

Barriers to Technology Integration into Teaching Chinese as a Foreign Language: A Case Study of Australian Secondary Schools

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Received: July 30, 2021

Accepted: September 21, 2021

Online Published: October 12, 2021

doi:10.5430/wje.v11n5p17

URL: <https://doi.org/10.5430/wje.v11n5p17>

Abstract

This case study examines the barriers to technology integration into teaching Chinese as a foreign language (CFL) in Australian secondary schools. Previous research on technology integration predominantly focused on higher education and English as a second language. This study extends the field by exploring barriers in secondary schools and targeting Chinese instruction. It identified three layers of barriers: The tool (technology), The user (teacher and student), and The tool supporter (school). This study highlights the students as technology users and as significant factors behind the teacher's technology consideration. Among the identified barriers, most notably were limited and blocked access to technology, a lack of time for class preparation and technology learning, a lack of technology knowledge, a lack of professional development, and students' distracting behaviours. Suggestions were made accordingly to improve tech-integrated Chinese teaching in Australian secondary schools.

Keywords: technology integration, Chinese as a foreign language (CFL), secondary school, perception

1. Introduction

1.1 Introduce the Problem

In the digital era, technologies are widely adopted as instructional tools in education (Bax, 2011). Those widely used e-tools can effectively enhance instructional outcomes, such as improving student motivation and providing new learning environments (Acree & Fox, 2015). However, despite their normalisation and perceived benefits, not all teachers are keen on integrating technology to improve educational outcomes (Al Meajel & Sharadgah, 2018).

Besides, Chinese is one of the four Asian languages that the Australian Government promotes (Department of the Prime Minister and Cabinet, 2012). It is embedded in the Australian Curriculum, enabling all schoolers to learn Chinese as a foreign language (CFL). The Government supports the technology use in CFL teaching and learning in schools. Nonetheless, the CFL teachers seem not to teach Chinese with technology actively in the tech-rich environment (Navarre, 2019; Orton, 2016a, 2016b, 2017). Therefore, it is essential to investigate the barriers to technology adoption in CFL teaching.

1.2 Importance of the Problem

Barriers to technology integration are universally researched. For example, failure to perceive the usefulness of technologies (Lee & Lehto, 2013; Teo, 2011), a lack of training and support (Derfler, 2002; Makki et al., 2018), and a lack of teacher knowledge (Alelaimat et al., 2021; Mumtaz, 2000; Ward & Parr, 2010) account for teachers' reluctance to technology-driven teaching. Those confirmed barriers behind technology adoption include three major groups: technology itself (e.g., perceived usefulness, perceived ease of use), external factors (e.g., class preparation time, access to technology), and internal factors (e.g., knowledge and skills, attitudes and beliefs) (Ertmer, 1999; Hew & Brush, 2007; Reyneke, 2020). A majority of the mentioned studies employed quantitative methods, and they did not investigate a specific subject area in language acquisition.

Therefore, it is unclear whether the above-confirmed barriers are valid if researched qualitatively. Also, it is unclear whether they exist in Chinese teaching in Australian secondary schools. Hence, this study uses a case study with a different research method – a qualitative one – to investigate what hinders technology integration into CFL

instruction in secondary schools and how to promote tech-integrated Chinese teaching.

2. Literature Review

2.1 Barrier Categories

Research confirms that teachers still experience problems integrating technologies into their teaching (Gil-Flores et al., 2017); their integration remains at low levels (Agyei & Voogt, 2011; Hu & McGrath, 2012; Rodney, 2002). In addition, the barriers to technology adoption have been extensively investigated in general contexts (Chai et al., 2013; Hew & Brush, 2007; Koh et al., 2013; Makki et al., 2018; Presby, 2017; Spector, 2015).

Researchers have grouped those barriers in the field of education. Ertmer (1999) developed the first- and second-order barrier theory of technology integration. According to Ertmer (1999), the first-order barriers relate to “a lack of resources in equipment, time, training, support and funding”, whose consequence can be “frustration and reluctance” to technology use in teaching activities (p. 50). The first-order barriers are also external. On the other hand, second-order barriers relate to pedagogical preference and willingness to change, which might root in “teacher’s underlying beliefs about teacher-student roles and their traditional classroom practices” (p. 51). In addition to Ertmer, other researchers categorised the factors on two levels: teacher level and school level (Bingimlas, 2009; British Educational Communications and Technology Agency (Becta), 2004a; Perrotta, 2013; Wikan & Molster, 2011). Teacher-level barriers include a lack of confidence, teacher competence, willingness to change, and positive attitudes towards technologies. In contrast, school-level barriers refer to insufficient class preparation time, practical training, technical support and accessibility (Bingimlas, 2009). If looked carefully, the categories are analogous to Ertmer’s (1999) theory of first- and second-order barriers, both shedding light on technology-intensive modern education.

Ertmer (1999) categorised the barriers to technology integration as external and internal barriers supported by recent studies (Hew & Brush, 2007; Thomson, 2015). In addition, other researchers have found that the characteristics of the technologies also relate to barriers to technology integration. For example, an e-learning system’s “perceived satisfaction, perceived usefulness, and interactive learning environment” are observed to predict its actual use (Liaw & Huang, 2013). Therefore, previous literature on barriers to technology integration can be divided into three categories: technology-level barriers, external barriers, and internal barriers.

2.2 Technology-Layer Barriers

Technology itself affects its adoption among users. Perceived usability and perceived quality of an e-tool can prevent a digital tool from reaching its full potential. The quality factors, including “quality of the system, quality of content and quality of service”, are affirmed to affect the intended use of mobile technologies as learning resources among Jordan university students (Almaiah & Al Mulhem, 2019, p. 1443). In addition, enjoyment is believed to significantly influence the use of digital tools (Presley & Presley, 2009), concluded by a survey study that investigates the use of academic portals among university students. The above research may contribute to the literature on technology integration, but those studies may have examined the technology-level factors unsystematically due to a lack of theoretical support.

