four types of technological language learning experiences, influential factors (PU, PEU, teacher, peer, parent support) adapted from TAM (Davis, 1989), and learning outcomes (academic achievement, enjoyment, confidence). I include these important components in an adapted theoretical framework to support the following quantitative research. The following chapter discusses how to set up different models to assess the constructs built up in the current chapter.

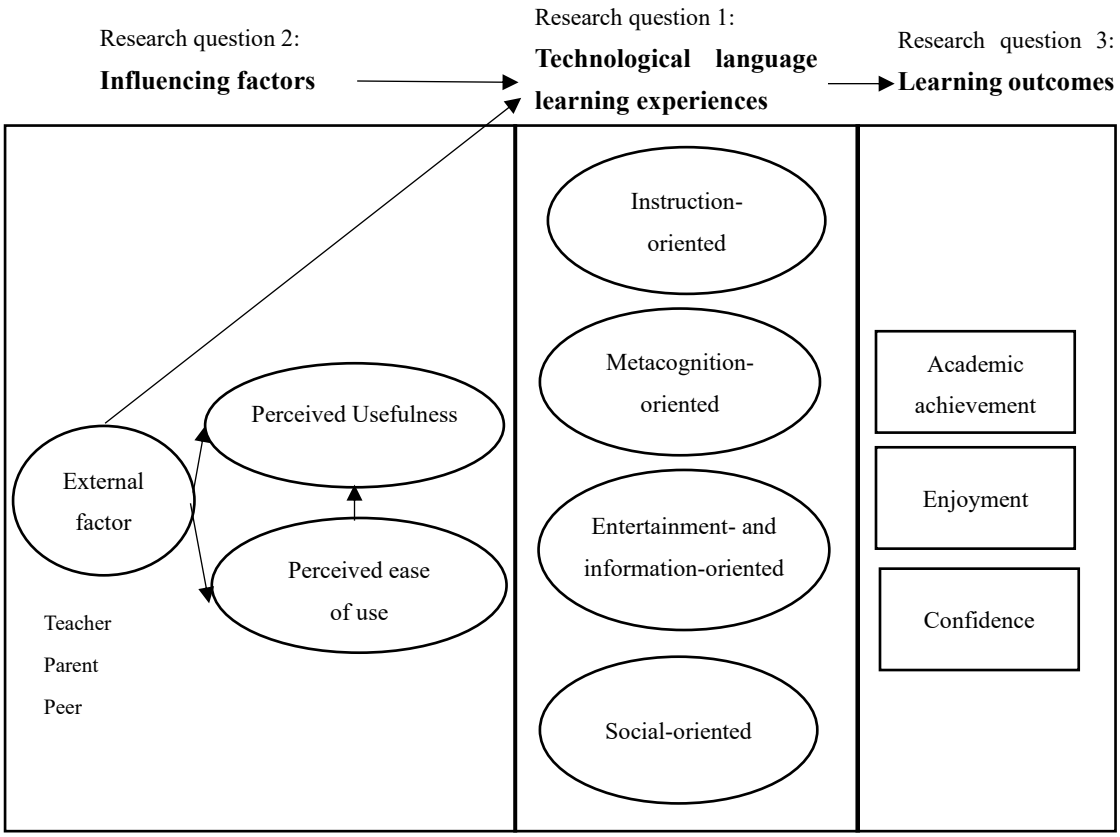


Figure 6.2. The Adaptation of theoretical framework after qualitative study

## Chapter 7. Quantitative Research

Quantitative study in this mixed methods research is a crucial component. It assessed the validity of the theoretical framework built up in previous phases of the study and it also enabled us to jointly discuss the qualitative findings with empirical evidence.

In this section, I describe the second phase in the mixed sequential research-the quantitative study. Firstly, the participants of the quantitative phase are described. Secondly, I state the procedure of the quantitative phase, including the sampling approach during data collection. I then discuss the assessment of validity and reliability of the instrument, and finally the hypothesis and main data analysis method are

presented.

### 7.1 Participants

429 valid questionnaires were finally collected. In order for participants to cover as wide a range of different areas as possible, I chose different areas in the quantitative study than in the qualitative study. For the qualitative study, I chose secondary school students from Shanghai as well as a small city in northern China as the study participants. For the quantitative study, students from several different secondary schools in the southern province of Guangdong were selected.

The participants were secondary students in Guangdong province with 48% male and 52% female students, ranging from grade seven to grade eleven. 57% of the students were from junior high schools (12% from grade seven, 25% from grade eight, 20% from grade nine), and 43% studied at senior high schools (25% from grade ten and 18% from grade eleven). The majorities of students reported to spend between ten minutes to one hour to finish the English assignments from school on a daily basis (45% for 30-60 minutes, 40% for 10-30 minutes). 5% students reported to spend averagely more than one hour each day on English assignment and 8% students spend less than ten minutes every day. 76% students from grade 10 reported that they needed 30 to 60 minutes on their English assignment. Except for English assignment, most students spend less than thirty minutes on self-directed English learning every day (9% for less than 5 minutes, 40% for 5-15 minutes, 45% for 15-30 minutes). More than half students spent less than 15 minutes to learn English autonomously using technologies. 13% of the students reported to learn English with technologies for averagely more than 30

minutes every week. Most students have learnt English systematically for 5-9 years (30% for 5-7 years, 34% for 7-9 years). 9% students have studies English for more than nine years. Students started to learn English either from kindergarten or elementary school.

**7.2 Data Collection**

Stratified sampling approach was adopted when selecting participants. Stratified sampling is a sampling method that divides a population into smaller sub-groups known as strata, which are generated based on shared features or characteristics among individuals (Mujere, 2016). It enables researchers to produce a sample population that most closely resembles the whole population under investigation (Buchstaller and Khattab, 2013). Secondary students in current study were divided into subgroups based on grade. For each grade, two classes were selected randomly in different secondary schools, with each class containing 50-60 students. Each grade was included to diminish the sample bias.

Students were asked to complete the questionnaire in paper when they returned school after nearly four-month lockdown due to the coronavirus pandemic in 2020. Questionnaires were delivered in Guangdong province by six secondary school English teachers in their classes, ranging from grade 7 to grade 11. 429 valid questionnaires were retained. Final sample consisted one class from grade seven, two classes from grade eight, nine, ten and eleven separately. At the time when survey was delivered, grade twelve was only less than one month from Gaokao (Chinese college entrance examination). No data was collected in grade twelve.

### 7.3 Validity and Reliability of the Instrument

The validity and reliability of the instrument were tested after the data collection. The validity of a measurement is regarded as the degree which an item or a variable coherently measures the construct it aims to measure (Jupp, 2006). Construct validation is a relatively broader concept, which demonstrates the extent to which the construct coherently fulfils the requirement it purports to measure by devising appropriate variables to do so. There are two varieties of construct validation, including convergent validation and discriminant validation. Convergent validity aimed to confirm that the indicators in a factor that should be theoretically corelated were in fact correlated in a high level whereas discriminant validity confirmed that the constructs that should not have high correlation had enough discrimination (Yong and Pearce, 2013). Moreover, the reliability of the instrument is of vital importance, which demonstrates the extent to which an instrument provides consistent results. There are three broad ways to assess reliability of a measuring instrument, including test-retest, alternate-form and internal consistency (Jupp, 2006).

In this research, I used a variety of methods to assess the distinct aspects of validity and reliability of the instrument. Exploratory factor analysis and The Average of variance extracted (AVE) were used to assess the validity whereas Cronbach's Alpha and composite reliability (CR) were calculated to test the reliability.

Firstly, the content of the questionnaire was confirmed by two teachers in target school to ensure the content validity. The interviewees in the qualitative phase of the research were also asked to complete the questionnaire to clarify that the items are

understandable to high school students.

Secondly, exploratory factor analysis (EFA) was implemented to assess the construct validation of the instrument. EFA is commonly used when a researcher aims to reduce dimensionality by discovering and exploring which measurable variables contribute to latent variables (Bartholomew et al, 2011). As the instrument in the current research was self-designed, exploratory factor analysis was implemented as a crucial step in the development process of the instrument. Moreover, the sample size （n=429）in current research fulfilled the requirement to implement EFA which needs at least 300 participants according to the rule of thumb (Yong and Pearce, 2013). Furthermore, two primary tests were performed before conducting EFA to ensure the data adequacy. The Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's test of sphericity were calculated to assess the adequacy of the sample and to guarantee the appropriateness of correlations for the EFA. Before exploratory factor analysis, missing data in the sample was dealt with multiple imputation. To perform EFA, three main components need to be considered, including factor extraction, rotation methods and the factor loadings. Principal Components analysis is used to extract factors by reducing a large number of variables in to a smaller number of components (Tabachnick and Fidell, 2007). After extraction, factors are rotated for easier interpretation as unrotated factors are ambiguous. Promax is implemented to do oblique rotation, as the factors in current research are considered to be correlated (Costello and Osborne, 2005). With the technique of Promax, greater correlations among factors can be achieved by raising the factor loadings, and therefore simplifying the structure. Interpretation of the factor

loadings is the last component in EFA.

Thirdly, The Average of variance extracted (AVE) is a measurement to assess convergent validity. AVE for each construct can be obtained by sum of squares of completely standardized factor loadings divided by this sum plus total of error variances for indicators. If the AVE is higher, the greater the percentage of variation in the indicator variable explained by the latent variable, the smaller the relative measurement error, indicating that the questionnaire has high reliability and convergent validity. Hair et al. (2006) suggested AVE higher than 0.5 showed good convergent validity. The quotation is as follows:

$$\rho_V = \frac{(\sum \lambda^2)}{[(\sum \lambda^2) + \sum (\theta)]}$$

Fourthly, discriminate validity was tested by calculating the correlations between constructs. As a rule of thumb, a correlation above 0.85 indicates poor discriminant validity in structural equation modeling (David, 1998). According to Fornell-Larcker (1981)'s criterion, if the square root of the AVE of each construct is greater than the inter-construct correlation between that construct and other constructs in the measurement model, then the model satisfies the discriminant validity criterion.

Fifthly, as for reliability, Cronbach's Alpha is commonly used to measure the internal consistency of the items in each construct. Hair et al. (1998) suggested an alpha of more than 0.7 indicated homogeneous items with same constant, showing a good reliability. However, in structural equation modelling models, it is not enough to just rely on the traditional coefficient alphas (Lee and Hooley, 2005), as Alpha assumes factor loadings to be the same for all items. Hair et al. (2006) proposed the use of

construct reliability (CR), also known as composite reliability, to assess the consistency within the constructs. In order to confirm the reliability of this multi-scale measurement model, composite reliability (CR) was calculated using the standard factor loadings. It is calculated from the squared sum of standardized factor loadings (λ) for each construct and the sum of the error variance terms for a construct (θ). The higher CR means more consistency in a construct and CR that is higher than 0.7 suggests a good construct reliability. The quotation is as follows:

$$\rho_c = \frac{(\sum \lambda)^2}{[(\sum \lambda)^2 + \sum(\theta)]}$$

**7.4 Main Analysis and Hypothesis**

The main analysis was conducted on the basis of N=429 students who completed the survey. Before discussing the main analysis according to each research question, missing data was discussed. Among variables of technological learning experiences, missing data proportions for items of instruction-oriented technological learning experience and social-oriented technological learning experience was 0%, for items of metacognition-oriented technological learning experience and entertainment and information-oriented technological learning experience ranged up to 0.23%. The low rate of missing value was probably due to the fact that the survey was distributed by school teacher face-to-face. Face-to-face respondents were more likely than web survey participants to make the necessary cognitive effort to answer the survey questions. (Heerwegh and Loosveldt, 2008). As for influential factors, missing data proportions for items of perceived usefulness ranged from 1.63% to 2.1%, for items of perceived ease of use ranged from 1.4% to 2.33%, for items of teacher support ranged from 1.4%

to 2.1%, for items of peer support ranged from 1.86% to 2.56%, for items of parent support ranged from 1.86% to 2.1%. The missing data proportion of students' learning outcome (enjoyment, confidence) were below 2%, except for their academic achievement with a missing data from 22.8% (pre-lockdown test score) to 26.3% (post-lockdown test score). All missing data were determined as missing completely at random. The analysis procedures were described in individual research questions.

### 7.4.1 Research question one: What types of self-directed technological experiences do Chinese secondary students engage in?

The initial aim of research question one was to explore students' use of technology for language learning outside the classroom. In order to achieve this aim, before exploring the different types of learning experiences, I examined how much time students spent on self-directed English learning and what proportion of that time was spent using technology. I also explored the descriptive data of students' time spend on school assignment as a reference of self-directed learning time. It was an initial step to understand in general whether students in current context engaged actively in self-directed language learning with technology.

The different types of technological experiences were explored in the qualitative and was assessed by exploratory factor analysis (EFA). Results are discussed in chapter 8 including data from qualitative and quantitative data, and an integrated interpretation to determine the final classification framework. I intended to answer research question two and three by quantitative study using structural equation modelling based on the final classification framework, in order to further assess the

differentiation between distinct types.

### 7.4.2 Research Question two: What are the factors that influence student's tendency of technology use in self-directed language learning in Chinese secondary context?

*The hypothesis for RQ2*

According to technology acceptance model (Davis, 1989), the present research hypothesized that perceived usefulness and perceived ease of use have direct influence on students' use of technology. Meanwhile, perceived ease of use has an indirect influence on technology use through perceived usefulness (Lai, 2013; Venkatesh et al., 2003; Williams et al., 2015). With consideration of previous research (Lai et al, 2017) and connections among computer, learner and language learning objectives in computer-assisted language learning environment (Levy and Hubbard (2005), I hypothesized that teach and peer support, as external variables, having indirect influence on technology use through perceived usefulness and perceived ease of use. According to the interview responses for Chinese secondary students in present research, I further hypothesized that parent is also another external variable in influencing students' use of technology in their language study. Thus, the following hypothesis were listed:

H1: Perceived usefulness and perceived ease of use have direct influence on students' use of technology in their self-directed language learning.

H2: Perceived ease of use has an indirect influence on students' use of technology in their self-directed language learning through perceived usefulness.

H3: Teacher support, peer support and parent support have indirect influence on students' use of technology in their self-directed language learning through perceived usefulness and perceived ease of use.

*Main analysis to answer RQ2*

After initial descriptive analysis of the data, the main analysis was made in three steps. Firstly, Structural equation modelling (SEM) was set up to test the above hypothesis in each pattern of self-directed language learning experiences with technology (model 1-4). In individual model, external variables including teacher, parent and peer support have direct influence on perceived usefulness and perceived ease of use. Perceived ease of use was assumed to have a direct effect on perceived usefulness whereas all external variables were presumed to have indirect effects on perceived usefulness via the effect through perceived ease of use. Both perceived usefulness and perceived ease of use were hypothesized to be the significant influencing factor on students' different patterns of experiences to use technology in their self-directed language learning. Within the model, some parameters were fixed in order to achieve model fit. The results and the process of model selection are presented in the next chapter.

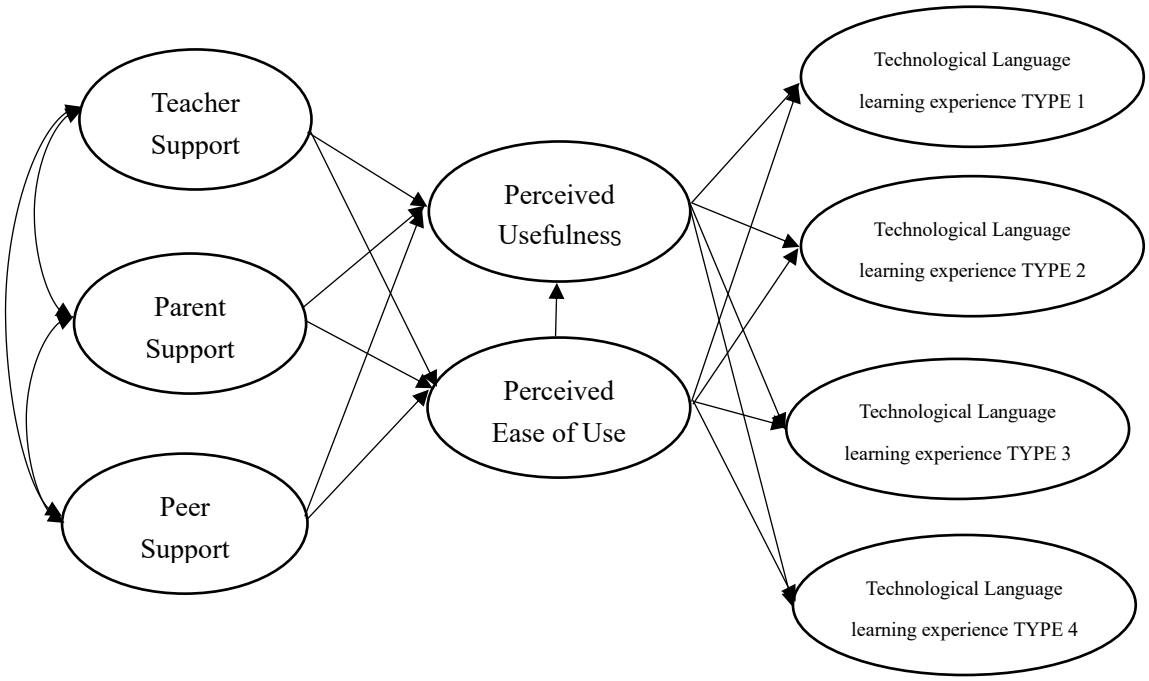


Figure 7.4.1 Structural equation modelling in influencing factors - adapted from technology acceptance model (Davis, 1989)

Secondly, in each pattern of technological language learning experiences, path analysis was conducted to calculate the regression coefficient between latent variables. The goodness of model fit indices was calculated for each model.

The present research adopted several indices to measure the model fit, including ChiSquare/df, Standardized Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), incremental fix index (IFI), non-normed fit index (NNFI) also known as Tucker Lewis index (TLI). Table 7.4.1 shows the cut-off for good fitness of the model.

| **Name of index** | **Level of acceptance** | **References** |
|---|---|---|
| Chisq/df | <5 acceptable fit | Awang (2012), Schumacker and Lomax (2004) |
| SRMR | <0.08 good fit | Hu and Bentler, 1999 |
| CFI | >0.9 satisfactory fit | Awang (2012) |
| IFI | >0.9 good fit | Kline (2005) |
| TLI (NNFI) | >0.9 satisfactory fit | Awang (2012) |

Table 7.4.1: Cut-off for good fitness of model

### 7.4.3 Research Question three: How does students' tendency of technological learning experiences predict their learning achievements?

Three variables were considered to represent student's achievement: students' academic achievement, enjoyment and confidence. I chose two aspects to represent students' academic achievement: language proficiency and language improvement. Language proficiency was calculated as a sum of pre-and post- lockdown test scores. The sum of two test scores could better represent students' actual language proficiency to avoid bias. Stratified sampling was adopted in this study, and two classes were selected as samples at each grade level. It might be difficult to refer to student performance alone to make comparisons, as each grade had distinct levels of difficulty for students' assessments, which cannot be regarded as standard assessment. Therefore, students' improvement was added as an extra dependent variable, calculated by students' post-lockdown test scores minus their pre-lockdown test scores, to assess whether engaging technological learning experiences in lockdown period had brought instant improvement on their performance in school.

Before exploring the differences of four types of technological language learning experiences predicting the learning outcomes, I investigated whether students' general engagement in self-directed language learning predict a better learning outcome. In order to do so, the time students spent in self-directed language learning and the time students adopted technology in their English learning were selected as independent variables to predict students' learning outcomes in various aspects. Moreover, structural equation modeling was conducted to calculate the coefficient of different technological

learning experiences on the four aspects of students' learning outcome: proficiency, improvement, enjoyment, and confidence. Finally, I also tried to build up a latent variable to represent learning outcomes considering the four aspects: improvement, proficiency, enjoyment, and confidence. The details of model selection in this process are described in the findings.

