

Using Digital Scaffolding Materials to Enhance Learners' Autonomous Learning: A Case in a Chinese University

Chen Chen

International College, Southwest University, Chongqing, China

**Corresponding author e-mail: cheeeeenc@swu.edu.cn*

ABSTRACT. *This case study explores Chinese university students' perceptions of using digital materials as scaffolding to facilitate their English as a Foreign Language (EFL) learning in an autonomous context. A total of 30 students participated in the study. Data were collected via multiple methods, including participants' reflective reports, individual interviews and documents. The collected evidence was categorized by themes and research questions. This study found gradual changes of students' perceptions and uses of digital materials as scaffolding to their EFL learning, which was not a linear process but a recursive one. Participants' understanding was deepened as more digital supportive materials were used to scaffold their language development. Their autonomy was also elevated in this process. The study found that students' perceptions and uses of scaffolding materials were different in linguistic learning and cultural knowledge learning. Recommendations for future studies are provided on the base of these findings.*

KEYWORDS: *Scaffolding, Autonomy, Supportive materials, ZPD, English as a Foreign Language*

1. Introduction

Scaffolding materials in English as a Foreign Language (EFL) learning has been the focus of recent research. Scaffolding materials are the learning resources used to help EFL learners overcome obstacles and challenges in their learning process (Safadi & Rababah, 2012). They are usually presented in various forms, including notes, scripts, hints, reference answers and extending information (Han, 2018), playing a strategic cognitive supportive role to facilitate students' foreign language learning (Opperman, 2016). For the positive effects on EFL learning, scaffolding materials have been used in the Chinese EFL education context for years (Li, 2017). However, these resources are usually selected, scheduled and assigned by teachers in the classroom (Xu, 2012). Chinese EFL students have limited autonomy in

learning with scaffolding materials (Shi, Delahunty, & Gao, 2018). The traditional learning approach in China does not provide a context for EFL students to improve their language abilities and knowledge with an autonomous attitude (Betts, 2004). It fails the objectives of EFL education outlined by the Chinese government released China's Standards of English Language Ability: "to enhance their ability to study independently... to improve their general cultural awareness." (Ministry of Education [MoE], 2018, p. 7, p. 76).

2. Literature review

As scaffolding, supportive materials have been accepted as an effective means of instruction in learning activities as well as a source of support, as learners can leverage the knowledge and skills through overcoming their limitations in learning, and achieve meaningful learning outcomes (Levitt, 2017). Learning with supportive materials, EFL learners are scaffolded to do something that "she or he might not have been able to do otherwise" (Ohta, 2000, p. 52). That is, supportive materials are a tool to bridge the gap between the "learning needs" and the "target needs" of language learners (Basturkmen, 2006, pp. 25-26). To date, the effectiveness of supportive materials on scaffolding EFL learning has been widely recognized in different contexts (Altin & Saracaloğlu, 2018; Lin & Chen, 2007).

Embedded supportive materials in foreign language learning are a common form of hard scaffolding, which is the "static support that can be anticipated and planned in advance" (Brush & Saye, 2002, p. 2). In EFL learning, hard scaffolding faces all learners, and provides general support to their learning needs (Oliver & Hannafin, 2000). Meanwhile, this form of scaffolding also leaves more thinking spaces for learners than teachers' or peers' on-demand responses (Brush & Saye, 2000). With the improvement of learners' abilities and knowledge, the amount of scaffolding should be reduced for creating a larger room for learners' increasing responsibilities (Lantolf & Appel, 1994). Hard scaffolding allows for the fading of support and encourages individual learners to gain increasing self-initiation and self-regulation in their own learning (Adolphs et al., 2018).

From a sociocultural perspective, scaffolding "lies very much within Vygotskian framework", owning a close association with the concept of Zone of Proximal Development (ZPD, Hammond & Gibbons, 2001, p. 8), while ZPD is "at the heart of the concept of scaffolding" (Verenikina, 2003, p. 163) to act as the theoretical basis. The concept of ZPD refers to "the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Empirical studies have indicated that actual language learning always occurs within a learner's individual ZPD via various mediations (De Guerrero & Villamil, 2000; Hidri, 2017). In this context, language learners are supposed to improve their language abilities and knowledge gradually from a lower level to the targeted one with the support of mediations (Khaliliaqdam, 2014).