The most related theory to understanding technology-related barriers is the Technology Acceptance Model (TAM) (Aburub & Alnawas, 2019; Presley & Presley, 2009; Teo, 2012). It brings up three critical factors behind people’s actual use of technology: perceived ease-of-use, perceived usefulness, and positive attitudes toward technologies. Recent studies support the three factors as strong predictors of the actual use of technology. For example, Teo (2012) concluded that computer use attitudes had the most substantial effect on the intended use of Information Communications Technology (ICT) from the survey research with over 150 teachers as participants. Chen, Scott, Huang, and Wu (2017) had similar findings that the attitudes towards LINE, a social networking app, significantly influenced the integration of such a technology in language learning. Moreover, the attitude overlapped with the second-order barriers classified by Ertmer (1999).

2.3 External Barriers

External factors, such as technical facilities, teacher support, and class preparation time, are investigated in the research on technology integration. To support technology-mediated teaching, any school should address several issues regarding providing technology facilities (e.g., Internet connectivity, digital hardware), teacher training, technical support and funding support.

Time constraint for class preparation profoundly affects teachers’ willingness and effectiveness to teach with

technological means (Bauer & Kenton, 2005; Howard et al., 2015). Bauer and Kenton (2005) discovered that “it can be difficult to find a time to squeeze technology into the curriculum when there is so much skill to teach” (p. 534). Hardisky (2018) concluded that time investment, including time for awareness, time to learn, time to apply, and time to utilise, was a constraint to technology implementation. Therefore, time should be guaranteed for teachers to prepare for tech-blended instruction, a gradual process requiring time investment (Wikan & Molster, 2011). Time not sufficiently offered, teachers, much as they desire to integrate technology in class, are unlikely to blend various e-resources into their actual teaching (Lin et al., 2014). Another constraint leading to teachers’ reluctance to technology-driven education is a lack of training and support for teachers (Fraillon et al., 2013; Roblyer & Doering, 2013). That is because the support for teachers will influence how they feel about the technology, and “in turn affects the incorporation of digital resources as learning tools in classrooms”. Among the studies investigating technology adoption based on teachers’ willingness to teach with digital tools, teachers are found readier to adopt technology into their instruction if they receive adequate training and support (Derfler, 2002; Makki et al., 2018). However, more than one third (37%) of participants reported inadequate technical support to apply digital technology tools in classes in the Australia Council for Education Research report (Thomson, 2015).

Similarly, a lack of instructional encouragement was reported to limit computer-based EFL teaching among Turkish university teachers (Onalan & Kurt, 2020). Furthermore, external barriers frequently bring up with the funding. Common sense has it that the availability of digital tools for instructional purposes naturally interrelates to funding distributed in the procurement of such tools. That is why a lack of funding for digital devices halts marriage between technology and education (Presby, 2017). Nevertheless, funding positively correlates to technology integration. More than 70% of teachers in wealthier school districts say their schools provide the necessary support to incorporate digital tools in classes; by comparison, only 50% in less-funded schools maintain the same belief (Purcell et al., 2013).

2.4 Internal Barriers

Some studies also focus on internal barriers, such as teacher beliefs and teacher knowledge. The application of behavioural teaching practices is the product of our beliefs connected with our understanding (Hermans et al., 2008). Therefore, other teacher attributes, such as self-efficacy and willingness to change, are dependent on teacher beliefs (Mumtaz, 2000; Ward & Parr, 2010). Teacher beliefs influence technology integration, which has recently received much scholarly attention (Dogan et al., 2021; Makki et al., 2018; Presby, 2017). A study, with more than 4000 teacher participants from six Sub-Saharan African countries, reported that its participants experienced general satisfaction with and positive perception of the ICT, implying the significance of positive teacher belief in the promotion of technology use in education (Dogan et al., 2021).

Self-efficacy, one of the teacher attributes, makes a difference to technology infusion in class. It refers to “people’s beliefs in their ability to influence events that affect their lives” (Bandura, 2010, p. 69). British Educational Communications and Technology Agency (Becta) (2004b) reported that an absence of self-efficacy discouraged teachers from adopting digital resources in their classrooms. More studies concur with the Becta report. Ward and Parr (2010) found that low self-efficacy led to poor professional development to support tech-enhanced instruction in New Zealand secondary schools. Similarly, Howard, Chan, and Caputi (2015) confirmed that lacking self-efficacy made teachers unwilling to use laptops. Hence, teachers have little incentive to incorporate technologies into teaching unless they perceive themselves able to produce a desired technology-supported class.

Willingness to change is another teacher attribute behind technology implementation. Some teachers can be reluctant to switch from traditional classes to technology-based ones, despite many strategies that help them gain successful experiences directly (e.g., technical support and training) and indirectly (e.g., realising the importance of technology use) (Bingimlas, 2009). The resistance to technology integration undoubtedly prevents a perfect combination of education and technology integration into language classes.

Teacher knowledge, one of the internal barriers, is closely related to the three groups of barriers above. A teacher may perceive technology differently when his or her knowledge increases. The more technologically knowledgeable teachers are, the more they perceive technology as an integrated part of teaching. Additionally, an increase in teacher knowledge might be able to remove some of the external barriers. For example, an increase in understanding pedagogy and teaching subjects helps enhance instructional outcomes when access to digital resources is limited (Makki et al., 2018; Ward & Parr, 2010). Besides, teacher knowledge is reported to influence school culture. A school culture that provided qualified teacher training encouraged teachers to share their knowledge (Spiteri & Rundgren, 2018).

3. Methodology

3.1 Research Design

This study adopted a case study method, as it is best used to “investigate a contemporary phenomenon (e.g., teaching Chinese as a foreign language) in-depth within its real-world context (e.g., tech-integrated education), especially when the boundaries between phenomenon and context may not be clearly evident” (Yin, 2018, p. 15).

Besides, a qualitative research design and semi-structured interviews were employed. This kind of interview “particularly well suited for studying people’s understanding of the meanings in their lived world, describing their experiences and self-understanding, and clarifying and elaborating their perspectives on their lived world” (Brinkmann & Kvale, 2015, p. 116). All participants were interviewed four times. The interview questions were adapted from validated and published studies. For example, interview questions of technology-level factors are adapted from Liaw and Huang (2013), Teo (2011), and Huang et al. (2012).