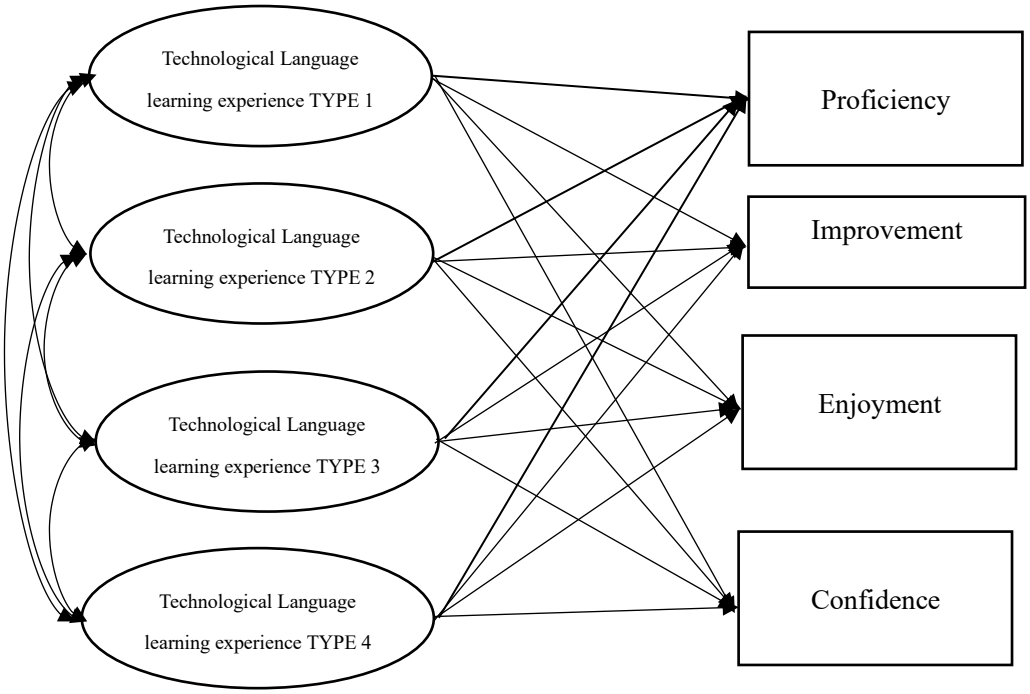


Figure 7.4.2 Structural equation modelling in learning results

## Chapter 8. Findings

In this chapter, I firstly present the results of validity and reliability test including an initial exploratory factor analysis. Findings confirmed the validity and reliability of current survey. There were some differences between the extracted factors from EFA and the initial classification framework from qualitative study. Both findings are discussed to finalize a classification framework to be utilized in structural equation modelling. Findings of research question 2 and 3 were mainly based on quantitative data with insightful explanations from interview responses.

## 8.1 Validation and Reliability of the Instrument

### 8.1.1 Exploratory Factor Analysis (EFA)

To examine construct validity of measures adopted in this study, an explorable factor analysis was performed. The Kaiser-Meyer-Olkin measure of sampling adequacy indicated that the strength of the relationships among variables was high (KMO = .93), thus it was acceptable to proceed with the analysis (see table 8.1.1). Present study requested nine factors, based on the fact that the items were designed to illustrate nine constructs. Nine factors extracted from EFA included instruction-oriented technological language learning (items INS1-INS6), entertainment-oriented technological language learning (items ENT1-ENT2), information-oriented technological language learning (items INF1-INF3), social-oriented technological language learning (items SOC1-SOC2), peer support (items PEE1-PEE3), parent support (items PAR1-PAR3), teacher support (items TS1-TS4), perceived usefulness (items PU1-PU3) and perceived ease of use (items PEU 1-PEU3). The number of factors was also tested using parallel function in R, which showed nine factors were a good fit.

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | .930 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 10533.520 |
| | df | 406 |
| | Sig. | .000 |

| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | cumulative % | Total | % of Variance | cumulative % |
| 1 | 12.284 | 42.358 | 42.358 | 12.284 | 42.358 | 42.358 |
| 2 | 4.565 | 15.742 | 58.100 | 4.565 | 15.742 | 58.100 |
| 3 | 1.449 | 4.997 | 63.096 | 1.449 | 4.997 | 63.096 |
| 4 | 1.322 | 4.557 | 67.654 | 1.322 | 4.557 | 67.654 |
| 5 | 1.139 | 3.928 | 71.582 | 1.139 | 3.928 | 71.582 |
| 6 | .916 | 3.159 | 74.740 | .916 | 3.159 | 74.740 |
| 7 | .790 | 2.723 | 77.463 | .790 | 2.723 | 77.463 |
| 8 | .663 | 2.285 | 79.748 | .663 | 2.285 | 79.748 |
| 9 | .612 | 2.109 | 81.857 | .612 | 2.109 | **81.857** |
| 10 | .550 | 1.897 | 83.755 | | | |
| 11 | .462 | 1.592 | 85.346 | | | |
| 12 | .435 | 1.499 | 86.846 | | | |
| … | … | … | … | | | |

Extraction Method: Principle components Analysis

Table 8.1.1. KMO and Bartlett's Test & Total Variance Explained

As we can see in the table, nine constructs were abstracted using principal components analysis. As I assumed the intercorrelation between factors and oblique rotation was conducted, their variances partly superimpose, thus no need to report the percentage of explanation in total. As we can noticed from the result, instruction-oriented technological language learning and metacognition technological language learning were abstracted as one factor whereas entertainment-information oriented technological language learning were divided into two parts. This was consistent with our discussion in the findings of interview research in previous chapter. Metacognition strategies were mainly utilized with the purpose of autonomy as learner, in this specific setting for Chinese secondary students, aiming to enhance their performance in school

test. It can be regarded as a complementary of instruction-oriented language learning. Referring to statistical results, the present research combined metacognition-oriented language learning with instructional-oriented learning as instructional oriented learning. For entertainment and information-oriented language learning with technology, the data also indicated the assumption that we assumed in previous discussion of the differences between these two kinds of learning experiences. Thus, although we discussed entertainment and information-oriented language learning experiences as one category, they will be considered separately following the displayed evidence from the factor analysis.

Nine factors include instruction-oriented technological language learning, entertainment-oriented technological language learning, information-oriented technological language learning, social-oriented technological language learning, peer support, parent support, teacher support, perceived usefulness and perceived ease of use (see table 8.1.2). Factor loadings of each item in pattern model is greater than 0.5, indicating the validity of each item. Correlation coefficients in structure model were all greater than 0.3, which also indicated that there was a strong relationship between the variables (Tabachnick and Fidell, 2007).

| | Factor | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| **ins5** | **.945** | -.045 | .040 | .003 | .056 | -.066 | -.060 | -.093 | .107 |
| **ins 4** | **.926** | .007 | .068 | -.049 | .013 | -.037 | -.046 | -.055 | .043 |
| **ins 6** | **.855** | -.012 | .046 | .008 | .033 | -.086 | -.017 | .049 | -.047 |
| **ins 3** | **.818** | .005 | .005 | .080 | -.112 | .037 | -.018 | -.017 | .063 |
| **ins 2** | **.717** | .031 | -.077 | .007 | -.059 | .149 | .054 | .089 | -.019 |
| **ins 1** | **.500** | .067 | -.098 | -.075 | .042 | .195 | .305 | .186 | -.218 |
| **ts2** | .041 | **.926** | .001 | -.132 | .094 | .026 | -.101 | -.027 | .070 |
| **ts3** | -.066 | **.918** | .035 | -.073 | .042 | -.043 | .124 | -.034 | .023 |
| **ts1** | .034 | **.838** | -.029 | .017 | .085 | .002 | -.032 | .013 | -.026 |
| **ts4** | -.018 | **.742** | .037 | .273 | -.086 | -.018 | -.057 | .106 | .007 |
| **peu2** | .121 | -.043 | **.945** | .017 | .039 | -.019 | -.013 | -.075 | -.055 |
| **peu3** | .011 | .110 | **.873** | .043 | -.070 | -.072 | .098 | .045 | -.051 |
| **peu1** | -.114 | -.015 | **.650** | -.093 | .046 | .369 | -.020 | .062 | .037 |
| **par2** | .032 | -.255 | -.024 | **.891** | .261 | -.043 | -.035 | .018 | -.013 |
| **par3** | -.042 | .170 | .070 | **.807** | -.153 | .040 | .053 | -.023 | .054 |
| **par1** | .022 | .151 | -.037 | **.772** | .004 | .087 | .002 | -.024 | -.040 |
| **pee2** | -.026 | .088 | -.021 | .032 | **.862** | .035 | -.023 | .008 | .054 |
| **pee3** | -.001 | .023 | -.027 | .117 | **.845** | .001 | .044 | .018 | -.078 |
| **pee1** | -.010 | .151 | .064 | -.025 | **.800** | -.001 | .020 | -.009 | .050 |
| **pu2** | .051 | -.045 | .028 | .035 | .022 | **.943** | -.028 | -.045 | .030 |
| **pu3** | -.076 | -.027 | .110 | .040 | -.006 | **.893** | -.086 | .048 | .071 |
| **pu1** | .038 | .156 | -.044 | -.003 | .012 | **.860** | .034 | -.083 | -.080 |
| **ent1** | -.023 | .011 | .065 | -.021 | .041 | -.086 | **1.0** | -.088 | -.016 |
| **ent2** | .005 | -.092 | -.021 | .062 | -.031 | .023 | **.715** | .093 | .204 |
| **inf3** | .099 | .136 | -.074 | .012 | -.025 | -.054 | -.038 | **.931** | -.112 |
| **inf1** | .085 | -.150 | .112 | .048 | .065 | -.095 | -.021 | **.832** | .054 |
| **inf2** | .054 | -.010 | -.011 | -.087 | -.012 | .090 | .021 | **.780** | .122 |
| **soc2** | .031 | .046 | -.069 | .013 | .017 | .052 | .108 | -.094 | **.910** |
| **soc1** | .173 | .032 | -.004 | -.020 | -.004 | -.046 | -.056 | .138 | **.763** |

Extraction Method: Principal components.

Rotation Method: Promax with Kaiser Normalization.

rotation converged in 7 iterations

**NOTE**: INS=instruction-oriented technological language learning experience; INF=information-oriented technological language learning experience; ENT=entertainment-oriented technological language learning experience; SOC= social-oriented-oriented technological language learning experience; TS=teacher support; PEE=peer support; PAR=parent support; PU=perceived ease of use; PEU=perceived ease of use

Table 8.1.2. Pattern Matrix[a] of EFA

### 8.1.2 Validity

Convergent validity was confirmed by checking the factor loadings in each construct. As shown in Table 8.1.3, all standard factor loadings in measurement model should be higher than 0.7, or at least 0.5. In the result, only the factor loading for INS1 was 0.68, which was also acceptable. All other factor loadings all above 0.7, suggesting a good

convergent validity. The Average of variance extracted (AVE) is also a measurement to assess convergent validity. AVE for each construct can be obtained by sum of squares of completely standardized factor loadings divided by this sum plus total of error variances for indicators. If the AVE is higher, the greater the percentage of variation in the indicator variable explained by the latent variable, the smaller the relative measurement error, indicating that the questionnaire has high reliability and convergent validity. Hair et al. (2006) suggested AVE higher than 0.5 showed good convergent validity.

| **Construct** | **Item** | **Factor loading** | **CR** | **AVE** | $\sqrt{AVE}$ |
|---|---|---|---|---|---|
| Instruction-oriented technological language learning (INS) | ins1 | 0.67 | 0.91 | 0.64 | 0.80 |
| | ins2 | 0.77 | | | |
| | ins3 | 0.79 | | | |
| | ins4 | 0.87 | | | |
| | ins5 | 0.88 | | | |
| | ins6 | 0.81 | | | |
| Entertainment- oriented technological language learning (ENT) | ent1 | 0.80 | 0.78 | 0.64 | 0.80 |
| | ent2 | 0.80 | | | |
| Information-oriented technological language learning (INF) | inf1 | 0.86 | 0.89 | 0.73 | 0.85 |
| | inf2 | 0.90 | | | |
| | inf3 | 0.79 | | | |
| Social-oriented technological language learning (SOC) | soc1 | 0.85 | 0.84 | 0.72 | 0.85 |
| | soc2 | 0.85 | | | |
| Teacher support (TS) | ts1 | 0.86 | 0.92 | 0.73 | 0.85 |
| | ts2 | 0.89 | | | |
| | ts3 | 0.86 | | | |
| | ts4 | 0.81 | | | |
| Peer support (PEE) | pee1 | 0.91 | 0.93 | 0.81 | 0.9 |
| | pee2 | 0.94 | | | |
| | pee3 | 0.84 | | | |
| Parents support (PAR) | par1 | 0.86 | 0.85 | 0.66 | 0.812 |
| | par2 | 0.77 | | | |
| | par3 | 0.80 | | | |
| Perceived usefulness (PU) | pu1 | 0.86 | 0.94 | 0.84 | 0.92 |
| | pu2 | 0.96 | | | |
| | pu3 | 0.93 | | | |
| Perceived ease of use (PEU) | peu1 | 0.84 | 0.89 | 0.73 | 0.85 |
| | peu2 | 0.88 | | | |

| | | | | | |
|---|---|---|---|---|---|
| | peu3 | 0.84 | | | |

Table 8.1.3: CR and AVE of the latent constructs

The correlations between constructs were used to verify discriminate validity. In structural equation modeling, a correlation greater than 0.85 implies poor discriminant validity (David, 1998). All correlations in our measuring model were less than 0.8, showing good discrimination. If the square root of each construct's AVE is larger than the inter-construct correlation between that construct and other constructs in the measurement model, the model meets the discriminant validity requirement, according to Fornell and Larcker (1981). As we can see in Table 8.1.4, the criterion was met to indicate discriminant validity. The abbreviations were listed in table 8.1.3.

| | **INS** | **ENT** | **INF** | **SOC** | **PEE** | **PAR** | **TS** | **PU** | **PEU** |
|---|---|---|---|---|---|---|---|---|---|
| **INS** | **.80** | | | | | | | | |
| **ENT** | .570** | **.80** | | | | | | | |
| **INF** | .751** | .650** | **.85** | | | | | | |
| **SOC** | .632** | .526** | .654** | **.85** | | | | | |
| **PEE** | .348** | .271** | .368** | .280** | **.90** | | | | |
| **PAR** | .300** | .221** | .317** | .251** | .643** | **.812** | | | |
| **TS** | .305** | .246** | .323** | .177** | .685** | .586** | **.85** | | |
| **PU** | .416** | .357** | .426** | .251** | .620** | .584** | .692** | **.92** | |
| **PEU** | .411** | .341** | .415** | .299** | .560** | .533** | .564** | .73** | **.85** |

Table 8.1.4: Comparison of the square root of the AVE and inter-correlation

### 8.1.3 Reliability

Cronbach's Alpha is commonly used to measure the internal consistency of the items in each construct. Hair et al. (1998) suggested an alpha of more than 0.7 indicated homogeneous items with same constant, showing a good reliability. Cronbach's alphas were all over 0.8, demonstrating that the questionnaire is a reliable measurement instrument (see table 8.1.5)

| Construct | Cronbach's Alpha | Mean | SD | Item | Survey questions (Abstract) |
|---|---|---|---|---|---|
| Instruction-oriented technological language learning (INS) | 0.914 | 2.711 | 0.94 | ins1 | to learn new vocabularies and grammar |
| | | | | ins2 | to do extra drills and practice on what the teacher has taught in class |
| | | | | ins3 | to do individual learning |
| | | | | ins4 | to test vocabulary and other English skills in order to arrange learning for specific skills. |
| | | | | ins5 | To identify my English level and find appropriate learning materials. |
| | | | | ins6 | To set up learning goal and make a plan. |
| Entertainment-oriented technological language learning (ENT) | 0.8 | 3.038 | 1.16 | ent1 | To pursue my personal interest.t |
| | | | | ent2 | To learn English for the purpose of everyday use. |
| Information-oriented technological language learning (INF) | 0.892 | 2.677 | 1.05 | inf1 | To find authentic material. |
| | | | | inf2 | To enhance self-expression skills. |
| | | | | inf3 | To seek information. |
| Social-oriented technological language learning (SOC) | 0.839 | 2.218 | 1.03 | soc1 | To talk with native speakers. |
| | | | | soc2 | To talk with other English learners or other people in English. |
| Teacher support (TS) | 0.915 | 3.695 | 0.94 | ts1 | Teacher encourages us to use technology |
| | | | | ts2 | Teacher shares us with online learning materials. |
| | | | | ts3 | Teacher uses online materials in the class. |
| | | | | ts4 | During the quarantine due to Covid-19, the teacher encouraged more to study with online materials. |
| Peer support (PEE) | 0.923 | 3.423 | 1.02 | pee1 | I have friends/classmates to whom I can go to seek advice on how to use technologies effectively for learning |
| | | | | pee2 | I have friends/classmates to who likes to share online learning materials that they think helpful with me. |
| | | | | pee3 | I have friends/classmates to whom I can go to seek technical help when I experiment with technologies for learning |
| Parents support (PAR) | 0.804 | 3.124 | 1.01 | par1 | My parents encourage me to learning with technology. |
| | | | | par2 | My parents select and share learning material that they think helpful with me. |
| | | | | par3 | During the quarantine due to Covid-19, my parents encouraged more to study with online materials |
| Perceived usefulness (PU) | 0.938 | 3.471 | 0.97 | pu1 | I find technologies useful in English learning |
| | | | | pu2 | Using technologies enhances my success in English learning. |
| | | | | pu3 | Using technologies enhances my effectiveness in English learning. |
| Perceived ease of use (PEU) | 0.888 | 3.259 | 0.94 | peu1 | I find it easy to select and find appropriate technological tools needed to enhance language learning |
| | | | | peu2 | It would be easy for me to become skillful at using technology to enhance language learning |
| | | | | peu3 | I find it easy to get technologies to do what I want them to do for language learning |

Table 8.1.5 Cronbach's Alpha, Mean, SD for constructs

Similar to earlier studies (Lee et al., 2005; Saade et al., 2007), this study confirmed

technology acceptance model to be a useful theoretical model in helping to understand and explain behavioral intention to engage in e-learning. Results of the present research led to the conclusion that the model well represented the collected data according to the result of goodness-of-fit test.

## 8.2 Main findings

Based on all of the assessments in the preceding section, the survey was determined to be valid and reliable. Then, in order to answer each research question, I conducted primary analysis and set out to find the answer. The current section contains the results.

### 8.2.1 Research question 1: What types of self-directed technological experiences do Chinese secondary students engage in?

In the findings of research question 1, four parts were included: descriptive data, findings from qualitative study, findings from quantitative study and a final interpretation combining all findings to finalize a classification framework of students' self-directed technological language learning experiences.

*RQ1-Descriptive data*

Before discussing the different types of self-directed technological experiences that Chinese secondary students engaged in, the descriptive data of their time distribution spending on school language assignment, self-directed language learning, and English learning with technology were introduced. Three charts showed the distribution respectively.

In terms of time to do assignment, among all grades, most of participants reported to spend 10-60 minutes every day on their English assignment from school with the

majority of grade 10 students stated to spend 30 to 60 minutes per day on their homework. The time for assignment reported by students was only for English subjects, secondary students still had homework of other subjects to be done on a daily basis. The results added empirical evidence that Chinese secondary students were struggling with the academic pressure (Zhang, 2016), as least due to long time to finish homework.

Moreover, from a learning ecology point of view, in order to achieve better holistic learning, out-of-class learning is even more important when students are under long-time intensive academic learning in school. Barron defined a learning ecology as "the set of contexts found in physical or virtual spaces that provides opportunities for learning" (2006, p. 195). In language learning contexts, both in-class and out-of-class context provided such opportunities to enhance holistic language proficiency. Affective strategies were considered to be important in learning beyond classroom, in order to reduce academic pressure in school and increase resilience. Thus, affective activities such as watching movies and listening to music were found to be the dominating activities in students' language learning beyond classroom (Toffolio and Sockett, 2010; Wu, 2012; Barbee, 2013).

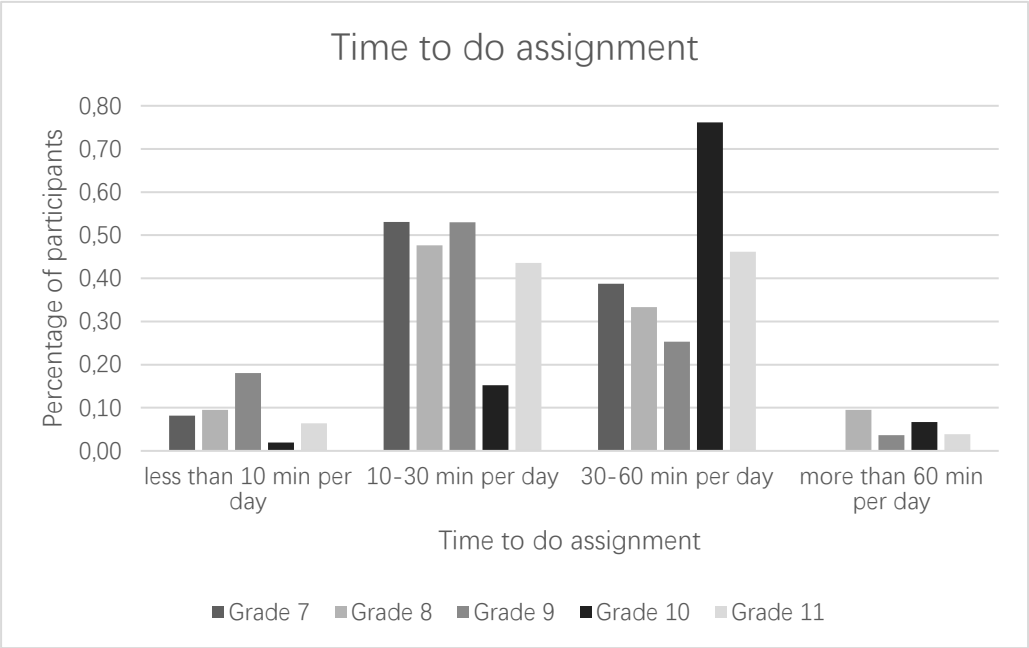


Figure 8.2.1 Descriptive data of time that students spent to do assignment

As for time to do self-directed language learning, most participants reported less than 15 minutes per day. In each grade group, less than ten participants have spent more than half hour on their self-directed English learning. Students in grade 7 reported the longest time to do self-directed language learning with more than 50% of them reported to spend more than 15 minutes per day in autonomous learning. In the interview, students repetitively stated that they were not unwilling to learn, rather had no time to arrange self-directed learning after finishing assignment of all subjects. Most students mentioned that they generally had little time for autonomous learning during the school days. Self-directed learning was usually scheduled on weekends or holidays, when more time was available. This was consistent with García Botero et al (2018)'s finding that tracking data in a mobile-based language learning application showed to be more active during holidays than course days. Therefore, it could be assumed that even these daily times reported may be the result of longer periods of independent learning during weekends allocated to each day. On school days, the most commonly cited self-directed

activities for language learning were memorizing vocabularies and reading newspapers. This was consistent with their reports in respective technological language learning experiences, in which the mean of three types of language learning with technology were lower than 3 on the 5-likert scale. It indicated that they were not frequently adopting technology in their language learning beyond classroom.