Supportive materials can play a mediation role to increase the effectiveness of language learning (Ash & Levitt, 2003). This form of scaffolding aims at helping language learners extend their abilities and knowledge in their individual ZPD. A number of studies have investigated how supportive materials scaffold language learning. For example, Perez, Peters and Desmet (2013) studied the use of scripts and captions to enhance students' listening comprehension. Lin and Tseng (2012) used multimedia resources to facilitate students' vocabulary learning. Kageto, Sato and Kirkpatrick (2012) explored to create an authentic language setting to scaffold EFL students' practice and development of their language abilities. These studies focus on the use of supportive materials to scaffold students' language development in their individual ZPD, which have achieved positive outcomes.

Being autonomous is one of objectives of learners' learning within their individual ZPD (Cross, 2003). Learners are expected to become "autonomous objects comprised of bundles of variables" in learning within the ZPD (Dunn & Lantolf, 1998, p. 428), who are more likely to seek learning resources that suit their own learning needs, instead of waiting for teacher's assignments passively (Nosratinia & Zaker, 2014). To achieve this, scaffolding is essential to the exercise of learner autonomy in EFL learning (Smith & Craig, 2013). Through learning with scaffolding, a language learner makes a shift of the role from a passive receiver of language knowledge to an active seeker or a knowledge contributor, and engages in the whole learning process with an autonomous attitude with less teacher supervision (Betts, 2004).

In autonomous learning, supportive materials can scaffold learners to achieve their goals in language learning (Yen, 2018). Empirical studies have explored the use of supportive materials as scaffolding to improve language learners' autonomous learning in different contexts. For example, Ge, Xiong and Xiong (2016) used supportive materials to help students reduce learning burden and focus attention on learning in an autonomous context. Lim and Lee (2007) investigate the use of supportive materials to improve students' abilities in autonomously planning their learning. With the integration of technologies, scholars and researchers also develop a set of digital supportive materials, which have helped learners achieve productive outcomes in autonomous learning (Hegelheimer & Lee, 2012; Marzban, 2011).

With the explosion of modern technologies, new dimensions of scaffolding have been added to autonomous EFL learning (Blin, 2004). Learning EFL with digital scaffolding materials, EFL learners can promote the development of learner autonomy in a self-determined context (Luhach, 2016). Empirical studies have been conducted to investigate digital materials as scaffolding to facilitate students' EFL learning (Wang, 2017; Kang, 2018). However, most research focuses have been put on a teacher-centered EFL learning and teaching context (Dong, 2015; Wang, 2017). There are not many studies on scaffolding materials contextualized in an autonomous context, where learners may have their individually different perceptions, and put these resources into practical use in different ways. To fill this research gap, EFL students' perceptions of supportive materials in an autonomous online learning context are investigated in a Chinese university context in this study.

3. Methods

This case study took place in a first-tier university located in Southwest China. A total of 60 undergraduate students, who were all native speakers of Chinese mandarin with English as their foreign language, voluntarily participated in this study. Of all participants, 40% were male (n=24) and 60% were female (n=36). In average, this group of participants had studied EFL in various levels of educational institutions in China for more than eight years (m=8.7). Only one student reported having experience of studying or living in an English-speaking country before. All participants were non-English major in the university. It might be able to generalize the findings of the study across more disciplines and learning contexts.

A highly recognized online EFL learning platform, which provided a set of digital learning resources, was employed in this study. It was developed by an Australian Research Council Linkage project: Images, perceptions and resources: Enhancing Australia's role in China's English language education (2011-2014). Digital learning resources, including both main and supportive materials, were provided by well considering Chinese university EFL students' language abilities and learning needs. Supportive materials were presented in various forms, including notes, scripts, captions, extending information and reference answers (see Appendices A for an example of the online learning module). Evidence regarding participants' use of supportive materials was collected, coded, categorized and analyzed to demonstrate Chinese university students' selection and employment in an autonomous online EFL learning context.