The research team proofread all interview questions to inspire flexibility in the conversations and guide interviewees in a focused discussion direction (King et al., 2019). Those questions probed generally (e.g., how do you decide how much technology to use in your teaching) and specifically (e.g., what makes an ideal Chinese-learning e-tool for your instruction), to explore participants’ perceived obstacles of technology integration into their CFL teaching.

3.2 Participants

This study adopted a convenience sampling and recruited participants from Australian secondary schools. An ideal number of participants for a case study is between 5 to 25 (Creswell, 2015). A total of 14 participants who fit the criteria agreed to participate in this study.

The selection criteria of participants were in-service teachers teaching Chinese as a foreign language in Australian secondary schools. They were from different Chinese programs. Those programs differ in the instruction language. Mainstream Chinese uses English, while Immersion Chinese and Accelerated Chinese use Chinese as the instruction language. All participants were given pseudonyms to maintain the confidentiality of personal information. Their demographic information displays in Table 1.

Table 1. Participants’ Demographic Information

Participant	Gender	Age range	Years of Chinese teaching	Chinese teachers in school	School type	Chinese program type
Amy	F	25-30	3 years	4	State	Mainstream Chinese
Beth	F	30-35	7 years	5	State	Accelerated Chinese, Mainstream Chinese
Carl	M	60-65	16 years	3	State	Mainstream Chinese, Immersion Chinese
Daisy	F	45-50	9 years	2	Independent	Mainstream Chinese
Emma	F	30-35	11 years	3	Independent	Mainstream Chinese
Flora	F	30-35	7 years	1	Independent	Mainstream Chinese
Grace	F	20-25	1 year	3	State	Immersion Chinese
Henry	M	30-35	2 years	3	State	Immersion Chinese
Iris	F	25-30	3 years	1	Independent	Mainstream Chinese
James	M	30-35	7 years	3	State	Mainstream Chinese
Kate	F	30-35	2.5 year	1	Independent	Mainstream Chinese
Lena	F	30-35	7 years	4	Independent	Mainstream Chinese
Mason	M	25-30	1 year	5	State	Accelerated Chinese, Mainstream Chinese
Nancy	F	45-50	10 years	5	State	Accelerated Chinese, Mainstream Chinese

3.3 Data Collection and Analysis Procedures

The participants were recruited from Australian secondary schools by emailing invitations. Three participants were recruited before the COVID 19 pandemic, and they participated in face-to-face interviews in their school offices. The remaining eleven interviewees conducted online interviews via Zoom or Wechat. All discussions were voice-taped for later analysis. On average, each interview lasted about 40 minutes, contributing to 2.6 hours of interview time. In total, 56 interviews were conducted for this study, lasting approximately 40 hours. All interviews were transcribed into a 383-page document. An appropriate proportion of the transcripts was reviewed by credited translators and

professional teachers at the university. The researchers read the transcripts wholly and sequentially to get a general understanding of the interview responses.

NVivo, a text analysis tool, was employed to analyse interview responses and to identify common themes. The themes identified by at least half of the interviewees were determined as common themes and corresponding sub-themes. Seven common themes were identified from all interviewee responses in the first coding process. Those themes were further categorised into sub-themes, developed from interview responses, the literature review, and the researcher's theoretical background. For example, all interviewees mentioned teacher attributes as potential determinants to technology use, hence a common theme as "teacher-user barriers"; they brought up specific characteristics that were identified as sub-themes (e.g., "traditional pedagogical belief"). In the second coding process, all common themes and sub-themes were re-examined to uncover details for the report writing. In addition, another coding process was arranged to differentiate and verify the literature-dependent pieces. Upon the completion of data analysis, the findings were presented in the following session.

4. Findings

All impactful barriers identified by more than half of the respondents were categorised into three common themes: the tool, the user, and the tool supporter. They are in line with interview responses rather than Ertmer (1999)'s categorisation.

4.1 Common theme 1: The tool (technology)

All participants voiced technological issues as barriers to technology use in CFL instruction. In addition, they referred to hardware and software problems. Table 2 lists the sub-themes of the first common theme –the tool.

Table 2. Sub-themes of the Common Theme- the Tool (technology)

Common theme	Sub-theme
The tool (technology)	Hardware problems
	○ low battery
	○ hardware breakdown
	○ keyboard dysfunction
	Software problems
	○ limited and blocked access to the software
	○ software errors, crashes, and instability
○ pricing	
○ technology features not fitting class time, second language learners, or the Australian Curriculum	
○ a lack of perceived ease-of-use	

Limited and blocked access to the software. Ten of fourteen interviewees perceived technologies' "limited and blocked access" as a barrier to integrating technology into Chinese teaching. Nine teachers mentioned not having enough options when choosing e-tools designed for Chinese education as a foreign language. As Emma stated, she had not found an "ideal" application for her class, and therefore, she needed to create "listening comprehension and other activities" by herself. However, three teachers disagreed that the available software was "sufficient" for Chinese teaching. Nancy disclosed that the Department provided Chinese e-resources in its "Curriculum to Classroom (C2C)" level.

Apart from limited access to Chinese-learning e-resources, those resources could sometimes be blocked or disabled, an obvious impediment to technology infusion. Some e-learning platforms, like Google Translate and YouTube, could be blocked by the Department of Education or the school. Nancy's school did not approve Kahoot, Quizlet, and Quizz (Chinese-learning platforms) due to privacy concerns, so that Nancy was highly restricted in applying those e-tools in her teaching.

Software errors, crashes, and instability. Nine of fourteen interviewees perceived software errors and crash as a barrier to integrating technology into Chinese teaching. The errors were not rare in Chinese learning software. For example, Google Translate offered "dialectal pronunciations rather than standard Chinese", "inaccurate pinyin, especially the fourth tone", and "funny translated work that confused students". Microsoft Word mistook the fourth

tone of Chinese pinyin that requested teachers to adjust manually. MDPG Dictionary could offer unrelated Chinese definitions after typing in an English word. Those errors would have prevented the wide use of such tools in Chinese instruction.

Apart from errors, software crashes became another hindrance to the use of those tools. Participants had to improvise if e-platforms, such as OneNote, Microsoft Teams, and Quizlet, crashed in class. Iris mentioned that OneNote “frozen” at her attempt to share her screen with students during the COVID 19 period, and the whole class time was wasted due to such a failure.