The interview participants also reported the consistent results, mentioning that they would involve in out-of-class learning without technology, especially when they were doing drills and taking structured courses. They practiced with popular extracurricular practicing books such as examination paper from Huanggang secondary school. In addition to the lack of time mentioned in less time in self-directed study, another reason that was always mentioned in the interviews in terms of less applied technology was the lack of motivation. Students reported to mainly intent to improve academic score in school. It was consistent with Chen et al (2005)'s description of Chinese society as 'a society emphasizing and even praising exam results' (p. 625). They stated that this motivation was unique to China, stemming from the traditional Chinese desire for personal growth and family well-being through test achievement. This motive could be considered as a strongly internalized part of the Chinese achievement-related mindset, associating value with exam accomplishment, which is reinforced by societal, educational, and familial expectations. When it comes to language learning motivation, You and Dörnyei (2016) found that the desire to avoid academic failure was a strong motivator, which was linked to the Chinese concept of 'losing face' and might be considered East Asian–specific (Magid, 2009). Their findings in mainland China

proved the importance of avoiding losing face as a potent motivator. Therefore, it was not surprising when many of the interviewees stated that their self-directed English learning beyond classroom was mainly intent to enhance their academic score in school.

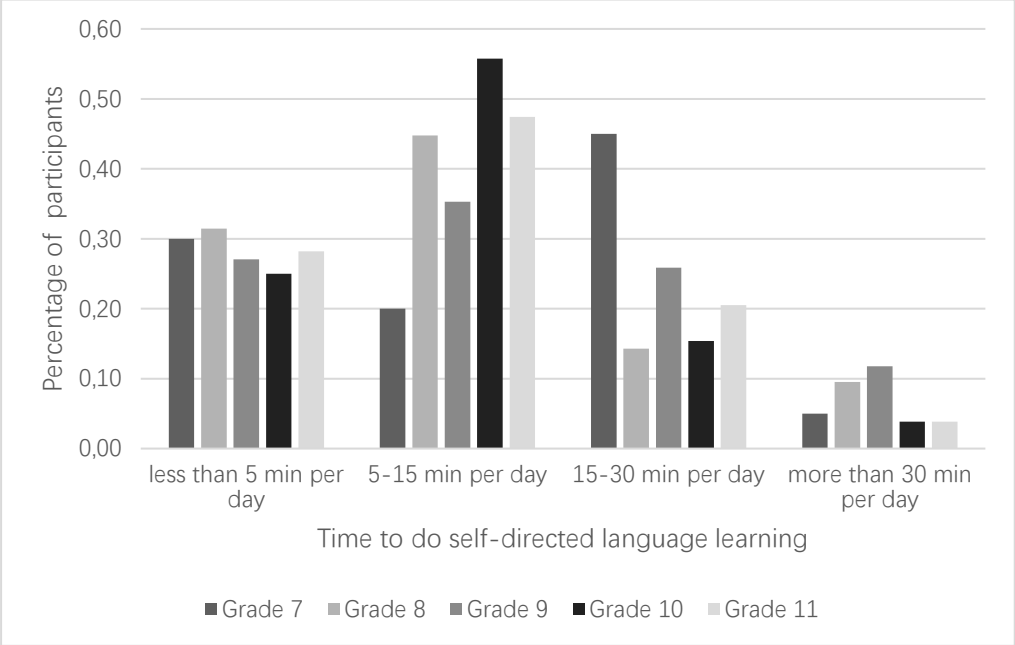


Figure 8.2.2 Descriptive data of time that students spent to do self-directed language learning

Considering the time participants spent on technology for their English learning, a considerably more proportion of students reported to spend less than 15 minutes a week. Comparing with others, students in grade 9 and 10 seemed to adopt technology in their language learning for a slightly longer time with around 40% of them adopted technology in their language learning for more than 15 minutes a week. As for self-directed language learning when most participants spent in English learning 5-15 minutes per day, it indicated that they spent around 35 to 105 minutes per week in their self-directed learning. However, it is extremely different from Sundqvist and Sylvén (2014)'s study with Swedish upper-primary school students, in which students were found to engage 7 hours a week in English-related technology usage. Lai and Gu (2011)

also found that 54% of the Chinese undergraduate students in the study engaged in technology-based language learning for more than four hours a week. Lai et al (2015) further investigated in secondary context, showing that the average time of using technology to assist language learning was 2.21 hours a week. The potential reason for such a big gap between current research and previous study might be due to different context. Secondary school students in mainland China spend a lot of time on homework under the pressure of the college entrance exams, which limits their use of technology for learning in general in terms of time. Although Lai et al (2015) also studied Chinese secondary school students, they also mentioned that this was a foreign language school in a metropolitan city close to Hong Kong, where the school places a higher emphasis on language learning than the Chinese average. The sampling in this study was for an average public school in China, and therefore more representative of the daily learning status of normal secondary school students.

However, the design of the questionnaire itself may also be the cause of this gap. The options for the previous two questions of this question were "every day", while this question suddenly became "every week". It was likely that the students did not notice this change. However, when combined with the students' responses of technological use time in the interviews, the bias caused by this questionnaire design might not be significant. Therefore, it assumed that most of the students did not adopt technology in a large proportion of their self-directed language learning time. This further validated the respondents' statement that their self-directed learning was primarily to improve their school English performance. They were more focused on the content they were

tested on in school, such as grammar, vocabulary, and reading, and placed relatively less emphasis on the comprehensive application of the language. For example, speaking was assessed in school examinations, so the need for speaking practice was not considered a priority.

However, students reported a variety of different out-of-class activities in qualitative study. Thus, the current research was not only valuable to investigate the different types of technological learning experiences they engaged, but also played as an insightful starting point to encourage students to adopt more technology in their self-directed language learning. The following sections provide detailed discussion of different types of language learning experiences with technology from different perspectives (qualitative vs. quantitative).

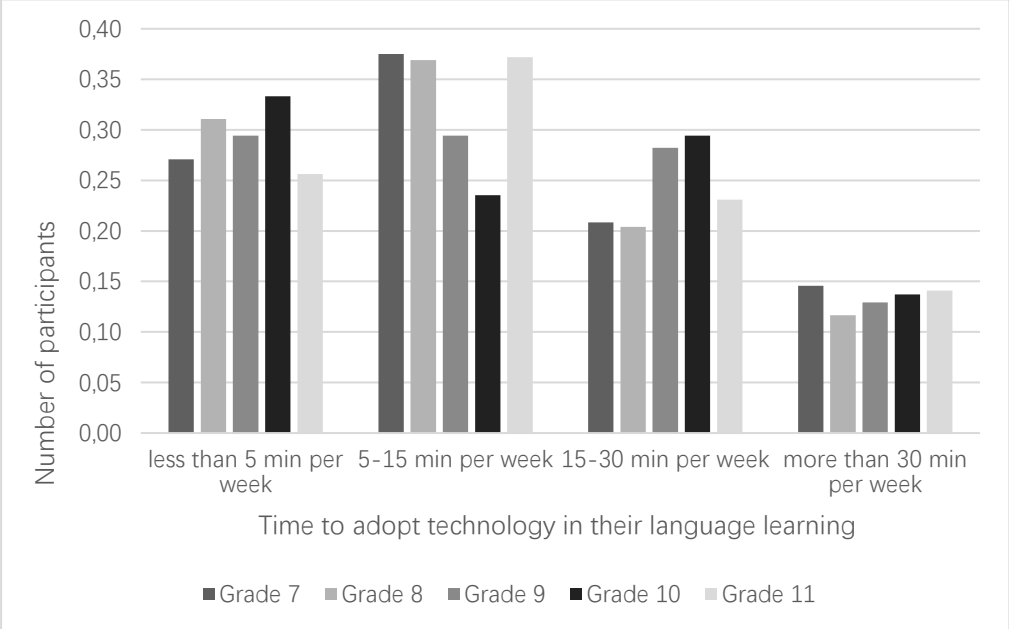


Figure 8.2.3 Descriptive data of time that students spent to adopt technology in their language learning

*RQ1-Four types of self-directed technological experiences in qualitative study*

Four types of technological language learning experiences were generalized

according to the interview with a sample of 15 Chinese secondary students: instruction-oriented technological language learning experiences, metacognition-oriented technological language learning experiences, entertainment and information-oriented technological language learning experiences, and social-oriented technological language learning experiences. I have discussed the four types of language learning experiences in detail with students' quotations in section 5.4.2. In this section, I summarize the results, according to the thematic coding results in the interview transcripts. Details of the emerging times of the codes showed in previous section (see table 5.4.1). The four types of technological learning experiences showed differences in terms of the characteristics of learning resources, learning strategies and their motivation.

In instruction-oriented technological language learning experience, students reported 32 times involvement of cognitive language learning strategies, such as vocabulary and grammatical practices with technological resources. They also reported 20 times of 'structured' when describing the characteristics of the learning resources they used in such learning experiences. The commonly used resources for such learning experience were the online materials designed especially for grammatical and vocabulary practices. Their motivation to engage in this kind of technological learning experiences was to enhance their English scores in school, regarding English as an instrument to achieve better academic performance.

The second technological language learning experience was metacognition-oriented. Students reported 8 times using metacognitive language learning strategies.

The most cited strategies were to memorize vocabularies in a planned manner and to monitor their progress using vocabulary applications. In the interviews, students did not often mention metacognition, and their learning process seemed to be more orchestrated and monitored by teachers and parents. The motivation of engaging in such learning experiences was similar with instruction-oriented technological learning experiences, namely to enhance their school achievement. However, due to the limited sample of interviews and the fact that some students did mention that they used metacognitive strategies, I still chose to include this learning experience as a separate category. Further validation should be explored in a quantitative analysis of a larger sample.

The third category was entertainment and information-oriented learning experience. The main characteristics of the learning resources was interesting and relaxing, and this was mentioned for 21 times in the interview transcripts in this type of technological learning experience. Students reported 26 times to adopt affective language learning strategies in such learning experience. 5 times of cognitive strategies were also mentioned by participants in the interview. Compared to the cognitive strategies mentioned in the instructional experience, the five-time cognitive strategies mentioned in entertainment and information-oriented experience differed in that they were always used in combination with affective strategies, and the descriptions of learning resources were always interesting rather than structured. Students reported an almost equal number of integrative motivations (18 times) as well as motivations motivated by cultural interests (17 times). Some minor differences could be seen in the motivation of entertainment-oriented (cultural interest) and information-oriented (integrative)

learning experiences. However, since these were both interest-oriented learning experiences, it is difficult to distinguish them in the qualitative analysis. Therefore, further analysis will be verified in the quantitative analysis.

The final type of technological language learning experiences was identified as social-oriented. This was the least reported type of technological learning experiences. The reason might be the inaccessible of commonly-used English social media such as Facebook, Instagram. The inaccessible characteristics of this type of learning resources was reported three times by the participants in the interviews. Students reported to engage in this learning experience with technology mainly to pursue cultural interest and to enhance linguistic self-confidence. Although this learning pattern was rarely reported by students, it was consistent with previous study results that Chinese students were not actively engaging in social-oriented language learning with technology (Lai, et al, 2017).

*RQ1-Four types of self-directed technological experiences in quantitative study*

In the early stages of scale building, EFA (exploratory factor analysis) is typically seen to be more appropriate than CFA (confirmatory factor analysis), because CFA does not demonstrate how well your items load on non-hypothesized factors (Kelloway, 1995; Yong and Pearce, 2013). EFA is one of the most useful tools in the statistical toolkit of social science for discovering the quantity and nature of unobserved latent variables that may be used to explain the shared variability in a set of observed indicators (Preacher et al, 2013). In the current study, the instrument was consisted by mainly nine latent variables: four types of technological learning experiences, five

influential factors. Although some of the variables such as perceived usefulness and perceived ease of use adopted scales that was previously validated, most of the latent variables were adapted based on previous scales and qualitative results, thus need to be assessed by exploratory factor analysis.

I firstly considered to fix the number of factors as nine to be consistent with theoretical framework. the results identified nine factors with four types of technological language learning experiences (instruction-oriented, entertainment-oriented, information-oriented, and social-oriented) and five influential factors (perceived usefulness, perceived ease of use, teacher, peer, parent support). Although the types of language learning experiences with technology were identified as four categories, they were not confirming the types which were generalized from qualitative study. The results showed two main changes. The first change was that the instructional and metacognition-oriented experiences in the qualitative study were combined into one category. Since the primary motivation for both categories were to improve academic performance, I also continued to use the name ‘instruction-oriented’ here to represent the combined category of this learning experiences. Another change was that the entertainment and information-oriented learning experiences, which were considered as one broad category in the qualitative findings, were split into two categories in the quantitative analysis: entertainment-oriented and information-oriented learning experiences.

Secondly, due to the emergence of such inconsistent results with the qualitative study, I had to consider the possibility of different classifications of students'

technological learning experiences. In order to determine the final numbers of factors, in EFA, it was suggested to consider the complexity and generalizability of the selected model to identify the most replicable factor numbers (Preacher et al, 2013). Complexity refers to a model's ability to fit a variety of or arbitrary data patterns (Dunn, 2000; MacCallum, 2003; Myung, 2000; Pitt and Myung, 2002), whereas generalizability refers to researchers' preference for models that can fit future data arising from the same underlying process over models that fit a specific data set well (Leahy, 1994; Pitt et al., 2002). Considering the generalizability of the model, the maximum number of types of technological language learning experiences I would like to consider was four. However, it would be meaningful to also consider three types as a three-type model were validated in Lai et al (2017)'s study.

Therefore, thirdly, EFA was conducted again with a fixed eight factor number (three types of technological language learning experiences and five influential factors). The results identified three types of technological language learning experiences: instruction-oriented (combined instruction and metacognition-oriented), entertainment and information-oriented, and social-oriented. In this three-type model, entertainment-oriented and information-oriented were combined as one type.

Finally, in order to determine final factor numbers so as to decide final types of technological language learning experiences, The root mean square error of approximation (RMSEA) (Browne and Cudeck, 1992) was compared between the four-type and three-type models. According to the criteria in Preacher et al (2013)'s study, the smallest number of factors for which the lower bound of the RMSEA 90%

confidence interval dropped below .05 was chosen as most appropriate. In four-type model, lower bound of the RMSEA 90% confidence interval was 0.047 whereas the counterparts in three-type model was 0.062.

Thus, I chose the four-type model and finally identified the four types of technological language learning experiences in quantitative study as instruction-oriented, entertainment-oriented, information-oriented, and social-oriented. A confirmative factor analysis in the measurement model with the final four types of learning experiences was conducted and raised a satisfactory fit (Chisq/df= 3.86; SRMR=0.047; CFI=0.96; TFI=0.95).

*RQ1-Final interpretation of the findings-The classification framework (RQ1)*

Considering the result from interview research and statistical description, I decided the four final types of technological language learning experiences generalized in Chinese secondary context: instruction-oriented, entertainment-oriented, information-oriented and social-oriented technological language learning experiences. In the qualitative study, the four types of self-directed technological experiences that were generalized from the interview were instruction-oriented, metacognition-oriented, entertainment and information-oriented and social oriented. The four types have undergone some changes after EFA, and these changes are explainable. The following paragraph describes the potential reasons which lead to the decision of final four types of language learning experiences with technology, and the facts of some descriptive data of these different types.

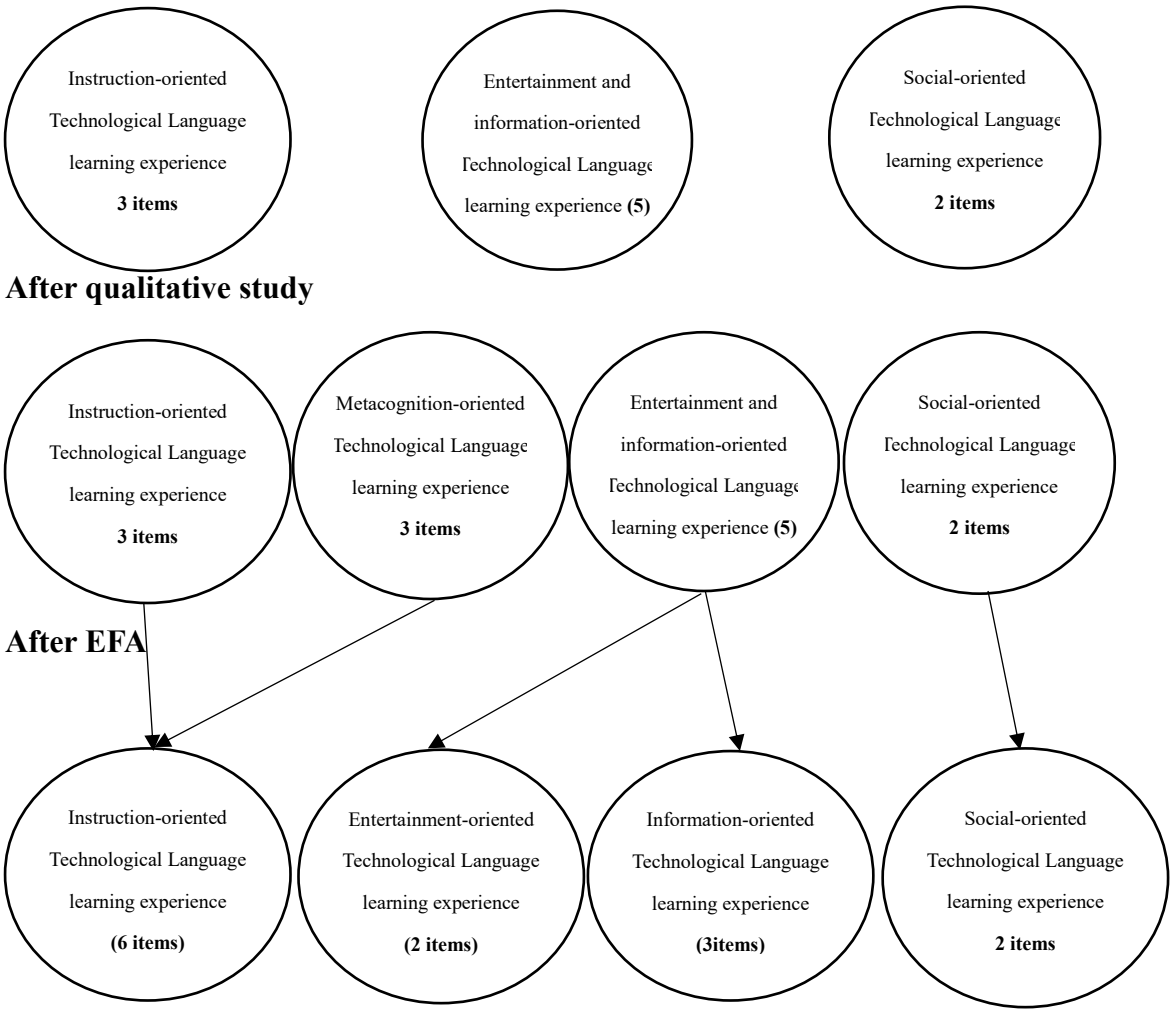


Figure 8.2.4 The changes of types of self-directed technological learning experiences in steps - Lai et al (2007)→Qualitative results→Quantitative results

Firstly, we discussed that instruction-oriented and metacognition-oriented have been merged as one category. The two types were initially separately discussed mainly based on different language learning strategies that students chose and it was based on a sample of 15 participants in the interview. When the two types of technological learning experiences (instruction-oriented and metacognition-oriented) were assessed with larger sample (n=429) in the quantitative study, they were statistically merged into one category. These two types are ultimately interpreted as a type that can be supported by multiple causes. One of the reasons was that the survey design itself influenced or

limited the students' understanding of metacognition. In the questionnaire design, the items in the metacognition included some examples to facilitate students' understanding of metacognition. These examples came from scenarios in which students mentioned in interviews that they used metacognitive strategies. For example, in the description, the questionnaire mentions taking vocabulary tests in the app and helping to schedule the study vocabs as well as using the app to make targeted study plan. This kind of study plan is more understood as to improve grades rather than to improve overall English proficiency, which was also called instruction-oriented in the current study. Another reason may be that secondary school students were not capable of fully understanding and being aware of metacognition. Zulkiply (2009) suggested that metacognitive awareness tended to increase with academic years. In his study, two groups of students with one group of students aging from 14 to 16 years old and another one group of participants aging from 17 to 19 showed significantly different level of metacognition awareness. The older group perceived significantly higher awareness of their metacognitive strategy in their learning process. The participants in current study were secondary students aging from 13 to 17 years old, it could be assumed that they have not fully developed their metacognition awareness even if they already used some metacognitive strategy in their learning. Thus, the above two reasons could be the main reasons that statistics had perceived instruction-oriented and metacognition-oriented learning experience as one type. Moreover, although metacognition type might be identified as separate factor in other context (e.g., with adult learners), most of metacognition-oriented experiences that were surveyed in current context is highly

related to the purpose of instruction, this merged type was finally renamed as instruction-oriented technological language learning experience.