Another problem was software instability. It might not crash, but it was unstable for participants to log in. Participants reckoned it as “infrequent but unexpected”, so they would prepare for a backup plan to address these unanticipated “crashes, logins, and other software issues”.

Pricing. Ten of fourteen interviewees perceived “an e-tool needing to charge” as a barrier to integrating technology into Chinese teaching. They could be limited to “trial or basic features” because a “full access” requested a subscription. As Grace revealed, she dropped using a Worksheet Generator, a Chinese stroke practice tool, after it started to charge for its use. James had a similar concern for Quizlet that might charge for its “future logins”. Therefore, they preferred free e-tools, or at least “of an acceptable price”.

Technologies not fitting class time, second language learners, or the Australian Curriculum. Nine of fourteen interviewees perceived technologies not perfectly matching their limited class hours, students’ Chinese proficiency, and the Australian Curriculum. For example, online videos usually lasted for more than ten minutes, but those within three minutes were preferred and adopted by most interviewees. In addition to inappropriate playing length, some Chinese learning e-resources were “overwhelming” and “over-informative”, not catering for students’ Chinese proficiency. For example, HSK reading, a Chinese reading platform, could be too challenging even for advanced learners of Year 12, so Daisy decided to simplify its primary-school-level Chinese passages to create reading tasks. Another problem was a disconnection between Chinese learning e-resources and the Australian Curriculum. The currently adopted C2C Curriculum detached from the firsthand Chinese instruction, “without enough ICT resources to backup and facilitate the Curriculum”, as Daisy and Mason concurred.

A lack of perceived ease-of-use. Half of the participants perceived a lack of perceived ease-of-use as a barrier to integrating technology into Chinese. The inconvenience and un-user-friendliness might manifest in the design and setting of specific software. For example, Amy suggested it “inconvenient” to bounce back to the previous page in Education Perfect, a language learning platform. Likewise, James voiced the school platform as “complicated, user-unfriendly, and difficult to operate”, requesting more than a week to familiarise himself with it.

4.2 Common Theme 2: The User (teacher and student)

The user, both teachers and students, was voiced as possible barriers to technology integration. Table 3 lists the sub-themes of the first common theme –the user.

Table 3. Sub-themes of the Common Theme- the User

Common theme	Sub-theme
The user	the teacher user
	○ a lack of time for e-class preparation and technology learning
	○ a lack of technological knowledge
	○ traditional pedagogical beliefs
	the student user
	○ distracting behaviours
○ digital incompetence	
	○ device problems

4.2.1 Sub-theme: The Teacher User

All participants voiced teacher attributes as barriers to their technology use in Chinese instruction. These types of barriers are also referred to as internal ones.

A lack of time. Twelve of fourteen interviewees perceived a lack of time for e-class preparation and technology learning as barriers to integrating technology into Chinese teaching. They had “too many classes to lecture and

limited spare time to prepare for their classes”. They were given “three spares” to prepare for their Chinese classes, “far from enough” to match their teaching workload. In addition to a heavy workload and limited spare time, administrative work accounted for lacking time to prepare for tech-integrated classes. Beth acknowledged that she had a hectic schedule because of email exchanges with colleagues and similar trivial stuff.

A similar hassle on time shortage was a lack of time for technology learning. The interviewees might have access to in-school workshops, seminars, or other training to increase digital competence, but not to the external ones that required them to leave schools. Some teachers might attend external training at weekends at the cost of their recreational activities; some might not show eagerness if their leisure time was taken for work. Consequently, teachers suggested that they should be released for the training during school hours. Such a suggestion was “sometimes unrealistic” because a school might not cover a supply teacher’s payment and the training; a teacher might be unwilling to “skip a class for such training,” Iris commented.

A lack of technological knowledge. Half of the interviewees perceived a lack of technological knowledge as a barrier to integrating technology into Chinese teaching. Insufficient technological knowledge resulted in traditional pedagogies and inactivated technology incorporation, as Nancy summarised. Carl also assumed that some inactive technology adopters were not “lazy” or “resistant” to use e-tools; they were unfamiliar with what was available in the market or how to integrate those resources into their teaching.

In addition to resulting in traditional teaching practice, lacking technological knowledge also failed to perceive technology benefits and use e-tools at an advanced level. A teacher could use e-tools as a gimmick at a basic level, which did not successfully transform a mundane task into an astonishing one. Such regular use of technology did not amaze the teacher and students. That was why teachers required increased technological knowledge to stimulate them to perceive the magic of e-resources and use them effectively. Lacking such knowledge kept teachers away from satisfactory technology integration.

Traditional pedagogical belief. Half of the interviewees perceived traditional pedagogical beliefs as a barrier to integrating technology into Chinese teaching. Traditional pedagogical belief might refer to thoughts that languages were better taught in a way without or with little technological intervention. Some interviewees chose direct instruction to fulfil their teaching goals. As they observed, some language teachers were adopters of textbook-based teaching that focused on blackboards, flashcards, worksheets and other paper-oriented materials.

Such beliefs were related to a teacher’s age, Chinese teaching years, educational background, and technological competence. As participants perceived, teachers with traditional pedagogical beliefs were likely to be teaching-experienced seniors who received non-tech education and appeared to lack technological competence. James assumed that they were “more effective” to assign a paper-based quiz than to type and set it up on a laptop.

However, interviewees did not judge a teacher because of pedagogies. Instead, they believed teachers could present a satisfactory Chinese class when they knew Chinese content and teaching strategies. As Nancy assumed, a teacher could excel in Chinese teaching using PowerPoint slides if he/she maintained active interactions with students and went through every teaching step as planned.

4.2.2 Sub-theme: The Student User

Thirteen of fourteen interviewees voiced specific but less researched student characteristics as barriers to their technology use in Chinese instruction.

Eleven of fourteen interviewees centred on students’ easy distraction when discussing student barriers to technology use in Chinese teaching. It was shared that students might do something irrelevant with the class, such as checking emails, chatting via the Messenger, and playing online games. In addition, teachers experienced ascending difficulties in monitoring their students and keeping them on the same teaching task because laptops and other devices disguised the distractions.

In addition to distracting behaviours, students’ lack of digital competence limited a teacher’s technology use. Students differed in technological capacities due to family and educational backgrounds, though most were perceived as “technology Guru”. As a result, interviewees considered their students’ technological proficiency before using certain e-tools. They gave up the integration of specific e-resources if their students appeared incompetent to handle such tools.

Another student-led barrier was device problems. Interviewees disclosed that some of the student devices could be troublesome, such as “keyboard malfunction”, “low battery”, and “Internet disconnection”. In such circumstances, they had to either fix the problems or be assigned a different teaching task. Besides, a lack of devices could be a

trouble for students to afford online learning during the Covid-19 period. Some students might not have a device for their online classes, possibly because “they had to share one laptop with their siblings and sometimes have classes simultaneously”.

4.3 Common Theme 3: The Tool Supporter (school)

Thirteen of fourteen interviewees voiced specific school characteristics as barriers to their technology use in Chinese instruction. These types of barriers are also referred to as external barriers in the literature. Table 4 lists the sub-themes of the first common theme –the tool supporter (school).

Table 4. Sub-Themes of the Common Theme- the Tool Supporter (school)

Common theme	Sub-theme
The tool supporter (The school)	a lack of professional development
	a lack of instructional support
	a lack of funding support
	discouraging school management

A lack of professional development (PD). Nine of fourteen interviewees perceived a lack of external PD as a barrier to integrating technology into Chinese teaching. Though they had sufficient internal PD opportunities, they did not respond the same to external ones. For example, Beth disclosed little chance to attend external workshops and training because of the school budget to cover a supply of teacher’s fees and the paid PD activity. More interviewees (Carl, Flora, Iris, and James) sided with such a statement that external PD was currently short.

In addition to a lack of officially organised PD activities, the causal networking among Chinese teaching teachers was expected to increase. Henry was eager for schoolwide visits when he could observe how his counterparts taught immersed Chinese. Moreover, he believed such exchanges could encourage teachers to integrate newly learned e-tools into their teaching if promoted by the Government or related associates.

Another PD-induced barrier was the existent PD activities’ irrelevance to technology integration or Chinese instruction. Though all participants received PD support from the school, 50% revealed that those activities might not relate to technology integration or Chinese teaching as a foreign language. Henry was straightforward, “I am not knowledgeable about everything and need coaching in technology integration”. Many other participants sided with such a statement and appealed for PD training themed in tech-based Chinese instruction.

A lack of instructional support. Half of the interviewees perceived a lack of instructional support as a barrier to integrating technology into Chinese teaching. Instructional support here referred to the assistance to facilitate Chinese teachers in teaching Chinese to their students. It included support in teaching materials, teaching strategies, and e-resources integration. This kind of support was “beneficial” for Chinese teaching teachers, especially for those beginning teachers and those in newly developed Chinese programs. When given instructional support, a teacher was allowed more time and freedom to explore the class’s best teaching strategy, including integrating various e-resources.

However, despite its significance, interviewees revealed a shortage of instructional support from their schools. Henry perceived himself as “a lab mouse” who experimented with teaching a young Chinese program, as few teachers could offer instructions in this regard. Another teacher (Carl) disclosed that he received ample support from the school, but not instructional support, thus needing him to handle his Chinese teaching all by himself. Other participants (Emma, Flora, Iris, and Kate) agreed with Carl’s statement that their school also provided instruction-related assistance so that they were almost on their own in preparing for e-classes and exploring available Chinese-facilitating tools.

A lack of funding support. Half of the interviewees perceived that a lack of funding support was a barrier to their technology use. The school funding here referred to that for Chinese-learning e-resources and PD activities. If a school did not finance relevant e-tools, its teachers were not encouraged to apply those tools to their teaching due to a lack of access or limited access to those platforms. Likewise, participants did not feel motivated without sufficient PD workshops, an essential technology source.

Half of the interviewees related that they received little or no support in terms of school funding. They concluded that funding support was not strong in state schools. Emma, Iris, James, and Mason disclosed that the school funding was limited, primarily used for “printing” and barely for Chinese-facilitating software purchases.

In addition to funding support for software procurement, interviewees were also concerned that a lack of funding resulted in insufficient paid PD opportunities. The school could filter those workshops and seminars that required extra fees, even though those PD activities were perceived as fruitful in technology learning and Chinese instruction. Nonetheless, some schools managed to strike a balance between the budget and the PD practices fees. As Nancy shared, her school might encourage their teachers to participate in the workshops at weekends, thus saving the costs to cover a supply teacher.

Apart from a shortage of school funding, not all teachers were receivers of external funding support. In the study, only five interviewees received Confucius Funding (a grant provided by Confucius Institute to support Chinese education in Australia), four serving in the same school. The four teachers mentioned that the Confucius funding motivated them to apply Education Perfect to their teaching because it covered both teachers and students' subscription fees. Hence, the subscription fee was not a problem for them, though it remained an issue impacting other interviewees' technology decisions. On the other hand, the Confucius funding facilitated Iris's bold technology attempts. She was highly motivated in technology use and barely considered the price of specific e-tool due to a large sum of funds from the Confucius Institute, though her school did not financially support her.

Discouraging school management. Another school-layer barrier to technology use was discouraging school management. Interviewees (Beth, Daisy, and Iris) described supportive school management: requiring a tech-friendly environment, receiving support from colleagues and superiors, and feeling respected in the Chinese teaching positions. Daisy, Iris, and James were straightforward that their schools did not take initiatives in Chinese-facilitating e-resources, and Carl further appealed for more software-recommendation efforts. It partially made them inactive technology adopters in Chinese instruction.

5. Discussion

This study finds that barriers to tech-integrated Chinese instruction are similar but different from those uncovered in previous literature. Barriers from this study were closely associated with four parties: technology, teachers, students, and school. They are included in Ertmer's first-and-second order barriers, which excluded the student user as the potential obstacles to technology integration. However, students were frequently spotlighted by participants in this study when they discussed the factors behind their technology use in class. In addition, researchers have shown interest to investigate technology integration from learners' perspectives in recent years (e.g., Xu & Moloney, 2011). "Learner should be the centre of our instructional design and be given the first and utmost consideration when we make a decision regarding technological implementation" (Navarre, 2019, p.10). As a result, this study re-categorised the barriers to the tech-based instruction by three interlocking agents involved in technology use: the tool (technology), the user (teacher and student), and the tool supporter (school).