Secondly, entertainment and information-oriented language learning experiences were perceived as two different types according to the quantitative data. In qualitative study, according to the similar language learning strategy (affective strategy), I considered to initially combine these two types as one type when discussing the results of the interview. However, in the result of qualitative study, I already discussed that some slight differences emerged according to the interview between these two types of experiences. It was also named entertainment and information-oriented learning experience because it actually covered two types of experiences that cannot be expressed in a single terminology, entertainment as well as information. In quantitative study, a larger sample (n=429) showed significant differences between these two types as it was perceived in the interview with 15 participants. In the findings of quantitative study, the four-type model in which entertainment and information-oriented learning experiences were split into two patterns showed to better fit the data than the three-type model when they combined as one pattern.

Thus, I finally decided to follow what has been explored in EFA as the final types of different language learning experiences with technology in the current study: instruction-oriented, entertainment-oriented, information-oriented and social-oriented technological language learning experiences. Based on these types, some descriptive data are described, including the mean, standard deviance. As it is showed in table 8.1.5, in general, students are not very actively employing technology in their self-directed

language learning, as the mean rating of all types of technological learning experiences were below 3, except for entertainment-oriented technological learning experience with an average rating of 3.04. According to participants in interview, this may be the result of high pressure of homework and limitation from teachers and parents. Students more actively engaged in instruction-oriented technological language learning (Mean=2.71, SD=0.94), entertainment-oriented technological language learning (Mean=3.04, SD=1.16) and information-oriented technological language learning (Mean=2.68, SD=1.05), rather than social-oriented technological language learning (Mean=2.22, SD=1.03). The result was in accordance with interview and previous studies, which students tend to utilize least social language learning strategies (Rao, 2006; Orhon; 2018). Moreover, Students reported to be most frequently involved in entertainment technologies, which was consistent with previous research (Celik et al, 2012; Ekşî and Aydin, 2013), indicating that watching movies and listening to songs in target language were mostly employed by language learners beyond classrooms.

However, obvious differences existed between entertainment-oriented and information-oriented learning with technology, which was unlike the result in Lai et al. (2017)'s research that considered these two as one type of technological learning experience. I also merged the items from initial metacognition-oriented learning experience into instruction-oriented. The final instruction-oriented type was not perceived as the same as it was in Lai et al (2017)'s study. Thus, I further identified the similarities of differences of these types of technological learning experiences in the findings of their influential factors and relationship with learning outcomes in the

following sections to prove the conceptual validity of the final classification framework.

### 8.2.2 Research question 2: What are the influential factors for them to choose different technological experiences?

*RQ2-Descriptive data*

The participants reported more positive perceptions of the value of technologies for language learning (M = 3.471, SD = 0.97) but slightly less positive perceptions of the ease of locating and using technological resources (M= 3.259, SD = 0.94). Moreover, they were also positive about the support received from teachers (M= 3.695; SD = 0.94) and peers (M= 3.423; SD = 1.02) in using technologies for language learning, but less positive about the support received from parents (M = 3.124; SD = 1.01). It indicated that the participants received less support from their parents than their teachers and peers for their self-directed use of technology for English language learning during lockdown period. This reveals that parents, as the important component that could more directly control students' learning outside the classroom, were still hesitant about technology-based learning (Gao, 2020).

*RQ2-Model selection*

According to Technology Acceptance Model, the four structural equation models (model 1: instruction-oriented, model 2: entertainment-oriented, model 3: information-oriented, model 4: social-oriented) were set up. The model fitness indices were shown in Table 8.2.1. As showed in the table, all indices for four types of technological language learning models are satisfactorily fit. To improve the model fit, I tried a few different approaches including modification indices in SEM and

measurement model assessment.

| Name of index | Instruction-oriented language learning (model 1) | Entertainment-oriented language learning (model 2) | Information-oriented language learning (model 3) | Social-oriented language learning (model 4) |
|---|---|---|---|---|
| **Chisq/df** | 3.724 | 4.056 | 3.651 | 3.792 |
| **SRMR** | 0.056 | 0.044 | 0.047 | 0.046 |
| **CFI** | 0.934 | 0.942 | 0.948 | 0.948 |
| **TLI** | 0.923 | 0.928 | 0.936 | 0.935 |

Table 8.2.1: Model Fits Before Adjustments

Firstly, I tried to adjust the model fit according to the modification indices, and none of the suggestions for a better model fit is in accordance with the theoretical framework. For example, in model 1 with instruction-oriented learning experience, the modification indices refer either to possible cross-loadings (e.g. TS =~ par2: MI = 38.587) or to residual covariances between manifest variables (e.g. ins1 ~~ pu1: MI = 13.563). The incorporation of cross-loadings and residual covariances (particularly across distinct latent variables) is not recommended for theoretical reasons. Model fit issues are common in self-report studies. Individual differences in scale use (response styles) can play a role, resulting in usually higher correlations across the variables that may not be appropriately accounted for in a multi-construct measurement model. Another element that may have contributed to the model-fit issues in this study was the general similarity of the constructs studied in terms of the important variables. There were parent support items, for example, in relation to teacher support. Student perceptions of the effectiveness of technology in language acquisition were also influenced by teacher and parents' perceptions.

Secondly, I tried to simplify the model by examining model fit from a measurement

model. I tried parental support, peer support, and teacher support as one measurement model and Perceived Usefulness and Perceived ease of use as another measurement model, respectively. In the measurement model, correlations were found among some items, which were also reflected in EFA. In order to improve the model fitness, I adopted the reasonable part of the modification proposal to establish correlation between ts2 and ts3, and ts4 and par3. Where ts2 and ts3 are residual covariances in the same construct (TS), while ts4 and par3 are in different constructs (TS and PAR). An important reason why ts2 (Teacher shares us with online learning materials) and ts3 (Teacher uses online materials in the class) were suggested to establish correlation may be that teachers who use online resources in their classrooms are more likely to have done screening of online learning resources. Not only are these teachers positive about the online learning model, but more relevantly, they are more likely to have done the research to better recommend online resources to their students. Moreover, even though ts4 (During the quarantine due to Covid-19, the teacher encouraged more to study with online materials) and par3 (During the quarantine due to Covid-19, my parents encouraged more to study with online materials) are items in different constructs, which normally shouldn't be establish a correlation. However, as these influential factors are correlated with each other, and especially in the context of current study during Covid-19 outbreak. All students were facing lock down at the time of data collection in current study. Parents' encouragement of using technology to support language learning were associated with teacher's encouragement more than ever. Thus, such modification indices in measurement model were accepted. After adjusting the structure model using

the modification indices suggested in individual measurement model, the model fitness improved as per table 8.2.2. Most of the indices are increased to a good fit with some satisfactory fit but close to a good fit. According to Little (2013), an acceptable model is also proved to have great utility and value, especially when the model is steeped in theory. In current study, the parameter estimates were as expected and detailed information about justification of the proposed model is also provided (McDonald and Ho, 2002). Since the model fit is still acceptable, we continue to work with this measurement model.

| **Name of index** | **Instruction-oriented language learning (model 1)** | **Entertainment-oriented language learning (model 2)** | **Information-oriented language learning (model 3)** | **Social-oriented language learning (model 4)** |
|---|---|---|---|---|
| **Chisq/df** | 2.79 | 3.3 | 3.1 | 3.1 |
| **SRMR** | 0.058 | 0.041 | 0.043 | 0.04 |
| **CFI** | 0.96 | 0.96 | 0.96 | 0.96 |
| **TLI** | 0.95 | 0.95 | 0.95 | 0.95 |

Table 8.2.2: Model Fits After Adjustments

Finally, several interviewees in qualitative study had repeatedly stated the direct influence of teachers, peers, and parents on their use of technology. Previous study also found that the external factors could directly influence technology use without the mediating influence of PU and PEU (Burton-Jones and Hubona, 2006). I tried to compare in each of the four structure models, whether external factors (PAR, PEE, TS) should have direct influence on technology use. Models with and without direct influence of external factors were compared with ANOVA analysis. The results showed that the differences between models were not significant (Table 8.2.3). This non-significance indicated that an additional direct influence of external factors on

technological experiences does not result in a significant improvement in fit over the model without direct influence of external factors. Moreover, the models without considering direct influence of external factors are consistent with technology acceptance model and can provide insightful information comparing with previous empirical studies. Thus, I decided to choose the 'without direct influence of external factors' as the final model that could best represent current data.

| | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
|---|---|---|---|---|
| AIC - Without direct influencing of external factors | 20258.462 | 16772.9 | 17367.074 | 16442.335 |
| AIC - With direct influencing of external factors | 20259.715 | 16777.198 | 17367.534 | 16435.756 |
| P value | >0.1 | >0.1 | >0.1 | >0.1 |

Table 8.2.3 Indices between structural equation models with and without direct influence of external factors on different types of technological learning experiences

*RQ2-Findings of Hypothesis*

Hypothesis were tested in the four measurement models separately and the results were listed in Table 8.2.4

| | **Model 1: Instruction-oriented technological language learning** | **Model 2: Entertainment-oriented technological language learning** | **Model 3: Information-oriented technological language learning** | **Model 4: Social-oriented technological language learning** |
|---|---|---|---|---|
| PAR →PEU | 0.29*** | 0.29*** | 0.29*** | 0.29*** |
| PEE →PEU | 0.198* | 0.193* | 0.195* | 0.192* |
| TS →PEU | 0.26*** | 0.26*** | 0.26*** | 0.27*** |
| PAR →PU | 0.121* | 0.12* | 0.12* | 0.12* |
| PEE →PU | 0.015 | 0.015 | 0.015 | 0.015 |
| TS →PU | 0.319*** | 0.316*** | 0.316*** | 0.316*** |
| PEU →PU | 0.51*** | 0.51*** | 0.51*** | 0.522*** |
| PEU →TU | **0.274*****| **0.185**^ | 0.231* | 0.**255*** |

| | | | | |
|---|---|---|---|---|
| PU →TU | 0.195* | 0.278*** | 0.297*** | 0.118 |
| **Note**: ^p < .10; *p < .05; ***p < .001; TS = teacher support; PEE = peer support; PAR = parent support; PU = perceived usefulness; PEU =perceived ease of use; TU = technology use. | | | | |

Table 8.2.4: Factors that influence different types of technological experience (n=429)

H1: perceived usefulness and perceived ease of use have direct influence on students' use of technology in their self-directed language learning

As it was listed in Table 8.2.4, perceived usefulness (PU) and perceived ease of use (PEU) showed direct influence on students' use of technology in their instruction-oriented (PU: $\beta=0.195$, $p<0.05$; PEU: $\beta=0.274$, $p<0.01$) and information-oriented (PU: $\beta=0.297$, $P<0.01$; PEU: $\beta=0.231$, $p<0.01$) language learning experiences with technology. It indicates that students' participation in instruction and information-oriented technology can be boosted by their perception of the value and the facilitation of access to technology.

This was different from Lai et al. (2017)'s research, in which PEU had no significant influence on students' use of technology in instruction-oriented type. Lai et al. (2017) defined the reason to be the widely access on the Internet with structured learning resources which students had little difficulty to locate and use. This is true that there are various structured learning materials and also in secondary context. However, it is not easy to find the appropriate online materials. Proved by participants in the interview, students found it hard to select the "correct" learning material unless the specific technological material is recommended by teacher or peer. Moreover, the potential technical problem is also a deterrent to students choosing technology-based learning. Therefore, in secondary context, it is important to help students remove technical barriers and find the right learning resources.

Considering the above reasons for the significant influence of PEU on instruction-oriented language learning experiences, the non-significant effect of PEU on entertainment-oriented language learning experiences ($\beta$=0.185, $p>0.05$) could also be well explained. The characteristics for entertainment-oriented learning were relax and interesting without the pressure of enhancing scores in exams. Easy access to such learning materials with these features made PEU less important than PU ($\beta$=0.278, $p<0.05$) in entertainment-oriented language learning experiences with technology. Moreover, the main difference between entertainment-oriented and information-oriented learning experiences was that the former was interest-driven, while the latter was based on this to find relevant information with a certain purpose. This kind of aim led to the significance of PEU in information-oriented learning experiences rather than entertainment-oriented experiences, as it was not always easy to find the "correct" information with a specific need.

As for social-oriented language learning experiences, PU ($\beta$=0.118, $p>0.05$) had no significant influence while PEU ($\beta$=0.255, $p<0.05$) had a significant effect. This is different from the result in Lai (2015)'s research in university-based context, in which there is no significance of both PEU and PU on social-oriented language learning experiences. In Lai et al. (2017)'s interview, students claimed that they were influenced by a myriad of sociocultural factors rather than technical problems. However, in secondary context, no matter students affirm the value of socialization or not, removing technological impediments could make them more likely to choose this type of learning. Some students in interview stated that although they did not intentionally seek

opportunities to interact, they did not exclude social activities online with natives. It seemed that the effect of such sociocultural factors was gradually disappearing. It was possible that secondary school students started learning English early and have increased their self-confidence in English, as most of the participants in Lai et al. (2017)'s research studied the foreign language for less than 2 years whereas most secondary students in mainland China nowadays have started English learning since elementary school or even kindergarten.

H2: Perceived ease of use has an indirect influence on students' use of technology in their self-directed language learning through perceived usefulness.

It was clear that PEU was positively influencing PU in all types of technological experiences. Especially in entertainment-oriented learning experience, although PEU had no significant influence, it had effect on this type of learning via the influence of PU. It meant that if students found it easy to access such learning, they would see the value in it and involve positively.

H3: Teacher support, peer support and parent support have indirect influence on students' use of technology in their self-directed language learning

Consistent with Lai et al. (2017)'s research, teacher played a vital role in students' perception of the helpfulness of technology in all types of learning experiences ($\beta=0.27$, $p<0.05$). It was much greater than the influence from parents ($\beta=0.12$, $p<0.05$). In contrast, parents ($\beta=0.29$, $p<0.05$) had a greater influence on how easily students could use technology than teachers ($\beta=0.26$, $p<0.05$) did. This was understandable especially during lockdown, as parents had more control of the usage of technology and

determined whether the student could receive effective help when a technology problem occurred during learning.

Moreover, support from peer showed no direct effect on students' perceived usefulness ($\beta$=0.016, $p>0.05$) whereas it had positive effect on students' perceived ease of use ($\beta$=0.19, $p<0.05$). As PEU is directly influencing PU, peer support could construct an effect indirectly on PU via PEU. This meant that even though peers might not directly change students' perceived usefulness of technology, help from peers would help students more easily achieve technological learning, thus leading to a positive influence of learning with technology. This was consistent with the result in Trinder et al (2008)'s research, in which peer was found to share information resources and made them to be easily accessible.

Furthermore, the effect sizes of the three external factors on students' technological learning experiences were calculated. In all types of technological learning experiences, teacher played the most important role with effect sizes being 0.157 (model1), 0.193 (model2), 0.187 (model3) and 0.10 (model 4). The effect sizes of parent support were generally smaller than that of teacher, being 0.126 (model1), 0.138 (model 2), 0.136 (model 3) and 0.089 (model4). Peer support seemed to play the least important role to influence students' choice of all technological learning experiences types, with effect sizes being 0.07 in model 1,2 and 3, and 0.05 in model 4. It indicated that teacher played generally most important role in influencing students' tendency of different learning experiences in their language learning beyond classroom.

### 8.2.3 Research Question 3: How does students' tendency of technological learning experiences predict their learning achievements?

*RQ3-Descriptive data*

Students' learning achievement were assessed from three aspects: their academic achievements (improvement and proficiency), enjoyment and confidence. A total of 316 students reported both of their pre- and post-lockdown test scores. The improvement was calculated as post-lockdown test scores minus pre-lockdown test scores whereas the proficiency was calculated as the sum of the two test scores. 30.4% of the students had improved in their academic test scores in school after the lockdown period. As for proficiency, the histogram showed a slightly left-skewed distribution. In general, most students seemed to hold neutral perception in enjoyment and confidence in their language learning. A relatively higher percentage of students in grade 7, 10 and 11 seemed to perceived more enjoyment and confidences in their language learning. From descriptive figures, students' perceived enjoyment and confidence in language learning seemed to see a similar distribution with a slightly left skewed distribution. However, whether the two variables were correlated or not needed to be further assessed.

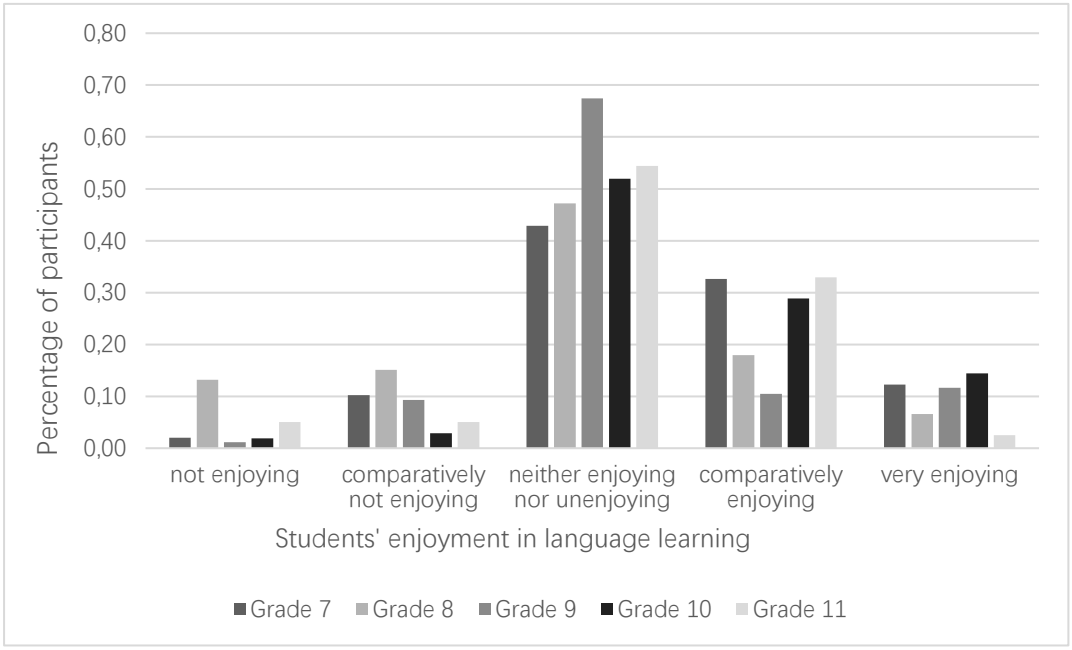


Figure 8.2.5 Students' enjoyment in language learning

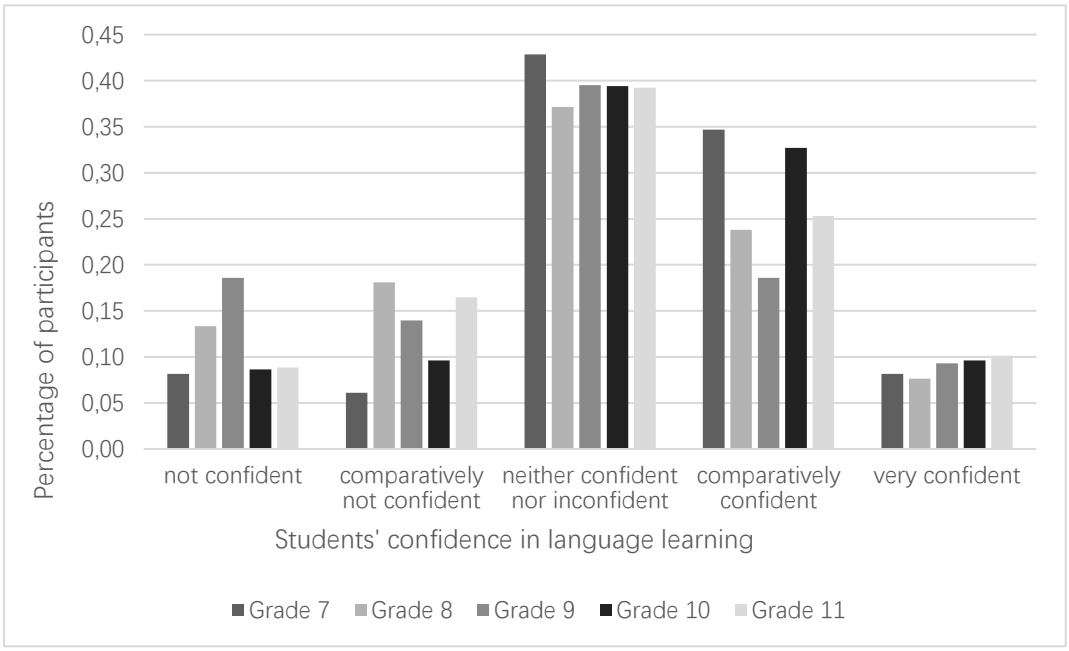


Figure 8.2.6 Students' confidence in language learning

*RQ3-Model selection*

Before building structural equation models, I explored the relationship among four aspects of learning outcomes (improvement, proficiency, enjoyment and confidence). A confirmatory factor analysis was conducted to assess whether the four items could

build up as one latent variable to represent students learning outcome. The results showed that students' improvement was not correlated with either proficiency, enjoyment nor their perceived confidence, but a significant correlation existed in correlation test among enjoyment and confidence ($r=0.637$, $p<0.01$), proficiency and confidence ($r=0.253$, $p<0.01$), enjoyment and proficiency ($r=0.233$, $p<0.01$) (Table 8.2.5). The results added empirical evidences to previous research which showed the feeling of enjoyment was associated with academic achievement (Piniel and Albert, 2018).