5.1 The Tool

The tool itself can influence its integration into actual language teaching (Aburub & Alnawas, 2019; Presley & Presley, 2009; Teo, 2012). Hardware problems are comparatively less effective barriers to software issues in technology adoption. Such device-based problems can be well handled through in-time technical support from the school IT department (Makki et al., 2018). Such support is well provided in most schools, explaining why hardware problems are less investigated as significant barriers to technology use. On the other hand, software issues relate to multiple players, such as technology companies, software designers, and Internet providers, thus challenging to address. For example, an e-resource's price or subscription fee, though perceived to block teachers and students from integrating it in class, is determined rightfully by its developers. That being said, it makes a difference for software developers to consider pricing when designing their products for schoolers. Besides, schools may be financially capable of subscribing e-products, when affordable, to the users. Meanwhile, schools and technology developers can join hands to reduce tool-induced barriers. For instance, if schools offer Curriculum-oriented Chinese-learning advice for technology designers to improve their products, the barrier - a disconnection between Chinese learning e-resources and the Australian Curriculum - can be reduced.

5.2 The User

The users make a difference in their tech-integrated Chinese teaching. Teachers, the primary users of the e-tools, may adopt the technology due to pedagogical beliefs, technological knowledge, and time for technology preparation. When they prefer a traditional pedagogical strategy, they are unlikely to invest time in tech-driven teaching (Project Tomorrow, 2017). Their pedagogy will decide the choices of technologies (Moloney & Xu, 2018). Reasons for a traditional pedagogical belief relate to their years of teaching experience, mindset, time for tech-integrated class

preparation, and technological knowledge. Senior teachers are more likely to be accustomed to non-tech instruction due to a lack of savvy technological knowledge than their younger counterparts (Joo et al., 2018). Apart from lacking technical know-how, they may feel unwilling to implement technology in their teaching because of not ever perceiving the practical benefits of technological tools for their instruction (Makki et al., 2018). Another reason for unwillingness to technology infuse is an imbalance of time teachers invest and their students spend on tech-based tasks, resulting in the sense of “a waste of time” and “low time efficiency”. For example, they may take half an hour to transform a paper-based task into a Quizlet game, but their students may take half a minute to finish playing it. It will discourage a teacher from adopting such a tool when they realise the game-based entertaining task achieves similar instructional outcomes to a paper-based one.

Furthermore, a deep-rooted barrier is perceived as a lack of time to prepare for their tech-driven class, consistent with the conclusion that time was the most stable barrier to technology integration (Francom, 2019; Lin et al., 2014). Understandably, working hours are limited, and therefore, teachers have to arrange them reasonably to achieve teaching goals. As a result, they may choose not to integrate technology in class, even though they acknowledge the benefits of technology, show technological competence, express willingness to explore various e-tools (Thomson, 2015).

The student user – the centre of the instructional design – also makes a difference in tech-adopted Chinese instruction. Though perceived as technology natives, secondary schoolers vary in digital competence. Therefore, when teachers consider arranging a tool, they have to think about how well their students can leverage it and to what extent they may encounter adversity in using such a tool (Navarre, 2019). As a result, after deciding to use a digital tool to aid their Chinese teaching, some teachers run general orientation sessions to the whole class or have their students try the first usage in the teacher-supervised context (Chen et al., 2017). However, if they perceive the training session to be disconcerting or time-consuming, they may drop this tool because it does not suit their students’ technology literacy.

Besides, students’ distraction from tech-supported learning missions may discourage teachers from frequently using such technology. Though such distraction was described as “inevitable but understandable”, teachers needed to spend efforts to manage those distracting behaviours in class, resulting in reduced use of a particular e-tool to save time for teaching goal completion.

5.3 The Tool Supporter

In addition to the tool and its users, the use of such a tool for language teaching requires school support to develop a tech-friendly surrounding (Fraillon et al., 2013). Lacking school funding is the most significant barrier for technology integration into actual teaching (Presby, 2017). That is because funding significantly relates to two determinants highlighted as essential technology integration enablers - the provision of tech-learning professional development and Chinese-learning software accessibility. Such funding varies in schools; independent schools are perceived to be more supportive in this regard than state schools (Purcell et al., 2013). Meanwhile, schools with a sizeable Chinese program may be generous to invest in Chinese-learning software. A sizeable Chinese language program may have more than three teachers for Chinese instruction, as participants in this study mentioned that most Queensland schools employed one or two teachers to teach Chinese.

Apart from the program scale, another new finding from this study is that the attention and value a school willing to attach to a Chinese program decides the funding distribution. Such attention usually results in Chinese-learning software recommendations and instructional support. Nonetheless, when a Chinese program is perceived as “marginal” in school, its teachers may be inactive to apply for funding support for tech-based teaching and stick with traditional non-tech instruction instead. As a result, insufficient support fails to incubate a tech-friendly school environment that facilitates satisfactory technology exploration in teaching practices.

6. Conclusion

This study has examined barriers to technology integration in Chinese instruction and categorised them into three layers: the tool (technology), the user (teacher and student), and the tool supporter (school). This re-classification includes the student as a technology user and highlights them as significant factors behind the teacher’s technology consideration. Therefore, this study extends Ertmer (1999)’s first- and second-order barrier theory of technology integration and other studies that summarise such barriers in the teacher- and school- level (Bingimlas, 2009; British Educational Communications and Technology Agency (Becta), 2004a; Perrotta, 2013; Wikan & Molster, 2011). Future research may proceed to explore how student characteristics impact the teacher’s technology integration.

The re-categorisation also provides practical implications for different parties to improve technology-based instructional outcomes. Policymakers can work on funding support and investment in Internet connectivity; school principals on software recommendation, subject-related instructional support, class preparation time, and professional development for technology competence; Chinese teachers on pedagogical beliefs, technology knowledge, and attitudes towards technology integration; and technology developers on perceived ease-of-use, reasonable price, stability, and relevance to particular users. Joint efforts are required to enhance effective technology integration into teaching Chinese as a foreign language.