**Correlations**

| | | Confidence | Enjoyment | Proficiency |
|---|---|---|---|---|
| Confidence | Pearson Correlation | 1 | .637** | .253** |
| | Sig. (2-tailed) | | .000 | .000 |
| | N | 424 | 424 | 408 |
| Enjoyment | Pearson Correlation | .637** | 1 | .233** |
| | Sig. (2-tailed) | .000 | | .000 |
| | N | 424 | 425 | 409 |
| Proficiency | Pearson Correlation | .253** | .233** | 1 |
| | Sig. (2-tailed) | .000 | .000 | |
| | N | 408 | 409 | 413 |

**. Correlation is significant at the 0.01 level (2-tailed).

Table 8.2.5 Correlations among language learners' enjoyment, confidence, and proficiency

There were two possible reasons why improvement was found to be not significantly correlated with the other aspects of learning outcome. A very important reason was perhaps the control of the difficulty of the tests. The data used in this study were the results of students' participation in English tests at school before and after the lockdown period. I did not have control over the difficulty of these tests. According to the school English teachers, they increased the relative difficulty of the tests on the post-lockdown test in order to make students to feel the pressure from their scores and to

move more quickly from the 'relative ease' of the lockdown atmosphere into a stressful learning mode. Therefore, the fact that only a small percentage of students have improved performance after lockdown was not necessarily solely due to the technological learning style being detrimental to proficiency, but may also be due to the increased difficulty of the test. Another reason why the improvement is not significant may be precisely the fact, which was, the technological learning experience outside of the classroom did not reflect on the scores instantly, but rather on the students' confidence and enjoyment in learning English, and in the long run improves the students' English ability. The results seemed to be consistent with Wu et al (2011)'s study, in which the results indicated that students' involvement with technological language learning experiences can enhance confidence, long-term changes in language ability can be enhanced by the enjoyment of the learning experience.

Thus, rather than regarding four aspects in learning outcome as a latent variable, I considered to combine proficiency, enjoyment and confidence as a latent variable to represent learning outcome. A structural equation model (model 5) was constructed using four types of technological learning experiences as predictors and a latent variable combining three aspects of learning outcomes as the dependent variable. The model showed a good fit (Chisq/df= 2.8; SRMR=0.044; CFI=0.96; TLI=0.95). The factor loadings of proficiency, enjoyment and confidence in representing the learning outcomes were 0.5, 0.79, 0.93. Although factor loading of proficiency as 0.5 was relatively lower comparing with that of the other two items, it was acceptable. Considering the good fit in this model, the findings of regression coefficients was

interpreted in the following section.

Moreover, I tried to assess whether the original instruction-oriented type (ins1-ins3) and metacognition-oriented learning experience (ins4-ins6) were highly correlated or not. I adapted the structural equation model (model 5) to separate INS (instruction-oriented) and MET (metacognition-oriented), and tried to fit the model with five independent latent variable (INS, MET, INF, ENT, SOC) predicting learning outcome. The model could not be fitted due to the high correlation between INS and MET. The covariance between INS and MET was larger than the variance of INS. Therefore, it further confirmed that it was not appropriate to consider separating INS and MET in current context.

| | **INS** | **MET** | **ENT** | **INF** | **SOC** | **Outcome** |
|---|---|---|---|---|---|---|
| **INS** | 0.687 | | | | | |
| **MET** | 0.755 | 0.929 | | | | |
| **ENT** | 0.585 | 0.506 | 0.856 | | | |
| **INF** | 0.740 | 0.706 | 0.701 | 0.973 | | |
| **SOC** | 0.603 | 0.678 | 0.604 | 0.758 | 1.009 | |
| **Outcome** | 0.339 | 0.330 | 0.343 | 0.420 | 0.285 | 0.763 |
| Note: INS=instruction-oriented technological learning experiences; ENT=entertainment-oriented technological learning experiences; INF=information-oriented technological learning experiences; SOC=social-oriented technological learning experiences; Outcome=~ language proficiency + enjoyment+confidence | | | | | | |

Table 8.2.6. Variance-covariance matrix of the types of technological language learning experiences and learning outcome

Furthermore, in order to explore how different types of technological learning experiences had predicted each of the aspect in learning outcomes, I also considered the four items (proficiency, improvement, enjoyment, confidence) as the separate dependent variables. Four separate models were built up as model 6 (improvement), model 7 (proficiency), model 8 (enjoyment) and model 9 (confidence). Models were not fit at the first try. According to modification indices, residual covariances in INS

was found to be the main issues (e.g., ins1~~ins2: MI = 20.452; ins2~~ins3: MI= 63.302). A correlation between the suggested modification indices (ins1~~ins2; ins2~~ins3) were added. The correlated variances often emerged in self-report surveys, in which the method effects were the most appropriate explanation for this kind of unexpected correlation (Saris and Aalberts, 2003). Moreover, the reporter and the settings could also be the reason of correlated variances. Model fit indices were listed in table 8.2.12, showing that all models were satisfactory fit after adjustment.

According to Worrall (2003), testing theories was a test of the primary theory, instrumentation theories, and other auxiliary theories. Only by taking a broad view of the data can scientists study the theory behind crucial concept measurement without succumbing to overfitting or other misleading, sample-specific connections. An acceptable model was also proved to have great utility and value (Little, 2013). Thus, I continued to interpret the regressions with these satisfactory models in order to get more valuable insights.

| **Name of index** | **Learning improvement (Model 6)** | **Learning proficiency (Model 7)** | **Enjoyment (model 8)** | **Confidence (model 9)** |
|---|---|---|---|---|
| Chisq/df | 3.73 | 3.4 | 3.5 | 3.46 |
| SRMR | 0.043 | 0.045 | 0.045 | 0.045 |
| CFI | 0.96 | 0.96 | 0.96 | 0.96 |
| TLI | 0.94 | 0.95 | 0.95 | 0.95 |

Table 8.2.7: Model Fits After Adjustments

*RQ3-Main findings*

I included two parts in the main findings. Firstly, I explored the relationship between general self-directed technology usage and students' learning outcomes. Secondly, the regression coefficients in structural equation models were reported to

explain how different types of technological language learning experiences predicted their learning outcomes.

*Finding a. General relationship between self-directed technological learning and learning outcomes*

Before interpreting structural equation models, a linear regression was conducted to assess whether students' self-directed learning time and the time of using technology had predicted their improvement, enjoyment and confidence in their language learning. The regression coefficients and significance were listed in the table.

| | **Improvement** | **Proficiency** | **Enjoyment** | **Confidence** |
|---|---|---|---|---|
| **Self-directed learning time** | -.051 | .101^ | **.333*** ** | **.211*** ** |
| **Time of using technology** | .013 | -.019 | **.139*** | **.174*** ** |
| Dependent Variables: Improvement, Proficiency, Enjoyment, Confidence<br>Independent Variables: self-directed learning time, time of using technology | | | | |

Table 8.2.8 The relationship among self-directed learning time, technology adoption time and learning outcomes

The results showed that students' involvement in self-directed learning (enjoyment: $\beta=0.333$, $p<0.01$; confidence: $\beta=0.211$, $p<0.01$) and technological language learning experiences (enjoyment: $\beta=0.139$, $p<0.05$; confidence: $\beta=0.174$, $p<0.01$) were significantly predicting their perceived enjoyment and confidence in language learning. The more time students spent on self-directed learning and using technology, the more likely they would perceive higher level of enjoyment and confidence in their language learning. The findings were consistent with the results from Piniel and Albert (2018)'s research, in which they found that students' language learning enjoyment was associated with not only the skills they had, but also the contexts (in class or out of class). They found that language learners tended to list more positive feelings in

connection with outside classroom language learning situations. It implies a high level of control assessment, indicating that people have a strong sense of control over the task they're doing, which leads to a pleasant emotional experience of freedom in self-directed language learning. The histograms of standardized residuals in enjoyment and confidence indicated that the data contained approximately normally distributed errors, as did the normal P-P plots of standardized residuals, which showed points that were not completely on the line, but close.

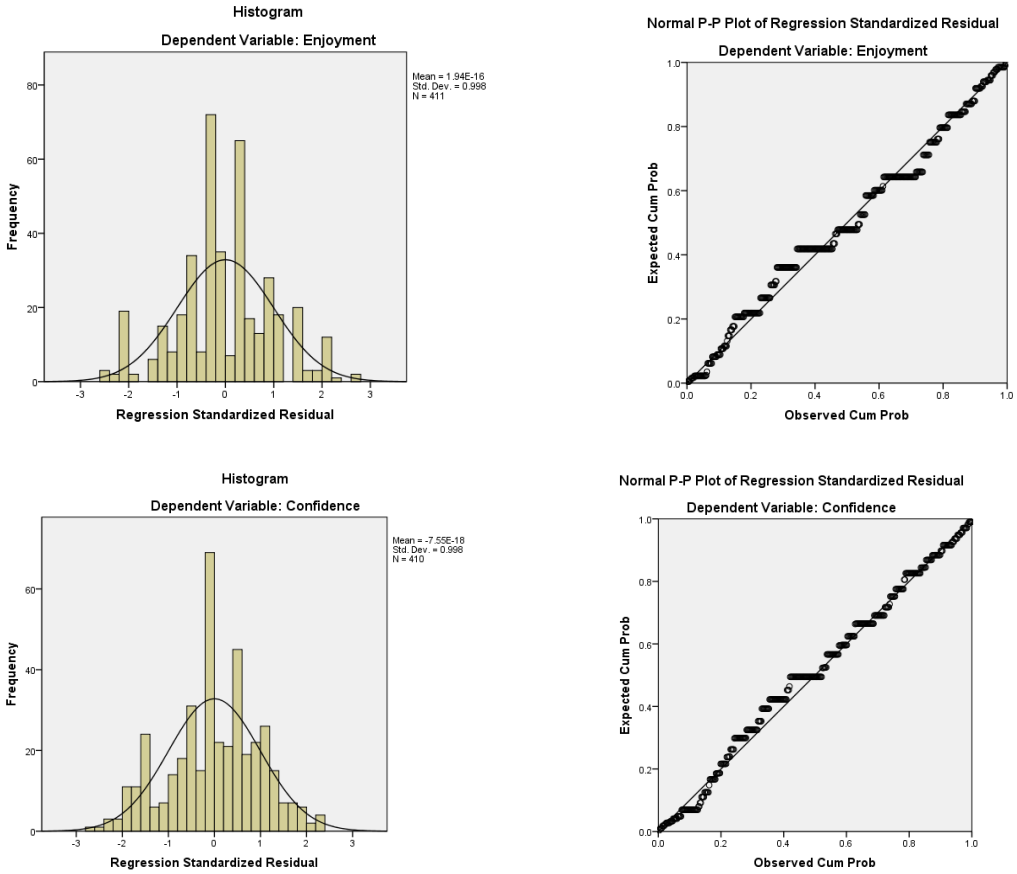


Figure 8.2.7 The histograms and Normal P-P Plot of standardized residuals in enjoyment and confidence

Moreover, although evidence was not sufficient, the results indicated a trend that the more time students spent in self-directed learning, the more likely they could achieve higher proficiency in English learning. However, it did not indicate the same

trend with technology usage. The effect size of technological learning time on students' language proficiency was negative and small.

As for improvement, no significancy was found with either autonomous learning time or technological learning time. Long-term changes in language ability can be strengthened by the enjoyment of the learning experience, according to Wu et al (2011)'s study, in which the results suggested that students' involvement with technological language learning experiences can enhance confidence. As the current research only considered technological learning during the four-month lockdown period in China, it could be assumed that instant improvement was not significantly emerged.

*Finding b. Four types of technological language learning experiences and learning outcomes*

In the structural equation model (model5) with latent variable – 'outcome' as dependent variable, only INF (information-oriented technological learning experience) ($\beta$=0.394, $p<0.01$) significantly predicted students' learning outcome. It indicated that the more students engaged in information-oriented language learning with technology, the more likely that they could achieve higher proficiency, the more enjoyment and confidence. The effect sizes of INS (instruction-oriented) ($\beta$=0.135, $p>0.1$) and ENT (entertainment-oriented) ($\beta$=0.119, $p>0.1$) technological language learning experiences were also positive whereas SOC (social-oriented learning experience with technology) was found to have a negative effect on students' learning outcome ($\beta$=-0.13, $p>0.1$). But there were not enough evidences to confirm their significance due to big p values.

In the structural equation models with consideration of four aspects in learning

outcome as separate dependent variables, the findings showed none of the four types technological language learning were significantly predicting students' improvement in academic scores at school (see Table 8.2.9). The effect sizes of instruction (β=0.016, p>0.1) and entertainment-oriented (β=0.028, p>0.1) learning types were much smaller than that of information-oriented learning experience (β=0.127, p<0.01). There were not enough evidences showing that engaging in either of the four types of technological learning would predict to achieve a better score in school.

| | **Learning improvement (Model 5)** | **Learning proficiency (Model 6)** | **Enjoyment (model 7)** | **Confidence (model 8)** |
|---|---|---|---|---|
| **INS** | 0.016 | 0.147 | 0.082 | 0.111 |
| **ENT** | 0.028 | 0.038 | 0.160^ | 0.070 |
| **INF** | 0.127 | **0.347*** | **0.339***** | **0.253*** |
| **SOC** | -0.138 | **-0.271*** | -0.169^ | -0.028 |
| | Note: ^p < .10; *p < .05; ***p < .001; INS=instruction-oriented technological learning experiences; ENT=entertainment-oriented technological learning experiences; INF=information-oriented technological learning experiences; SOC=social-oriented technological learning experiences | | | |

Table 8.2.9 Technological learning experiences and Learning Outcomes

Moreover, the results showed that information-oriented technological language learning significantly predicted students' language proficiency (β=0.347, p<0.05), enjoyment (β=0.339, p<0.05) and confidence (β=0.253, p<0.05). It indicated that the more frequently students involved in information-oriented language learning, the more likely they could achieve higher proficiency, more enjoyment and confidence in language learning. The findings added empirical evidences to previous research, which suggested that students' foreign language enjoyment was positively associated with academic achievement by promoting psychological resiliency, relieving negative arousal, and broadening learners' instant thought-action repertoires (Fredrickson, 2003 ; Lai et al., 2017; Piniel and Albert, 2018). As information-oriented technological

language learning experience was defined to involve authentic learning resources and adopting affective and cognitive language learning strategies in order to achieve daily-life usage of the language, this kind of learning experience has achieved to promote positive emotions and students' instant practical usage of the language in authentic language situation.

Furthermore, the effect sizes of social-oriented technological language learning experiences on all four aspects of learning outcomes were negative, with a significant negative effect to predict language proficiency ($\beta$=-0.271, $p<0.01$). It indicated that the more frequently students were engaged in social-oriented language learning experience with technology, the less likely that they achieved high proficiency. A possible reason for this negative relationship might be explained by the insights from interview, in which a student stated that there were limited opportunities for students in mainland China to get access to English social media. According to the interview, the only technological learning experiences with social-oriented purpose was an online one-to-one tutorial which was designed partially designed for the purpose of socializing with English native speaking tutor. Another possible activity mentioned by another interviewee was to interact with English players in games, which also rarely happened. These insights described a low-quality technological social environment with native speakers and other English speakers in mainland China. Although individual resources played a part in second language acquisition, social environment elements were critical in determining how effective students were in acquiring academic English (Carhill et al, 2008). Commonly used English social media such as Facebook was not accessible

in mainland China, which could be the reason that limited the authenticity and quality of the technological social environment, leading to the negative effect on students' language proficiency.

## Chapter 9. Discussion and conclusion

The aim of this study was to investigate what types of technological experiences students are engaging in considering their self-directed (informal) language learning beyond the classroom including the influencing factors and students' achievement in a Chinese secondary learning environment. In the final chapter, I firstly summarized the main results and discussed how the findings were related to theories and previous literatures. Moreover, the limitation and strengths of this study are discussed, as well as the main implications. Future research directions are recommended based on the current findings. Finally, the chapter ends with a brief conclusion.

### 9.1 Discussion of the results

With the development of technology and the closer integration of new technologies into the field of education, learners are increasingly using technology to support their learning. This study provides valuable empirical data and in-depth interview perspectives in order to understand students' use of technology for autonomous language learning beyond classroom. The findings provide a classification framework on Chinese secondary school students' use of technology for English language learning. It provides academics as well as educators with new aspect of exploring technology-based language learning from a perspective centered on the student's point of view and built on the self-directed learning model. The model adaptation based on this

classification framework further validates its value. It not only allows us to take a comprehensive view of the phenomenon of students' autonomous use of technology for English language learning, but also provides a taxonomic framework to support further research on the phenomenon. This study analyzed the influential factors of different learning experiences based on this classification and discusses the impact of different learning experiences on learning outcomes.

### 9.1.1 Research question 1: What types of self-directed technological experiences do Chinese secondary students engage in?

I analyzed four types of Chinese secondary school students' experiences of using technology for English learning outside of the classroom, incorporating the theoretical components from self-directed learning model in online context (Song et al., 2007). This categorization comprehensively considered students' perceptions of the technology resources themselves, their language learning strategies (Oxford, 2008) for using the resources, and their behavioral motivations (Csizér and Dörnyei, 2005). Exploratory factor analysis (EFA) further adapted the results from qualitative study. Moreover, I considered whether the different types in this classification framework was affected differently by various influencing factors and whether they led to distinct learning outcomes. By assessing so, it further confirmed the validity of the classification framework. Thus, final four-type classification framework was more validated after exploring research question two and three.

In section 8.2.1 I have briefly discussed the four types of classification framework identified through qualitative research and EFA. In this section, I define the final

classification framework with further validated by findings in research question 2 and 3 (see section 8.2.2 and 8.2.3).

Instruction-oriented technological language learning experience is defined as the students using structured technological language learning resources for instructional purpose, or/and adopting cognitive and metacognitive learning strategies in response to some unstructured online resources with a motivation of instrumentality to support their self-directed language learning beyond classroom. For example, American dramas or English movies were often considered as an affective English learning resource, but when students used learning strategies such as dictation, or repetition to learn vocabulary or even grammar with these resources, such learning experience was also recognized as instruction-oriented technological learning experiences. The underlying reason for adopting different learning strategies for the same learning resource was often that students had various motivations. Therefore, any one of these three components was critical in defining a learner's English learning experience. Moreover, I tried to separate instruction into two original variables generalized in qualitative study (mitigation-oriented and the original instruction-oriented with three items each), and tested that they showed high correlation with each other in predicting the learning outcomes. Thus, it makes no sense to separate the one type into two.