References

- Aburub, F., & Alnawas, I. (2019). A new integrated model to explore factors that influence adoption of mobile learning in higher education: An empirical investigation. *Education and Information Technologies*, 24(3), 2145-2158. <https://doi.org/10.1007/s10639-019-09862-x>
- Acree, L., & Fox, C. (2015). *Digital Learning Exemplars*. https://www.setda.org/master/wp-content/uploads/2015/10/DigitalLearningExemplars_June2015.pdf
- Agyei, D. D., & Voogt, J. M. (2011). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education*, 56(1), 91-100. <https://doi.org/10.1016/j.compedu.2010.08.017>
- Al Meajel, T. M., & Sharadgah, T. A. (2018). Barriers to Using the Blackboard System in Teaching and Learning: Faculty Perceptions. *Technology, Knowledge and Learning*, 23(2), 351-366. <https://doi.org/10.1007/s10758-017-9323-2>
- Alalaimat, A. M., Ihmeideh, F. M., & Alkhalwaldeh, M. F. (2021). Preparing Preservice Teachers for Technology and Digital Media Integration: Implications for Early Childhood Teacher Education Programs. *International Journal of Early Childhood*, 52, 299-317. <https://doi.org/10.1007/s13158-020-00276-2>
- Almaiah, M. A., & Al Mulhem, A. (2019). Analysis of the essential factors affecting of intention to use of mobile learning applications: A comparison between universities adopters and non-adopters. *Education and Information Technologies*, 24(2), 1433-1468. <https://doi.org/10.1007/s10639-018-9840-1>
- Bandura, A. (2010). Self-Efficacy. In I. B. Weiner & W. E. Craighead (Eds.), *The Corsini encyclopedia of psychology* (pp. 69). John Wiley.
- Bauer, J., & Kenton, J. (2005). Toward Technology Integration in the Schools: Why It Isn't Happening. *Journal of Technology and Teacher Education*, 13(4), 519-546.
- Bax, S. (2011). Normalisation Revisited: The Effective Use of Technology in Language Education. *International Journal of Computer-Assisted Language Learning and Teaching*, 1(2), 1-15. <https://doi.org/10.4018/ijcallt.2011040101>
- Bingimlas, K. A. (2009). Barriers to the Successful Integration of ICT in Teaching and Learning Environments: A Review of the Literature. *Eurasia Journal of Mathematics, Science and Technology Education*, 5(3), 235-245. <https://doi.org/10.12973/ejmste/75275>
- British Educational Communications and Technology Agency (Becta). (2004a). *A review of the research literature on barriers to the uptake of ICT by teachers*. BECTA ICT Research. <http://dera.ioe.ac.uk/id/eprint/1603>
- British Educational Communications and Technology Agency (Becta). (2004b). *A review of the research literature on barriers to the uptake of ICT by teachers*. http://dera.ioe.ac.uk/1603/1/becta_2004_barrierstouptake_litrev.pdf
- Chai, C. S., Chin, C. K., Koh, J. H. L., & Tan, C. L. (2013). Exploring Singaporean Chinese Language Teachers' Technological Pedagogical Content Knowledge and its Relationship to the Teachers' Pedagogical Beliefs. *The Asia-Pacific Education Researcher*, 22(4), 657-666. <https://doi.org/10.1007/s40299-013-0071-3>
- Chen, H., Scott, J., Huang, Y.-M., & Wu, W.-C. V. (2017). Technological acceptance of LINE in flipped EFL oral training. *Computers in Human Behavior*, 70, 178-190. <https://doi.org/10.1016/j.chb.2016.12.066>
- Creswell, J. W. (2015). *A Concise Introduction to Mixed Methods Research*. SAGE.
- Department of the Prime Minister and Cabinet. (2012, October). *Australia in the Asian Century White Paper*. https://www.defence.gov.au/whitepaper/2013/docs/australia_in_the_asian_century_white_paper.pdf

- Derfler, K. E. (2002). *Factors which affect middle school teachers' willingness to utilise technology as an instructional tool* [Doctoral dissertation, La Sierra University]. ProQuest Dissertations and Theses Global.
- Dogan, S., Dogan, N. A., & Celik, I. (2021). Teachers' skills to integrate technology in education: Two path models explaining instructional and application software use. *Education and Information Technologies*, 26(1), 1311-1332. <https://doi.org/10.1007/s10639-020-10310-4>
- Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, 47(4), 47-61. <https://doi.org/10.1007/BF02299597>
- Fraillon, J., Schulz, W., & Ainley, J. (2013). *International Computer and Information Literacy Study: Assessment Framework*. Retrieved from https://research.acer.edu.au/ict_literacy/9
- Francom, G. M. (2019). Barriers to technology integration: A time-series survey study. *Journal of Research on Technology in Education*, 52(1), 1-16. <https://doi.org/10.1080/15391523.2019.1679055>
- Gil-Flores, J., Rodríguez-Santero, J., & Torres-Gordillo, J.-J. (2017). Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behavior*, 68, 441-449. <https://doi.org/10.1016/j.chb.2016.11.057>
- Hardisky, M. (2018). *TPACK: Technology Integration and Teacher Perceptions* [Doctoral dissertation, Drexel University]. Doctoral dissertation ProQuest Dissertations and Theses Global.
- Hermans, R., Tondeur, J., van Braak, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education*, 51(4), 1499-1509. <https://doi.org/10.1016/j.compedu.2008.02.001>
- Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, 55(3), 223-252. <https://doi.org/10.1007/s11423-006-9022-5>
- Howard, S. K., Chan, A., & Caputi, P. (2015). More than beliefs: Subject areas and teachers' integration of laptops in secondary teaching. *British Journal of Educational Technology*, 46(2), 360-369. <https://doi.org/10.1111/bjet.12139>
- Hu, Z., & McGrath, I. (2012). Integrating ICT into College English: An implementation study of a national reform. *Education and Information Technologies*, 17(2), 147-165. <https://doi.org/10.1007/s10639-011-9153-0>
- Huang, Y.-M., Huang, Y.-M., Huang, S.-H., & Lin, Y.-T. (2012). A ubiquitous English vocabulary learning system: Evidence of active/passive attitudes vs. usefulness/ease-of-use. *Computers & Education*, 58(1), 273-282. <https://doi.org/10.1016/j.compedu.2011.08.008>
- Joo, Y. J., Park, S., & Lim, E. (2018). Factors Influencing Preservice Teachers' Intention to Use Technology: TPACK, Teacher Self-efficacy, and Technology Acceptance Model. *Journal of Educational Technology & Society*, 21(3), 48-59.
- Koh, J. H. L., Chai, C. S., & Tsai, C.-C. (2013). Examining practicing teachers' perceptions of technological pedagogical content knowledge (TPACK) pathways: a structural equation modeling approach. *Instructional Science*, 41(4), 793-809. <https://doi.org/10.1007/s11251-012-9249-y>
- Lee, D. Y., & Lehto, M. R. (2013). User acceptance of YouTube for procedural learning: An extension of the Technology Acceptance Model. *Computers & Education*, 61, 193-208. <https://doi.org/10.1016/j.compedu.2012.10.001>
- Liaw, S.-S., & Huang, H.-M. (2013). Perceived satisfaction, perceived usefulness and interactive learning environments as predictors to self-regulation in e-learning environments. *Computers & Education*, 60(1), 14-24. <https://doi.org/10.1016/j.compedu.2012.07.015>
- Lin, C.-Y., Huang, C.-K., & Chen, C.-H. (2014). Barriers to the adoption of ICT in teaching Chinese as a foreign language in US universities. *ReCALL*, 26(1), 100-116. <https://doi.org/10.1017/S0958344013000268>
- Makki, T. W., O'Neal, L. J., Cotten, S. R., & Rikard, R. V. (2018). When first-order barriers are high: A comparison of second- and third-order barriers to classroom computing integration. *Computers & Education*, 120, 90-97. <https://doi.org/10.1016/j.compedu.2018.01.005>
- Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education* 9(3), 319-342.