Entertainment-oriented technological language learning experiences shared the similar learning resources with information-oriented language learning experiences with technology, which tended to be authentic, interesting and relaxing. This was why initially these two types were considered as one large category in the qualitative

analysis of the small sample. They were eventually distinguished most probably because students used different learning strategies in these two types of learning experiences due to unintelligible learning motivations. This difference in motivation and choice of learning strategies was displayed in the large-sample quantitative analysis. These small interpolations could also be traced in the results of the qualitative analysis. In the entertainment-oriented learning experience, the affective strategy was dominant, and students reported to be motivated by their attraction to L2 culture and interest in the content itself. In the latter learning experiences (information-oriented), students used affective strategies while consciously incorporating cognitive strategies. Students preferred to retain the integrative motivation for learning in order to integrate more naturally into the target language community. Moreover, the different effect sizes and significances between entertainment-oriented and information-oriented technological language learning experiences on learning outcomes confirmed again that it was valuable to separate the two types in the classification framework.

Thus, combining the results from qualitative, exploratory factor analysis, and structural equation models, the two types really differentiated from each other in many aspects. In the final classification framework, they were considered as separate types. Entertainment-oriented technological language learning experiences is defined as students using interesting and relaxing technological resources, adopting affective language learning strategies, driven by the interest of target culture and just for entertaining themselves. Information-oriented technological language learning experiences is defined as students using interesting and authentic technological

resources, adopting both affective and cognitive language learning strategies, searching for information needed to be integrated into daily life communication in target language.

Social-oriented technological language learning experiences is defined as students using convenience and accessible online resources in China, adopting social language learning strategies, with the motivation to be enhance language confidence or just because of cultural interest. Several students reported that it seemed to have limited opportunity to interact with native speakers online for social purposes, as commonly-used English social media was not accessible in mainland China. While students did mention social strategies, due to the lack of online resources, some mentioned that they would use them offline, such as communicating in English with other English learners and with native speakers when traveling abroad. Descriptive data also showed that social-oriented technological language learning experiences were least adopted by learners in Chinese secondary context.

The reason to explore and identify the types of technological language learning experiences was to help educators get a comprehensive understanding of the phenomenon of students' self-directed language learning beyond classroom in Chinese secondary context. I have summarized in previous chapters (see section 2.1.1) some classifications of students' autonomous English learning outside of the classroom. Most of these classifications addressed only single component in the self-directed learning model, such as the classification of online resources, the classification of self-directed learning strategies, and the study of students' motivation to engage in self-directed learning.

However, the exploration of technology-based learning resources, or learning strategies alone, is not sufficient to describe a complete phenomenon. In language learning field, Lai et al (2017)'s study was the first to provide learner-experience-centric framework, concentrating on learners' perceptions of and interactions with technological experiences in order to acquire a better understanding of the nature of language learning with technology outside of the classroom. The research methodology of the current study drew on Lai et al (2017)'s investigation of Hong Kong university students' perceptions of autonomous language learning. Building on their research, the current study was based on a more solid theoretical foundation with comprehensive reference to students' perception on three major aspects of the SDL model (Song et al, 2007): technological learning resources, language learning strategies, language learning motivation. This study not only classified technological learning experiences based on the interview results, but also tested the reliability and validity of the classification and considered the findings from both qualitative and quantitative studies to finalize the classification framework. The investigation in types of technological language learning experiences' impact on learning outcomes further validate this classification framework by showing different impact from distinct types in the classification.

Institutional contexts and social environments tended to determine students' language learning strategies and motivation (Gan, 2009). Thus, the present study not only provided a more solid theoretical basis grounded on Lai et al (2017)'s study, added more empirical evidences to their study, but also provided the different results generated under different contexts. The empirical results added value to the research of the

phenomenon of out-of-class English learning with technology in Chinese secondary context. The findings of this study could also be discussed in other similar educational environments and social contexts. Moreover, the categories proposed in this study has showed reliability and validity in quantitative studies, providing valuable data support for similar studies in other contexts to follow.

### 9.1.2 Research question 2: What are the influential factors for them to choose different technological experiences?

This study explores in detail the factors that may influence students' use of technology for English language learning based on the technology acceptance model, adding valuable insights of the influential factors from both qualitative and quantitative points of view. The findings showed that the significance of influencing factors changed for different types of technological language learning experiences. This suggested that educational interventions should focus on the diverse sorts of support needed for different types of technological learning experiences with a given technology rather than on supporting learners' usage of a single technology as a whole, which is consistent with the implication from Lai et al (2017)'s study. However, the majority of previous research in investigating influential factors of students' language learning out of classroom only considered technological use as a whole rather than different classifications (Lai, 2013; Ekşî and Aydin, 2013; Lee, Yeung, and Ip, 2016; Saad et al., 2013; Trinder, 2016). A possible reason was also the lack of a classification model with validity and reliability. Lai et al (2017) were the first to propose the concept of technological learning experiences, but the classification also lacks tests of reliability

and validity. This study filled the gap in this aspect and provided a classification framework with validity with reliability for future related studies.

Moreover, this study showed that students' perspectives on the usefulness (PU) of technology and students' perceptions of the ease of use (PEU) of that technology were important influences in both instruction-oriented as well as information-oriented technology-based learning experiences. In the entertainment-oriented type, ease of use was no longer a significant influence on students' choice of the learning experience, and in the social-oriented type, usefulness was no longer a significant influence.

Although similar methodology was adopted to analyze influencing factors of different types of technological language learning experiences with Lai et al (2017)'s study, and the current research came up with some different findings than their precious findings. Firstly, in instruction-oriented language learning experiences with technology, students reported that the easier they can get access to this kind of technology, the more likely they would engage in such technological language learning experiences whereas Lai et al (2017) found easy accessibility was not a significant predictor for students to choose this type of learning. The reason of the non-significancy, according to Lai (2015), is the widespread availability of structured learning resources on the Internet, which students found relatively easy to identify and use, which seems to invalid in the context of middle school students in mainland China. I agree with the analysis of the first half of the sentence, but have doubts about the application of the second half of the argument to middle school students in mainland China. The similar doubts were also raised by the interviewees in current qualitative study. Students said that they found it hard to

locate the “correct” learning material unless the specific technological material was recommended by teacher or peer. I believe that the different regional assessment standard in English education in mainland China is one of the reasons for such difficulty. Students have plenty of more regionally-focused offline practice materials to support their instruction-oriented language learning, which makes it unnecessary and time-consuming for them to sift through the vast amount of technological resources at varying levels of quality, especially considering their limited time after finishing assignments from school. This also well explained the non-significance of PEU in entertainment-oriented learning, as students no longer need to sift through resources very carefully due to relaxing purpose and learning happens unconsciously in such type of language learning. The final difference emerged in social-oriented language learning experience with technology. PEU was found to be not significant influencing factor in Lai et al (2017)’s research, which showed to be a significant predictor in current study. In chapter 8, I discussed the possibility that this may be due to different language levels, educational settings, and the influence of the technological and social environment (Gan, 2009).

Furthermore, similar external factors including teacher, parent and peer support were summarized in this qualitative study comparing with previous study (Lai et al, 2017). This result was consistent with Bronfenbrenner's (1979) ecological system theory, which is one of the useful theoretical frameworks to understand the complexity between psychological, social and environmental process in learning and development. The mesosystem in this theory considered the close surrounding in learner’s

environmental setting. For secondary students, teacher, peer, and parents are the main components of such close surrounding. The current research added qualitative data support to the test of mesosystem. Teacher support was found to be the main predictor of students' perceptions of technological usefulness whereas parents were significantly influencing students' perceived ease of using technology. Peer support was only influencing students' use of different types via perceived ease of use. These findings were also consistent with Lai et al (2017)' study. Although parents were the most influential in students' ease of using technology for language learning, descriptive data indicated that parents provided the least support to students compared to teachers and peers. This reveals parents' distrust of technology-based learning due to the uncontrollable quality of online learning (Gao, 2020).

This study adds further empirical evidence to prove the validity and reliability of technology acceptance model when implemented in e-learning fields. By discussing the potential reasons behind the differences found in the current study and Lai et al. (2017)'s study in various aspects, this study also achieves to show rich in-depth insights to draw on for further discussion of different influencing factors in other contexts.

### 9.1.3 Research Question 3: How does students' tendency of technological learning experiences predict their learning achievements?

According to Gan et al (2004), a complex and dynamic combination of internal cognition and emotion, external incentives, and social setting may explain differing levels of success. They suggested that diversity in language learning outcomes should be viewed holistically. The framework for classifying technological language learning

experiences in this study took into account exactly all aspects of student learning in a comprehensive way. Thus, by exploring the different predictions of these different types on learning outcomes, the study also reflects the impact of the various aspects included in the different types on learning outcomes indirectly.

Firstly, the findings suggested that students' use of technology to learn English outside the classroom did not result in short-term gains in achievement. The current study asked students about their use of technology for English language learning during the initial lockdown period in China due to covid-19 in early 2020. During the lockdown period about 4 months, students' engagement in technology-based language learning beyond classroom did not significantly help them to enhance school test scores. However, in the long run, information-oriented technological language learning experience is significant predictor of students' language proficiency. Wu et al (2011) proved that the long-term enhancement of language proficiency was associated with learners' enjoyment.

Secondly, information-oriented technological language learning experience was found to be the only one among the four types to significantly predict students' learning outcomes. The more frequently students engaged in this type of learning experiences, the more likely students would achieve higher proficiency, more enjoyment and confidence. It suggests that educational interventions could be given more weights to this kind of technological learning resources, combining interesting and authentic characteristics. It was indicated that even a modest quantity of authentic English contact made students more confident in their abilities, more confident in what they had studied,

and more motivated to develop global, cross-cultural connections (Wu et al, 2011). Moreover, as Burston (2014) suggested, the aim of using technologies in language learning is more a matter of pedagogy than technology itself. The design of technology-based language education products also needs to consider how they can motivate students to adopt more effective and cognitive learning strategies to apply the content in the products. Educational interventions could consider a variety of topics and the level of proficiency with easy filter to quickly locate in the resources they want.

Thirdly, the findings showed significant negative impact of social-oriented language learning experiences with technology on students' language proficiency. The effect sizes of this type of learning experiences on enjoyment and confidence were also negative. However, in Wu et al (2011)'s study with 227 university students in Taiwan, more interaction with native speakers via technology showed a positive effect on students' language learning. Lai et al. (2015) also found that Chinese students' engagement of focus-on-meaning language learning activities beyond classroom was positively associated with their good English grades and enjoyment. An et al. (2021) found that technology-based social strategies had a statistically significant association with students' English learning outcomes among Chinese university students. These studies indicated that social strategies were positively predicting students' outcome. Therefore, based on findings in previous studies, the most likely cause of the negative impact of social-oriented technological language learning experiences on language proficiency in this study is the low quality of this kind of technological resources. Most commonly-used English social media was not accessible in mainland China, which

limited the authenticity and quality of the social-oriented technological learning resources. As social-oriented technological language learning experiences are consisted with not only social strategies, but also social-oriented online learning resources, the low quality of such resources might indicate a negative effect on students' language proficiency.

In summary, this study provides a guidance for students, educators, and educational provides of what achieves best. It also emphasizes the low quality of social-oriented technological resources in Chinese context. Moreover, the different impact level with significance and non-significance on aspects of learning outcomes showed that the classification framework categorized the types of technological experiences in a valid way.

**9.2 Strengths and limitations**

This study has brought valuable insights for the research in self-directed language learning with technology. Firstly, it adds a valuable classification framework for the phenomenon of students using technology to learn English outside the classroom. The classification framework is based on a solid theoretical foundation. I synthesized the qualitative data, factor analysis and quantitative data of the implementation of the classification framework to predict students' learning outcomes and finally defined a 4-category classification framework in students' self-directed language learning with technology. Definition of the four types can be found in section 9.1.1.

Secondly, although the analysis framework was generated among middle school students in mainland China, it covers almost all of the language learning strategies,

motivations, and characteristics of most of the learning resources that students can use. Therefore, I can speculate that it can be applied to other contexts as well. Future research could consider adapting the questionnaire to suit the classification framework in new contexts based on this research framework while taking into account possible changes in different contexts. The discussion of interview data, empirical data, and previous studies in finalizing the four categories of classification frameworks also provided deeper insights into the possibility of adaptive design of the classification framework based on various contexts.

Thirdly, the classification framework was also tested in a structural model and was shown to be able to be combined with other well-established theoretical frameworks for further research. The structural model based on the classification framework for the impact factor study and the predictive model for academic performance research were found to have good model fit. The value of the classification framework is also showed in the findings of structure models, in which the influential factors showed a variety of effect sizes on different types technological language learning experiences with significance or insignificance. This indicates that a broad impact factor analysis for the phenomena of students utilizing technology to learn English outside of the classroom is no longer appropriate. When this phenomenon is classified, different types of employing technology for English learning appear to be influenced to varying degrees by various social and psychological elements. The same applies to the study of learning outcomes for language learning using technology. The differences further confirmed the validity of the classification, indicating the distinctions between types. Previous

research has considered the relationship between learning resources, learning strategies, motivation, enjoyment, and student achievement (Wu et al, 2011; An et al,2021). The present study's framework for classifying students' experiences with technology-based English language learning integrates learning resources, learning strategies, and motivation to provide a more comprehensive and practical framework for discussing the impact of students' actual learning situations on learning outcomes.

However, some limitations that exist in this study cannot be ignored. Firstly, in terms of questionnaire design, two categories of technological language learning experiences in this classification framework contain only 2 items. This leads to a limited choice of the number of factors when conducting exploratory factor analysis. Although there were scales in psychology literature contain only two items in per factor (Gosling et al, 2003), researchers have suggested a number of items ranging from three to five to represent a latent variable (Raubenheimer, 2004). For categories that may change during interviews or in previous studies, researchers need to consider such possible changes in advance and increase the number of items accordingly. Secondly, the context of this study has limitations in terms of technological ease of use. Due to the unique political context of mainland China, some of the technology-based learning resources that are often used internationally as English language learners are inaccessible in mainland China. This leads to some results, particularly the impact of different types of technology experiences on learning outcomes, that are difficult to apply to other contexts. Thirdly, the difficulty of the students' pre- and post-lockdown English tests were not controlled for in this study, so it is difficult to conclude whether technological

English learning during lockdown really did not result in an effective improvement in students' performance.

### 9.3 Implications

Chinese government has announced a "double reduction" policy aimed at alleviating the academic burden placed on pupils in compulsory education in mid-2021. At the same time, the education industry was stifled as a result of this policy. After a capital retreat, China's online education market, especially for k12 subject-based education, is set to undergo a directional shift. This study offers some suggestions following ‘double reduction’ policy in the field of English learning outside of the classroom.

#### 9.3.1 Teacher training

Schools and even local educational department can conduct assessments of free and commercially available English language learning (ELL) resources and organize training for English teachers related to technology-based learning resources. Teacher is the biggest influencing factor on students' perceptions of the usefulness of technology-based ELLs. Firstly, this kind of training encourages teachers to understand the importance and usefulness of technology-based language learning and to recommend and present some of these resources in their classrooms. Their recommendations and emphasis can be effective in increasing students' affirmation of the usefulness of using technology in their self-directed language learning beyond classroom. Teachers can gain a systematic understanding at the training courses and make recommendations to their students in relation to their own teaching experience and the level of the students

in their class. This can be a good solution to the problem of personalized recommendations for regional and student levels that cannot be given by to-customer products on the market.

In addition, the integration of technological English teaching in the classroom can also greatly improve the teaching efficiency of English teachers. According to Bax (2003), the future of computer assisted language learning is normalization, in which technology becomes invisible, fulfilling the requirements of students and being integrated into every teacher's daily practice. For example, 17zuoye adopted a world-leading instant pronunciation grading technology for teachers and students to use free of charge (Le, 2019). Teachers can set up certain online games that blend education and pleasure so that students can use the game to complete oral English, dictation, and spelling homework, as well as evaluate and receive feedback in a timely manner. With the development of technology, these technologies like 17zuoye can be directly applied in English learning as well as increasingly mature. However, many of these technologies are not widely used in daily teaching and language learning outside of the classroom. One of the reasons for this is that language teachers themselves are not aware of the wide range of technologies available on the market or that they are hesitate about the uncontrollable quality. Schools and government education departments should take responsibility for integrating technology in teaching and learning, consolidating the resources available on the market, and training teachers on the subject. This could effectively increase the percentage of teachers incorporating technology in the classroom, while encouraging students to use technology for learning outside of the

classroom.

Moreover, in secondary schools, teachers can also influence whether parents support their students' use of technology for language learning outside of the classroom. Encouragement from teachers can reduce parental concerns about using technology for learning, thus making it easier for students to use technology at home. Teachers can also train parents in their own classes and introduce them to extracurricular language learning resources so that parents can better assist the students at home and truly personalize their recommendations. In this way, learning inside and outside the classroom is combined to most efficiently improve overall English proficiency (Malcolm et al, 2003; Lai et al, 2015).

Through teacher training in the application of technology, parents and students can truly achieve 'double reduction', while also equipping teachers with the assistance of technology for teaching, improving teaching efficiency and reducing the burden on teachers.

### 9.3.2 Educational product development

Firstly, as content providers, the more topics and more varieties of forms in resources for technological language learning, the better they can attract the learner. The current study found that information-oriented technology-based language learning experiences had a significant positive impact on learning outcomes. Therefore, the findings suggest that content providers should consider a combination of authenticity and interestingness when presenting content on different topics. Interestingness can be reflected in the themes themselves. If the student is interested in the subject, the resource is interesting

for that student. Interestingness can also be reflected in the forms of presentation. For example, the same content can be presented in the form of reading, videos or animations, or presented in games. Duolingo is a typical example to take gamification in their learning journey. The challenging exercises, reward motives, hierarchical levels, and user ranking based on achievements are just a few of the components that show strong gamification elements inside this popular language learning program (Shortt et al, 2021). Different ways of presenting contents can cater to the needs of different students for the fun of the format.

Secondly, educational interventions need to be designed for varying levels of language proficiency and set up efficient filter system. Students can only increase their recognition of the usefulness of technology-based learning resources when they are appropriate for them. Even students in the same class can be at different language levels. Unlike the classroom where you must follow the teacher at the same time, language learning outside the classroom provides the opportunity to tailor learning to your own pace and level. If the technological resources match one's own language level and achieves the previously stated characteristics of authenticity and fun, they can effectively increase the student's learning engagement in such learning experiences and achieve higher learning outcomes. In addition, during the interviews, students mentioned that it was sometimes difficult to locate the right content for their level in the vast amount of technology-based learning resources. An effective filtering system can help students find the resources they need efficiently and improve the ease of use of the resources. While parents and teachers are great helpers in improving the ease of

use of technology-based resources, the design of the filtering system itself is equally important. A good example is to recommend graded reading through a pre-test on vocabulary size. Pre-test is an efficient filter to help students explore their level with the help of AI algorism. Some interesting elements are often added, such as gamified tests, choosing pictures for tests, etc., to make the originally boring vocabulary tests interesting.

Thirdly, peer community for language learning purpose is recommended. On the one hand, peer learning communities are what make it easier for students to access more useful learning resources, as peer support was found to have a significant positive effect on technology ease of use. On the other hand, peer communities can increase the quality of social-oriented technological resources among Chinese secondary students, which was assumed to be the main reason that led to a negative effect of social-oriented technological language learning experiences on learning outcomes. Virtual games and virtual characters in the metaverse are well suited for building such peer communities. Educational interventions could consider applying these latest technologies to language learning to improve the quality of socially oriented learning resources.

By enhancing the quality of educational product, educational interventions in language learning in Chinese secondary context can achieve effective link between home and school, thus effectively implementing the double reduction policy.

### 9.4 Future directions

The findings of this study provide some directions for further research in the future. First, this study proposes a classification model of technological language learning

experiences based on the theoretical foundation of the SDL model. Future studies can test the reliability and validity of the framework in different contexts and discuss the replicability of the classification framework in different contexts. Same types of technological language learning experiences may also lead to different learning outcomes in varying social, cultural, and educational environment.

Second, socially oriented technological language learning experiences were found to have a significant negative impact on students' learning outcomes in this study. This study proposes the hypothesis that this negative impact may come from the socially oriented technology-based learning resources included in this type of experience. Some comparative studies can come to try to corroborate this hypothesis.

Thirdly, metacognition-oriented technological language learning experiences were found highly-correlated with instruction-oriented learning experience, and thus merged as one type in current context. I discussed there were two possible reasons: the limitation of questionnaire itself or the young participants who were with limited metacognition. Future research can further valid in other contexts (e.g., with adult learners) to assess whether metacognition-oriented learning experience can be separated from instruction-oriented learning experience in other context.

## 9.5 Conclusion

With an explosion of technological innovations being used in language learning, students have access to a wealth of technology-based learning resources outside the classroom. It is worth exploring how to guide students in selecting the right resources and using them efficiently to reach their desired learning goals. This study investigated

the types of technological experiences students engaged in considering their self-directed (informal) language learning beyond the classroom including the influencing factors and students' achievement.