<https://doi.org/10.1080/1475939000200096>

- Navarre, A. (2019). *Technology-enhanced teaching and learning of Chinese as a foreign language*. Routledge.
- Onalan, O., & Kurt, G. (2020). Exploring Turkish EFL teachers' perceptions of the factors affecting technology integration: A case study. *Dil ve Dillilimi Çalışmaları Dergisi*, 16(2), 626-646. <https://doi.org/10.17263/jlls.759264>
- Orton, J. (2016a). *Building Chinese Language Capacity in Australia*. University of Technology Sydney. Retrieved 978-0-9942825-4-5 from https://www.australiachinarelations.org/sites/default/files/20032%20ACRI%20Jane%20Orton%20-%20Chinese%20Language%20Capacity_web_0.pdf
- Orton, J. (2016b). Issues in Chinese Language Teaching in Australian Schools. *Chinese Education & Society*, 49(6), 369-375. <https://doi.org/10.1080/10611932.2016.1283929>
- Orton, J. (2017). Changes in the Chinese landscape : New paths for Chinese language in Australian schools. *Babel*, 51(3), 6-13.
- Perrotta, C. (2013). Do school-level factors influence the educational benefits of digital technology? A critical analysis of teachers' perceptions. *British Journal of Educational Technology*, 44(2), 314-327. <https://doi.org/10.1111/j.1467-8535.2012.01304.x>
- Presby, B. (2017). *Barriers to Reducing the Digital-Use Divide as Perceived by Middle School Principals* [Doctoral dissertation, Brandman University]. ProQuest Dissertations and Theses Global.
- Presley, A., & Presley, T. (2009). Factors influencing student acceptance and use of academic portals. *Journal of Computing in Higher Education*, 21(3), 167-182. <https://doi.org/10.1007/s12528-009-9022-7>
- Project Tomorrow. (2017). *Trends in Digital Learning: Building teachers' capacity and competency to create new learning experiences for students*. <http://bbbb.blackboard.com/2017digitaltrends>
- Purcell, K., Buchanan, J., & Friedrich, L. (2013, February 28). *How teachers are using technology at home and in their classrooms*. Pew Research Center. <http://pewinternet.org/Reports/2013/Teachers-and-technology>
- Reyneke, J. A. (2020). *What drives educators: A mixed methods study on the impact of motivations and attitudes on technology integration practices in the K-8 classroom setting*. [Dcotoral dissertation, Pepperdine University]. ProQuest Dissertations and Theses Global.
- Roblyer, M. D., & Doering, A. H. (2013). *Integrating educational technology into teaching* (6th ed.). Pearson.
- Rodney, E. S. (2002). The Integration of Instructional Technology into Public Education: Promises and Challenges. *Educational Technology*, 42(1), 5-13.
- Spector, J. M. (Ed.). (2015). *The SAGE Encyclopedia of Educational Technology*. SAGE. <https://doi.org/10.4135/9781483346397>
- Spiteri, M., & Rundgren, S.-N. C. (2018). Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology. *Technology, Knowledge and Learning*, 25(1), 115-128. <https://doi.org/doi:10.1007/s10758-018-9376-x>
- Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education*, 57(4), 2432-2440. <https://doi.org/10.1016/j.compedu.2011.06.008>
- Teo, T. (2012). Examining the intention to use technology among pre-service teachers: an integration of the Technology Acceptance Model and Theory of Planned Behavior. *Interactive Learning Environments*, 20(1), 3-18. <https://doi.org/10.1080/10494821003714632>
- Thomson, S. (2015, June). *Australian Students in a Digital World*. ACER. <https://research.acer.edu.au/policyinsights/3/>
- Ward, L., & Parr, J. M. (2010). Revisiting and reframing use: Implications for the integration of ICT. *Computers & Education* 54(1), 113-122. <https://doi.org/10.1016/j.compedu.2009.07.011>
- Wikan, G., & Molster, T. (2011). Norwegian secondary school teachers and ICT. *European Journal of Teacher Education*, 34(2), 209-218. <https://doi.org/10.1080/02619768.2010.543671>
- Yin, R. K. (2018). *Case study research and applications: Design and methods*. SAGE.

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