Various studies have found that students widely used technology in their self-directed language learning. Most previous studies that have attempted to classify the phenomenon of students' use of technology outside the classroom have been based on a more superficial level, considering a single dimension (see section 2.2.1).The current study draws on the technology-based learning experiences in Lai et al.'s (2017) study to explore the realities of students' use of technology for learning outside the classroom based on self-directed learning model with consideration of three dimensions: technology-based resources, language learning strategies, and motivation they use. Based on the limitations in their study (see section 2.1.2), their classification of technological learning experiences could not be replicable in other contexts.

Viewing the need to establish a replicable classification framework to help understanding the phenomenon of students' use of technology for language learning beyond classroom, I chose to adapt the similar methodology and explore the types in Chinese secondary school context. The main reason for choosing this specific context was based on the fact that students with high levels of English proficiency in a form-based language instructional strategy in school would use choose to use a greater variety of technology to facilitate their language learning (Benson et al, 2003). Chinese secondary school students are well placed to explore a more complete classification framework after years of English learning and receiving grammar-based language

instruction at school.

This study finalized a four-type classification framework of technological language learning experience with in-depth discussion of qualitative and quantitative evidence. They are instruction-oriented, entertainment-oriented, information-oriented, and social-oriented technological language learning experiences. The findings further showed that different types of technological language learning experiences were driven by influencing factors in varying degrees, and can also result in different learning outcomes. These distinctions further validated the categories in this classification framework. Although the metacognition-oriented type from the qualitative findings was merged with the instruction-oriented type in the final discussion, it still deserves to be studied in other contexts, especially among adult learners.

Information-oriented technological language learning experience was found to be the only one that significantly predicting learning outcomes. The research findings could lead students to use technology effectively to aid their language learning and guide educators, providers of educational products to design and iterate their products in a more targeted way (see section 9.3). Based on the findings of the study, the classification framework is considered to be a comprehensive elaboration of the technological English learning experience types after considering three dimensions, and can be replicated in other contexts. Future research could adapt this classification framework in other contexts and examine its impact factors, as well as the implications for learning outcomes.

**References**

Abraham, R. G., & Liou, H. C. (1991). Interaction generated by three computer programs: Analysis of functions of spoken language. *Computer-assisted language learning: Research and practice*. New York: Newbury House/Harper & Row.

Ainley, M., and Hidi, S. (2014). "Interest and enjoyment," in *International Handbook of Emotions in Education*, eds R. Pekrun and L. Linnenbrink-Garcia, (New York, NY: Routledge), 205–227.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control* (pp. 11-39). Springer, Berlin, Heidelberg.

Almekhlafy, S. (2016). Mobile-mediated communication a tool for language exposure in EFL informal learning settings. *Arab World English Journal (AWEJ) Volume*, *7*.

Alwahaishi, S., & Snásel, V. (2013). Acceptance and use of information and communications technology: a UTAUT and flow based theoretical model. *Journal of technology management & innovation*, *8*(2), 61-73.

An, Z., Gan, Z., and Wang, C. (2020). Profiling Chinese EFL students' technology-based self-regulated English learning strategies. *PLoS One* 15:e0240094. doi: 10.1371/journal.pone.0240094

Awang, Z. (2012). *Structural equation modeling using AMOS graphic*. Penerbit Universiti Teknologi MARA

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the association for information systems*, *8*(4), 3.

Barbee, M. (2013). Extracurricular L2 input in a Japanese EFL context: Exposure, attitudes, and motivation. *University of Hawai'I Second Langauge Studies Paper 32 (1)*.

Barkhuizen, G., Benson, P., & Chik, A. (2013). *Narrative inquiry in language*

*teaching and learning research*. Routledge.

Bartholomew, D., Knotts, M., & Moustaki, I. (2011). *Latent variable models and factor analysis: A unified approach. (3rd ed.).* West Sussex, UK: John Wiley & Sons.

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human development*, *49*(4), 193-224.

Bax, S. (2003). CALL—past, present and future. *System*, 31(1), 13-28.

Bekleyen, N., and Hayta, F. (2015). "Language learning in new era: do mobile phones help?," in *The Practice of Foreign Language Teaching: Theories and Applications*, ed. A. Akbarov, (New Castle: Cambridge Scholars Publishing), 434–445.

Bell, J. S. (2011). Reporting and publishing narrative inquiry in TESOL: Challenges and rewards. *Tesol Quarterly*, *45*(3), 575-584.

Benson, P., Chik, A., & Lim, H. Y. (2003). Becoming autonomous in an Asian context: Autonomy as a sociocultural process. In *Learner autonomy across cultures* (pp. 23-40). Palgrave Macmillan, London.

Benson, P. (2008). perspectives on autonomy. *Learner and teacher autonomy: Concepts, realities, and responses*, *1*, 15.

Benson, P. (2011). Language learning and teaching beyond the classroom: An introduction to the field. In *Beyond the language classroom* (pp. 7-16). Palgrave Macmillan, London.

Benson, P. (2013). *Teaching and researching: Autonomy in language learning*. Routledge.

Bernstein, B. (2000). *Pedagogy, symbolic control, and identity: Theory, research, critique* (Vol. 5). Rowman & Littlefield.

Bian, H. (2016). Mixed methods research. *PowerPoint presentation. Available online:*

*https://core. ecu. edu/ofe/statisticsresearch/mixed% 20methods% 20new. pdf [Accessed on 13 August 2019]*.

Biesenbach-Lucas, S. (2003). Asynchronous discussion groups in teacher training classes: Perceptions of native and non-native students. *Journal of Asynchronous Learning Networks,* 7(3). Retrieved March 08, 2004, from http://www.sloan-c.org/publications/jaln/v7n3/index.asp

Boudreau, C., MacIntyre, P., & Dewaele, J. M. (2018). Enjoyment and anxiety in second language communication: An idiodynamic approach. *Studies in Second Language Learning and Teaching*, *8*(1), 149-170.

Bozionelos, N. (2004). Socio-economic background and computer use: The role of computer anxiety and computer experience in their relationship. *International Journal of Human-Computer Studies*, *61*(5), 725-746.

Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in adult learning: Perspectives on theory, research, and practice.* New York: Routledge.

Bronfenbrenner, U. (1986). Recent advances in research on the ecology of human development. *Development as action in context*, 287-309.

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods and Research,* 21, 230–258.

Bruner, J. (2020). *The culture of education*. Harvard University Press.

Buchstaller, I., & Khattab, G. (2013). Population samples. *Research methods in linguistics*, 74-95

Butler, Y. G. (2014). Parental factors and early English education as a foreign language: A case study in Mainland China. *Research papers in education*, *29*(4), 410-437.

Burston, J. (2014). MALL: The pedagogical challenges. *Computer Assisted Language Learning*, *27*(4), 344-357.

Burton-Jones, A., & Hubona, G. S. (2006). The mediation of external variables in the technology acceptance model. In *Information and Management* (Vol. 43, Issue 6, pp. 706–717). https://doi.org/10.1016/j.im.2006.03.007

Candy, P. C. (1991). *Self-Direction for Lifelong Learning. A Comprehensive Guide to Theory and Practice*. Jossey-Bass, 350 Sansome Street, San Francisco, CA 94104-1310.

Carhill, A., Suárez-Orozco, C., & Páez, M. (2008). Explaining English language proficiency among adolescent immigrant students. *American Educational Research Journal*, *45*(4), 1155-1179.

Carr, D., Crook, C., Noss, R., Carmichael, P., & Selwyn, N. (2008). *Education 2.0? Designing the web for teaching and learning: A commentary by the technology enhanced learning phase of the teaching and learning research programme.*

Cavanaugh, C., Sessums, C., & Drexler, W. (2015). A call to action for research in digital learning: Learning without limits of time, place, path, pace… or evidence. *Journal of Online Learning Research*, *1*(1), 9-15.

Çelik, S., Arkın, E., & Sabriler, D. (2012). EFL learners' use of ICT for self-regulated learning. *Journal of Language and Linguistic Studies*, *8*(2).

Chang, C., and Chang, C.-K. (2014). Developing students' listening metacognitive strategies using online videotext self-dictation-generation learning activity. *EuroCall Rev.* 22, 3–19. doi: 10.4995/eurocall.2014.3636

Chang, C. H., & Liu, H. J. (2013). Language Learning Strategy Use and Language Learning Motivation of Taiwanese EFL University Students. *Electronic Journal of Foreign Language Teaching*, *10*(2).

Chen, J. F., Warden, C. A., & CHANG, H. T. (2005). Motivators that do not motivate: The case of Chinese EFL learners and the influence of culture on motivation. *TESOL quarterly*, *39*(4), 609-633.

China Internet Network Information Center (CNNIC). (2020). Statistical Report on Internet Development in China. https://www.cnnic.com.cn/IDR/ReportDownloads/202012/P020201201530023411644.pdf

Chizmar, J. F., & Walbert, M. S. (1999). Web-based learning environments guided by principles of good teaching practice. *Journal of Economic Education,* 30(3), 248- 264.

Chun, D., Kern, R., & Smith, B. (2016). Technology in language use, language teaching, and language learning. *The Modern Language Journal*, *100*(S1), 64-80.

Clandinin, D. J. (2006). Narrative inquiry: A methodology for studying lived experience. *Research studies in music education*, *27*(1), 44-54.

Clandinin, D.J., & Connelly, F.M. (2000). *Narrative inquiry: Experience and story in qualitative research*. San Francisco: Jossey-Bass.

Clément, R. (1980). Ethnicity, contact and communicative competence in a second language. In *Language* (pp. 147-154). Pergamon.

Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience.* New York, NY: Harper and Row.

Csizér, K., & Dörnyei, Z. (2005). The internal structure of language learning motivation and its relationship with language choice and learning effort. *The modern language journal*, *89*(1), 19-36.

Costello, A.B., & Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation*, 10(7), 1-9.

Cox, M. J. (2013). Formal to informal learning with IT: research challenges and issues for e-learning. *Journal of computer assisted learning*, *29*(1), 85-105.

Creswell, J. W. (2015). *A concise introduction to mixed methods research*. Thousand Oaks, CA: Sage.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Thousand Oaks, CA: Sage.

Crook, C. (1994) *Computers and the collaborative experience of learning*. London: Routledge

Dam, L., Eriksson, R., Little, D., Miliander, J., & Trebbi, T. (1990). Autonomy–Steps towards a definition. In *Third Nordic workshop on developing autonomous learning in the FL Classroom* (p. 96e103). University of Bergen Bergen, Norway.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

David, A. K. (1998). Multiple factor models. Retrieved May, 2017 from http://davidakenny.net/cm/mfactor.htm

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2011). *The Sage handbook of qualitative research*. sage.

Dewaele, J. M., and MacIntyre, P. D. (2016). "Foreign language enjoyment and foreign language classroom anxiety: the right and left feet of FL learning?," in *Positive Psychology in SLA*, eds P. D. MacIntyre, T. Gregersen, and S. Mercer, (Bristol: Multilingual Matters), 215–236. doi: 10.21832/9781783095360-010

Dewey, J. (1966). *Lectures in the Philosophy of Education:* 1899.

Dickinson, L. (1987). *Self-instruction in language learning*. Cambridge: Cambridge University Press

Downes, S. (2010). New technology supporting informal learning. *Journal of emerging technologies in web intelligence*, *2*(1), 27-33.

Doyle, H., & Parrish, M. (2011). Investigating students' ways to learn English outside of class: A researchers' narrative. *Reading*.

Dunn, J. C. (2000). Model complexity: The fit to random data reconsidered. *Psychological Research*, 63, 174–182.

Ekşi, G., & Aydın, H. (2013). What are the students doing 'out'there? An investigation of out-of-class language learning activities. *Abant İzzet Baysal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*.

Elvers, G. C., Polzella, D. J., & Graetz, K. (2003). Procrastination in online courses: Performance and attitudinal differences. *Teaching of Psychology*, 30(2), 159-162.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, *5*(1), 1-4.

Farr, F., & Murray, L. (Eds.). (2016). *The Routledge handbook of language learning and technology*. Routledge.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39-50.

Fredrickson, B. L. (2003). The value of positive emotions. *American Scientist*, 91(4), 330-335.

Fredrickson, B. L. (2004). Gratitude, like other positive emotions, broadens and builds. *The psychology of gratitude*, *145*, 166.

Fishbein, M., & Ajzen, I. (1977). Belief, attitude, intention, and behavior: An

introduction to theory and research. *Philosophy and Rhetoric*, *10*(2).

Flick, U. (2018). *Doing triangulation and mixed methods* (Vol. 8). Sage.

Gao, H. (2020). Research on the Development Status and Trend of K12 Online Education in China. In *2020 International Conference on Modern Education and Information Management (ICMEIM)* (pp. 759-762). IEEE.

Gan, Z. (2009). 'Asian learners' re-examined: an empirical study of language learning attitudes, strategies and motivation among mainland Chinese and Hong Kong students. *Journal of Multilingual and Multicultural Development*, *30*(1), 41-58.

Gan, Z., Humphreys, G., & Hamp-Lyons, L. (2004). Understanding successful and unsuccessful EFL students in Chinese universities. *The modern language journal*, *88*(2), 229-244.

García Botero, G., Questier, F., & Zhu, C. (2019). Self-directed language learning in a mobile-assisted, out-of-class context: Do students walk the talk?. *Computer Assisted Language Learning*, *32*(1-2), 71-97.

Gardner, R. C. (1985). *Social psychology and second lan- guage learning: The role of attitudes and motivation.* London: Edward Arnold.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. Adult Education Quarterly, 48(1), 18-33.

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *Internet and Higher Education*, 2(2-3), 87-105.

Gee, J. (2005). *Why video games are good for your soul.* Sydney, Australia: Common Ground

Golonka, E. M., Bowles, A. R., Frank, V. M., Richardson, D. L., & Freynik, S. (2014).

Technologies for foreign language learning: A review of technology types and their effectiveness. *Computer assisted language learning*, *27*(1), 70-105.

Gosling, S. D., Rentfrow, P. J., & Swann Jr., W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality,* 37(6), 504–528. http://doi.org/10.1016/S0092-6566(03)00046-1

Gorard, S. (2015). Research design, as independent of methods. *Sage handbook of mixed methods in social and behavioral research*, 237-252.

Grow, G. (1991). Teaching learners to be self-directed: A stage approach. *Adult Education Quarterly,* 41(3), 125-149.

Hager, P. (2012). Informal learning: a vital component of lifelong learning. In *Second international handbook of lifelong learning* (pp. 773-785). Springer, Dordrecht.

Haidari, S. M., Yelken, T. Y., & Cenk, A. K. A. Y. (2019). Technology-enhanced self-directed language learning behaviors of EFL student teachers. *Contemporary Educational Technology*, *10*(3), 229-245.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis: (5th ed.)* Upper Saddle River, NJ: Prentice Hill.

Hair, J. F. (2006). *Multivariate data analysis.* Upper Saddle River: Prentice Hall

Hannafin, M. J., Hill, J. R., Oliver, K., Glazer, E., & Sharma, P. (2003). Cognitive and learning factors in Web-based distance learning environments. In M. G. Moore, & W. G. Anderson (Eds.), *Handbook of distance education* (pp. 245–260). Mahwah, NJ: Lawrence Erlbaum.

Hara, N., & Kling, R. (1999). Students' frustrations with a web-based distance education course. *First Monday,* 4(12). Retrieved January 12, 2003, from http://www.firstmonday.org/issues/issue4_12/index.html

Heerwegh, D., & Loosveldt, G. (2008). Face-to-face versus web surveying in a high-internet-coverage population: Differences in response quality. *Public opinion quarterly*, *72*(5), 836-846.

Herring, S. C. (Ed.). (1996). Computer-mediated communication: Linguistic, social and cross-cultural perspectives. Philadelphia/Amsterdam: John Benjamins.

Hill, J. R. (2002). Overcoming obstacles and creating connections: Community building in web-based learning environments. *Journal of Computing in Higher Education*, 14(1), 67-86

Hill, J. R., & Hannafin, M. J. (2001). Teaching and learning in digital environments: The resurgence of resource-based learning. *Educational Technology Research and Development*, 49(3), 37-52.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55.

Huang, R., Tlili, A., Chang, T. W., Zhang, X., Nascimbeni, F., & Burgos, D. (2020). Disrupted classes, undisrupted learning during COVID-19 outbreak in China: application of open educational practices and resources. *Smart Learning Environments*, *7*(1), 1-15.

Jupp, V. (2006). *The Sage dictionary of social research methods*. Sage.

Kearney, M., Schuck, S., Burden, K., & Aubusson, P. (2012). Viewing mobile learning from a pedagogical perspective. *Research in learning technology*, *20*(1), n1.

Kelloway, E. K. (1995). Structural equation modelling in perspective. *Journal of Organizational Behavior*, *16*(3), 215-224.

Kern, R. (1998). Technology, social interaction, and FL literacy. In J. Muyskens (Ed.), *New ways of teaching and learning: Focus on technology and foreign language*

*education* (pp. 57–92). Boston: Heinle & Heinle.

Kline, R. B. (2005). *Principles and practice of structural equation modeling.* New York: Guilford Press.

King, K. P. (2002). Identifying success in online teacher education and professional development. *Internet and Higher Education,* 5(3), 231-246.

Kritikou, Y., Paradia, M., & Demestichas, P. (2014). Cognitive web-based vocabulary learning system: The results of a pilot test of learning Greek as a second or foreign language. *Procedia-Social and Behavioral Sciences*, *141*, 1339-1345.

Kuppens, A. H. (2010). Incidental foreign language acquisition from media exposure. *Learning, Media and Technology*, *35*(1), 65-85.

Kwon, H. S., & Chidambaram, L. (2000). A test of the technology acceptance model: The case of cellular telephone adoption. In *Proceedings of the 33rd Annual Hawaii International Conference on System Sciences* (pp. 7-pp). IEEE.

LaBella, T. J. (1982). Formal, non-formal and informal education: A holistic perspective on lifelong learning. *International Review of Education*, 28(2), 159-175

Lake, J. (2013). "Positive L2 self: linking positive psychology with L2 motivation," in *Language Learning Motivation in Japan (Second Language Acquisition)*, eds M. T. Apple, D. Da Silva, and T. Fellner, (Bristol: Multilingual Matters).

Lai, C. (2013). A framework for developing self-directed technology use for language learning. *Language Learning & Technology*, *17*(2), 100-122.

Lai, C., & Gu, M. (2011). Self-regulated out-of-class language learning with technology. *Computer assisted language learning*, *24*(4), 317-335.

Lai, C. (2015a). Perceiving and traversing in-class and out-of-class learning: accounts from foreign language learners in Hong Kong. *Innovation in Language Learning and*

*Teaching*, *9*(3), 265-284.

Lai, C. (2015b). Modeling teachers' influence on learners' self-directed use of technology for language learning outside the classroom. *Computers & Education*, *82*, 74-83.

Lai, C., Zhu, W., & Gong, G. (2015). Understanding the quality of out-of-class English learning. *TESOL quarterly*, *49*(2), 278-308.

Lai, C. (2017). *Autonomous Language Learning with Technology: Beyond The Classroom*. Bloomsbury Publishing.

Lai,C. , Hu,X. & Lyu, B. (2017): Understanding the nature of learners' out-of-class language learning experience with technology, *Computer Assisted Language Learning*, 31(1-2), 114-143.

Lamy, M. N., & Hampel, R. (2007). *Online communication in language learning and teaching*. Basingstoke: Palgrave Macmillan.

Lan, Y.-J., Sung, Y.-T., & Chang, K.-E. (2007). A Mobile Device Supported Peer-Assisted Learning System for Collaborative Early EFL Reading. *Language Learning & Technology*, 11(3), 130-151.

Larsson, B. (2012). English Out-of-School Activities-A Way of Integrating Outwards?.

Le J.Y. (2019) Research on the development status and future trend of China's online education market, *Curriculum education research*, Vol8, pp.255-256.

Leahy, K. (1994). The overfitting problem in perspective. *AI Expert*, 9, 35–36.

Lee, J. S. (2020). Informal digital learning of English and strategic competence for cross-cultural communication: Perception of varieties of English as a mediator. *ReCALL*, 32(1), 47–62.

Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005). Acceptance of internet-based learning medium: The role of extrinsic and intrinsic motivation. *Information and Management*, 42, 1095–1104.

Lee, N., & Hooley, G. (2005). The evolution of "classical mythology" within marketing measure development. *European Journal of Marketing*.

Lee, C., Yeung, A. S., & Ip, T. (2016). Use of computer technology for English language learning: do learning styles, gender, and age matter?. *Computer assisted language learning*, *29*(5), 1035-1051.

Levy, M. (1997). *Computer-assisted language learning: Context and conceptualization*. Oxford University Press.

Levy, M., & Hubbard, P. (2005). Why call call "CALL"?. *Computer Assisted Language Learning,* 18(3), 143-149

Lewis, T. (2013). Between the social and the selfish: Learner autonomy in online environments. *Innovation in Language Learning and Teaching*, *7*(3), 198-212.

Li, C., Jiang, G., and Dewaele, J.-M. (2018). Understanding Chinese high school students' foreign language enjoyment: validation of the Chinese version of the Foreign Language Enjoyment scale. *System* 76, 183–196. doi: 10.1016/j.system.2018.06.004

Liker, J. K., & Sindi, A. A. (1997). User acceptance of expert systems: a test of the theory of reasoned action. *Journal of Engineering and Technology management*, *14*(2), 147-173.

Liton, H. A. (2012). Developing EFL teaching and learning practices in Saudi colleges: A review. *Online Submission*, *5*(2), 129-152.

Little, T. D. (2013). *Longitudinal structural equation modeling*. Guilford press.

Littlewood, W. (1996). “Autonomy”: An anatomy and a framework. *System*, *24*(4), 427-435.

Lin, C. H., Zhang, Y., & Zheng, B. (2017). The roles of learning strategies and motivation in online language learning: A structural equation modeling analysis. *Computers & Education*, *113*, 75-85.

Ling, Q., Qin, R., & Guo, J. (2016). An empirical study on northwest minority preppies' self-efficacy in English learning on WeChat platform. *Technology Enhanced Foreign Language Education*, *46*(11), 789-792.

Liu, C. 2010. Internet censorship as a trade barrier: A look at the WTO consistency of the Great Firewall in the wake of the China–Google dispute. *Georgetown Journal of International Law* 42: 1199–237

Liu, N., Lin, C. K., & Wiley, T. G. (2016). Learner views on English and English language teaching in China. *International Multilingual Research Journal*, *10*(2), 137-157.

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2010). *Methods in educational research: From theory to practice* (Vol. 28). John Wiley & Sons.

MacCallum, R. C. (2003). Working with imperfect models. Multivariate Behavioral Research, 38, 113–139.

MacIntyre, P., & Gregersen, T. (2012). Emotions that facilitate language learning: The positive-broadening power of the imagination.

Magid, M. (2009). The L2 motivational self system from a Chinese perspective: A mixed methods study. *Journal of Applied Linguistics*, *6*(1).

Malcolm, J., Hodkinson, P., & Colley, H. (2003). The interrelationships between

informal and formal learning. *Journal of workplace learning*.

Marek, M. W., & Wu, W. C. V. (2014). Environmental factors affecting computer assisted language learning success: a Complex Dynamic Systems conceptual model. *Computer Assisted Language Learning*, *27*(6), 560-578.

McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological methods*, *7*(1), 64.

McIntosh, M. J., & Morse, J. M. (2015). Situating and constructing diversity in semi-structured interviews. *Global qualitative nursing research*, *2*, 2333393615597674.

Mei, B., Brown, G. T., & Teo, T. (2018). Toward an understanding of preservice English as a Foreign Language teachers' acceptance of computer-assisted language learning 2.0 in the People's Republic of China. *Journal of Educational Computing Research,* 56(1), 74-104.

Melnic, A. S., & Botez, N. (2014). Formal, non-formal and informal interdependence in education. *Economy Transdisciplinarity Cognition*, 17(1), 113-118.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (n.d.). (2007) Learning in Adulthood: A Comprehensive Guide. *Reflective Practice: Formation and Supervision in Ministry,* 31.

Meyer, D. K., & Turner, J. C. (2002). Using instructional discourse analysis to study the scaffolding of student self-regulation. *Educational Psychologist*, 37(1), 17-25.

Mihas, P. Odum Institute.(2019). *Learn to use an exploratory sequential mixed method design for instrument development*.

Mocker, D. W., & Spear, G. E. (1982). *Lifelong learning: Formal, nonformal, informal, and self-directed*. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education.

Moskovsky, C., & Alrabai, F. (2009). Intrinsic Motivation in Saudi Learners of English as a Foreign Language. *The Open Applied Linguistics Journal,* 2(1), 1-10.

Mok, M. M. C., Cheng, Y. C., Leung, S. O., Shan, P. W. J., Moore, P., & Kennedy, K. (2007). Self-directed learning as a key approach to effectiveness of education: A comparison among mainland China, Hong Kong, Macau, and Taiwan. In *International handbook of school effectiveness and improvement* (pp. 839-858). Springer, Dordrecht.

Morse, J. M. (2016). *Mixed method design: Principles and procedures* (Vol. 4). Routledge.

Morse, J. M., & Niehaus, L. (2009). Mixed method design: Principles and procedures. Walnut Creek, CA: Left Coast Press

Mujere, N. (2016). Sampling in research. In *Mixed methods research for improved scientific study* (pp. 107-121). IGI Global

Mynard, J. (2012). Written advising strategies in self-directed learning modules and the effect on learning.

Mynard, J., & Carson, L. (2014). *Advising in language learning: Dialogue, tools and context*. Routledge.

Myung, I. J. (2000). The importance of complexity in model selection. *Journal of Mathematical Psychology*, 44, 190–204.

Namey, E., Guest, G., Thairu, L., & Johnson, L. (2008). Data reduction techniques for large qualitative data sets. In G. Guest & K. M. MacQueen (Eds.), *Handbook for team-based qualitative research* (pp. 137–61). Lanham, MD: AltaMira Press.

Olmedo, M. I. (2015). English language learning beyond the classroom walls. *Unpublished doctoral dissertation). Barcelona: University of Barcelona*.

Olsson, E. (2011). Everything I read on the Internet is in English. *On the impact of extramural English on Swedish 16-year-old pupils' writing proficiency*.

Onwuegbuzie, A. J., Bailey, P., & Daley, C. E. (2000). Cognitive, affective, personality, and demographic predictors of foreign-language achievement. *The Journal of Educational Research*, *94*(1), 3-15.

Organisation for Economic Co-operation and Development (OECD). (2010). *Education at a glance 2010: OECD indicators*. Paris: OECD.

Organisation for Economic Co-operation and Development (OECD). (2015). *Students, Computers and Learning. Making the Connection*. Paris: OECD. Retrieved September 19, 2017 from http://dx.doi.org/10.1787/9789264239555-en

Oxford, R. (1990). *Language learning strategies What every teacher should know*. Heinle & heinle Publishers.;.

Oxford, R. L. (1996). Employing a questionnaire to assess the use of language learning strategies. *Applied language learning*, *7*(1), 28-47.

Oxford, R. L. (2008). Hero with a thousand faces: Learner autonomy, learning strategies and learning tactics in independent language learning. *Language learning strategies in independent settings*, *33*, 41.

Oxford, R. L., & Burry-Stock, J. A. (1995). Assessing the use of language learning strategies worldwide with the ESL/EFL version of the Strategy Inventory for Language Learning (SILL). *System*, *23*(1), 1-23.

Palloff, R. M., & Pratt, K. (1999). *Building learning communities in cyberspace: Effective strategies for the online classroom.* San Francisco, CA: Jossey-Bass.

Passey, D. (2000). Developing teaching strategies for distance (out-of-school) learning in primary and secondary schools. *Educational Media International*, *37*(1),

45-57.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* 3rd ed. Thousand Oaks, CA: Sage

Peng, L., Tan, X., & Xie, F. (2014). Rethinking the Way Out for College English Teaching-After China's Reform in National College Entrance Exam in English. *Journal of Language Teaching and Research*, *5*(6), 1393.

Peng, J. (2020). An Analysis of Online Education Business Model. In *International Conference on Education Studies: Experience and Innovation (ICESEI 2020). Atlantis Press* (pp. 319-324).

Petrides, L. A. (2002). Web-based technologies for distributed (or distance) learning: Creating learning-centered educational experiences in the higher education classroom. *International Journal of Instructional Media*, 29(1), 69-77.

Piniel, K., & Albert, A. (2018). Advanced learners' foreign language-related emotions across the four skills. *Studies in Second Language Learning and Teaching*, *8*(1), 127-147.

Pitt, M. A., & Myung, I. J. (2002). When a good fit can be bad. Trends in Cognitive Sciences, 6, 421–425.

Pitt, M. A., Myung, I. J., & Zhang, S. (2002). Toward a method of selecting among computational models of cognition. *Psychological Review,* 109, 472–491.

Preacher, K. J., Zhang, G., Kim, C., & Mels, G. (2013). Choosing the optimal number of factors in exploratory factor analysis: A model selection perspective. *Multivariate Behavioral Research*, *48*(1), 28-56.

Raubenheimer, J. (2004). An item selection procedure to maximise scale reliability and validity. *SA Journal of Industrial Psychology,* 30(4). Retrieved from http://www.sajip.co.za/index.php/sajip/article/viewArticle/168

Richards, J. C. (2015). The changing face of language learning: Learning beyond the classroom. *Relc Journal*, *46*(1), 5-22.

Rogers, A. (2016). Informal learning and education, an emerging field. In. S. McGrath and Q. Gu (eds), Routledge Handbook of International

Rosell-Aguilar, F. (2013). Podcasting for language learning through iTunes U: The learner's view. *Language Learning & Technology*, *17*(3), 74-93.

Saad, N. S. M., Yunus, M. M., & Embi, M. A. (2013). Research on international students in traditional host countries and Malaysia: Some potential areas in Malaysia. *Procedia-Social and Behavioral Sciences*, *90*, 488-496.

Saade, R., Nebebe, F., & Tan, W. (2007). Viability of the" technology acceptance model" in multimedia learning environments: a comparative study. *Interdisciplinary Journal of E-Learning and Learning Objects*, *3*(1), 175-184.

Saldaña, J. (2014). *The coding manual for qualitative researchers*. sage.

Salloum, S. A., Alhamad, A. Q. M., Al-Emran, M., Monem, A. A., & Shaalan, K. (2019). Exploring students' acceptance of e-learning through the development of a comprehensive technology acceptance model. *IEEE Access*, *7*, 128445-128462.

Saris, W. E., & Aalberts, C. (2003). Different explanations for correlated disturbance terms in MTMM studies. *Structural Equation Modeling*, *10*(2), 193-213.

Savignon, S. J. (2018). Communicative competence. *The TESOL encyclopedia of English language teaching*, 1-7.

Scarcella, R. C., & Oxford, R. L. (1992). The tapestry of language learning: The individual in the communicative classroom.

Schmidt, R., & Watanabe, Y. (2001). Motivation, strategy use, and pedagogical preferences in foreign language learning. *Motivation and second language*

*acquisition*, *23*(1), 313-359.

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *69*(2), 107-131.

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*. psychology press.

Saldaña, J. (2014). Coding and analysis strategies. In *The Oxford handbook of qualitative research*.

Selwyn, N. (2007, October). Web 2.0 applications as alternative environments for informal learning-a critical review. In *Paper for CERI-KERIS international expert meeting on ICT and educational performance* (Vol. 16, p. 17).

Shapley, P. (2000). On-line education to develop complex reasoning skills in organic chemistry. *Journal of Asynchronous Learning Networks*, 4(2). Retrieved December 8, 2017, from http://www.sloan-c.org/publications/jaln/v4n2/index.asp

Simons, P. R. J. (2000). Towards a constructivistic theory of self-directed learning. *Self-learning*, 1-12.

Shaheen, F., Ahmad, N., Waqas, M., Waheed, A., & Farooq, O. (2017). Structural equation modeling (SEM) in social sciences & medical research: a guide for improved analysis. *International Journal of Academic Research in Business and Social Sciences*, *7*(5), 132-143.

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., & Akinkuolie, B. (2021). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from public release of 2012 to early 2020. *Computer Assisted Language Learning,* 1-38.

Smith, B., Alvarez-Torres, M. J., & Zhao, Y. (2003). Features of CMC technologies

and their impact on language learners' online interaction. *Computers in Human Behavior*, *19*(6), 703-729.

Steel, C. H., & Levy, M. (2013). Language students and their technologies: Charting the evolution 2006–2011. *ReCALL*, *25*(3), 306-320.

Sockett, G., & Toffoli, D. (2012). Beyond learner autonomy: A dynamic systems view of the informal learning of English in virtual online communities. *ReCALL*, *24*(2), 138-151.

Song, L., Singleton, E. S., Hill, J. R., & Koh, M. H. (2004). Improving online learning: Student perceptions of useful and challenging characteristics. *Internet & Higher Education*, 7(1), 59-70

Song, D., & Bonk, C. J. (2016). Motivational factors in self-directed informal learning from online learning resources. *Cogent Education*, *3*(1), 1205838.

Suhail, K., & Bargees, Z. (2006). Effects of excessive Internet use on undergraduate students in Pakistan. *CyberPsychology & Behavior*, *9*(3), 297-307.

Sun, Y. C., & Yang, F. Y. (2015). I help, therefore, I learn: service learning on Web 2.0 in an EFL speaking class. *Computer Assisted Language Learning*, *28*(3), 202-219.

Sundqvist, P. (2009). *Extramural English matters: Out-of-school English and its impact on Swedish ninth graders' oral proficiency and vocabulary* (Doctoral dissertation, Karlstad University).

Sundqvist, P. (2011). A possible path to progress: Out-of-school English language learners in Sweden. In *Beyond the language classroom* (pp. 106-118). Palgrave Macmillan, London.

Sundqvist, P., & Sylvén, L. K. (2014). Language-related computer use: Focus on young L2 English learners in Sweden. *ReCALL*, *26*(1), 3-20.

Sung, Y. T., Chang, K. E., & Yang, J. M. (2015). How effective are mobile devices for language learning? A meta-analysis. *Educational research review*, *16*, 68-84.

Sumuer, E. (2018). Factors related to college students' self-directed learning with technology. *Australasian Journal of Educational Technology*, *34*(4).

Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative research journal*.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Allyn & Bacon

Thomas, M., Reinders, H., & Warschauer, M. (Eds.). (2012). *Contemporary computer-assisted language learning*. A&C Black.

Thornton, K. (2013). Supporting self-directed learning: A framework for teachers. *Research and practice in English language teaching in Asia*, 59-77.

Tian, X. (2015). A survey on the construction of micro blog platform of college English teaching. *Foreign Language Education*, 36(4), 69–72.

Tobin, T. J. (2004). Best practices for online information-literacy courses. *Journal of Interactive Online Learning*, 2(4). Retrieved 2016 from http://www.ncolr.org/jiol/issues/PDF/2.4.3.pdf

Toffoli, D., & Sockett, G. (2010). How non-specialist students of English practice informal learning using web 2.0 tools. *ASp. la revue du GERAS*, (58), 125-144.

Trinder, K., Guiller, J., Margaryan, A., Littlejohn, A., & Nicol, D. (2008). Learning from digital natives: bridging formal and informal learning. *Higher Education*, *1*, 1-57.

Trinder, R. (2016). Blending technology and face-to-face: Advanced students' choices.

*ReCALL*, 28, 83–102

Ullmer, E. J. (1994) Media and learning: are there two kinds of truth? *Educational Technology Research and Development*, (42) , 21–32

UNESCO (2020). Learning never stops. The Global Education Coalition https://en.unesco.org

Van Noy, M., James, H., & Bedley, C. (2016). Reconceptualizing learning: A review of the literature on informal learning.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Vonderwell, S. (2003). An examination of asynchronous communication experiences and perspectives of students in an online course: A case study. *Internet and Higher Education*, 6(1), 77-90

Vonderwell, S., & Turner, S. (2005). Active learning and preservice teachers' experience in an online course: A case study. *Journal of Technology and Teacher Education,* 13(1), 65-84.

Wang, W., & Zhan, J. (2020). The relationship between English language learner characteristics and online self-regulation: A structural equation modeling approach. *Sustainability*, *12*(7), 3009.

Warschauer, M. (2000) The death of cyberspace and the rebirth of CALL. Keynote address given to the IATEFL/ESADE CALL in the 21st Century. (Available at http://www.gse.uci.edu/markw/ cyberspace.html).

Warschauer, M., & Kern, R. (2000). Network-based language teaching: Concepts and practice. Cambridge university press.

Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of

acceptance and use of technology (UTAUT): a literature review. *Journal of enterprise information management*.

Wong, L. L., & Nunan, D. (2011). The learning styles and strategies of effective language learners. *System*, *39*(2), 144-163.

Worrall, J. (2003). Normal science and dogmatism, paradigms and progress: Kuhn 'versus' Popper and Lakatos. In T. Nickles (Ed.), *Thomas Kuhn* (pp. 65-100). New York, NY: Cambridge

Wu, M. M. F. (2012). Beliefs and Out-of-class language learning of Chinese-speaking ESL learners in Hong Kong. *New Horizons in Education*, *60*(1), 35-52.

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in quantitative methods for psychology*, *9*(2), 79-94

You, C. J., & Dörnyei, Z. (2016). Language learning motivation in China: Results of a large-scale stratified survey. *Applied Linguistics*, *37*(4), 495-519.

Zhang, Y. (2016). Making students happy with wellbeing-oriented education: Case study of a secondary school in China. *The Asia-Pacific Education Researcher*, *25*(3), 463-471.

Zhang, D., & Pérez-Paredes, P. (2021). Chinese postgraduate EFL learners' self-directed use of mobile English learning resources. *Computer Assisted Language Learning*, *34*(8), 1128-1153.

Zulkiply, N. (2009). Metacognition and its relationship with students' academic performance. *The International Journal of Learning*, *15*(11), 97-106.

**Appendix 1. Guidance for narrative reviews**

*a. Frequently-used technological learning resources*

TV shows, movies and songs in target language

Games in target language

*b. Language learning strategies (Oxford, 1990)*

(1) Think of relationships between known and new, (2) use new words in a sentence, (3) connect sounds and images, (4) use mental images, (5) use rhyme, (6) use flashcards, (7) physically act out words, (8) review often, (9) remember by location, (10) say or write words several times, (11) try to talk like native speakers, (12) practice sounds, (13) use words in different ways, (14) start conversations, (15) watch TV/movies, (16) read for pleasure, (17) write notes, messages, letters, or reports, (18) skim then read, (19) look for similar words across languages, (20) find patterns, (21) divide words for meaning, (22) avoid verbatim translation, (23) make summaries, (24) guess the unknown, (25) using gestures, (26) make up new words, (27) read without looking up words, (28) guess what the speaker will say, (29) use circumlocution or synonym, (30) find as many ways as possible to use English, (31) notice mistakes, (32) pay attention to the speaker, (33) find out how to learn better, (34) plan schedule, (35) look for conversation partners, (36) look for opportunities to read, (37) have clear goals, (38) think about progress, (39) relax when fearful, (40) encourage self to speak when afraid, (41) give self a reward, (42) notice tension, (43) write a learning diary, (44) talk about feelings, (45) ask for slowness or repetition, (46) ask for correction, (47) practice with others, (48) ask questions, (50)learn about culture

**Appendix 2. Survey items**

| | | |
|---|---|---|
| Grade | | |
| Gender | | |
| How long do you need to finish English homework every day? | | |
| How long do you spend to self-directed English learning every day? | | |
| How long do you learn English with technology every week? | | |
| How many years have you learnt English? | | |
| What is the test score at the end of last semester before lockdown | | |
| What is the test score at the beginning of this semester after lockdown | | |
| Do you have confidence in English learning? | | |
| Do you enjoy English learning? | | |
| Instruction-oriented technological language learning | ins1 | to learn new vocabularies and grammar |
| | ins2 | to do extra drills and practice on what the teacher has taught in class |
| | ins3 | to do individual learning |
| | ins4 | to test vocabulary and other English skills in order to arrange learning for specific skills. |
| | ins5 | To identify my English level and find appropriate learning materials. |
| | ins6 | To set up learning goal and make a plan. |
| Entertainment-oriented technological language learning | ent1 | To pursue my personal interest. |
| | ent2 | To learn English for the purpose of everyday use. |
| information-oriented technological language learning | inf1 | To find authentic material. |
| | inf2 | To enhance self-expression skills. |
| | inf3 | To seek information. |
| Social-oriented technological language learning | soc1 | To talk with native speakers. |
| | soc2 | To talk with other English learners or other people in English. |
| Teacher | ts1 | Teacher encourages us to use technology |
| | ts2 | Teacher shares us with online learning materials. |
| | ts3 | Teacher uses online materials in the class. |
| | ts4 | During the quarantine due to Covid-19, the teacher encouraged more to study with online materials. |
| peer | pee1 | I have friends/classmates to whom I can go to seek advice on how to use technologies effectively for learning |
| | pee2 | I have friends/classmates to who likes to share online learning materials that they think helpful with me. |
| | pee3 | I have friends/classmates to whom I can go to seek technical help when I experiment with technologies for learning |
| Parents | par1 | My parents encourage me to learning with technology. |
| | par2 | My parents select and share learning material that they |

| | | |
|---|---|---|
| | | think helpful with me. |
| | par3 | During the quarantine due to Covid-19, my parents encouraged more to study with online materials |
| Perceived usefulness | pu1 | I find technologies useful in English learning |
| | pu2 | Using technologies enhances my success in English learning. |
| | pu3 | Using technologies enhances my effectiveness in English learning. |
| Perceived ease of use | peu1 | I find it easy to select and find appropriate technological tools needed to enhance language learning |
| | peu2 | It would be easy for me to become skillful at using technology to enhance language learning |
| | peu3 | I find it easy to get technologies to do what I want them to do for language learning |