All students participated in autonomous online learning on the provided learning platform on a voluntary basis. The online learning lasted six weeks. Participants were given two weeks to learn with each module. The employed three learning modules were on different topics, focusing on students' both linguistic ability and intercultural awareness development. Each learning module was of similar difficulty for them.

At the end of each week, participants provided their written reflective reports regarding their perceptions and employment of supportive materials in the learning process. The reports were designed to collect information about participants' immediate reflections of supportive materials. Chinese mandarin was recommended to use for encouraging participants to provide detailed information. After the accomplishment of each learning module, a teacher-led tutorial was provided. Participants could engage in the tutorial to seek assistance or information from the teacher to solve their problems. Tape-records were used for data collection.

After six week's online learning, eight of these participants were interviewed individually to acquire empirical data about their learning practice. The face-to-face interviews were guided by an array of questions(see Appendices B). The guiding questions were developed by referring to the literature, and modified according to the student participants' reflective reports. Each interview lasted for around 45 minutes. For ensuring participants' understanding of interviews, as well as for encouraging them to express their opinions freely, Chinese mandarin was used.

Participants' learning documents and logs generated in their online learning process were also collected. Data gathered from documents and logs were used to investigate Chinese university EFL students' practical use of supportive materials for facilitating their learning in an autonomous online context. The triangulation approach was employed by collecting data from different sources via different means. All data that were in Chinese were translated and back translated by professional translators to maintain validity.

4. Results

Data show that participants' understanding of scaffolding materials was not the same in three LMs. At the beginning stage of their learning, many participants equated scaffolding materials with reference answers. Most only employed these materials to obtain answers to learning tasks in the process. In LM2, participants' perceptions changed. They believed scaffolding materials could help them have better performance in the online EFL learning. They were supposed to be effective to help overcome learning problems. With the increase use of scaffolding materials in LM3, participants mentioned several benefits were discovered for their EFL learning. They indicated that they could make use of these materials to promote their learning to a higher level, and obtain more information for language development. The following table lists some typical comments from participants in three LMs:

Table 1 Participants' understanding of supportive materials in three LMs.

LM1	LM2	LM3
"Supportive materials always provided the answer directly to the learning tasks." (Shen)	"Supportive materials acted like a virtual teacher in the online space. ... They enabled me to accomplish a difficult task that I could not do without them." (Han)	"I believed supportive materials extended my language learning to a larger context." (Han)
"Supportive materials were playing an auxiliary role that had indirect impacts on my language skills. They just functioned through learning tasks and provided reference answers. ... I gave up using them as long as I got the correct answers." (Yang)	"Supportive materials provided strong support to my English learning. They could do more than reference answers did." (Yang)	"For students who were capable in English learning, supportive materials provided a pool of resources. We could promote our learning to a higher level by using these resources." (Zheng)
"Supportive materials seemed not to be materials. They were affiliated with learning tasks. ... I did not think these two could be separated." (Jiang)	"Sometimes I did not really use these supportive materials. However, it did matter I knew they were there. That made me confident." (Zhou)	"Supportive materials seemed to be more contributing to language learning than I thought. They could be a tool to enhance learning for students with different language levels and different learning goals." (Yang)

On the basis of their different understanding in three LMs, students' uses of scaffolding materials were not the same either. Participants' learning logs, which were recorded by the online learning platform, showed that not many participants used the provided materials to support the learning in LM1. The average use rate of supportive materials in LM1 was 26.3%. Participants also provided some details about their uses of scaffolding materials in LM1, as well as the concerns and obstacles they encountered in the process. Of all eight interviewees, seven had negative feelings about their experience of using scaffolding materials on the platform. For example:

In the class, my teachers would correct my mistakes. I got used to it. ... It was difficult to use supportive materials to take all the responsibilities overnight. (Zhou)

I attempted to use supportive materials. However, they seemed to be quite confusing for me, as they were different from most of the materials used in the classroom. ... I had not used such resources before. (Jiang)

In LM2, the recorded data indicated that an increasing number of participants used scaffolding materials in their learning. Of all 16 supportive materials, the average use rate was promoted to 45.83% in this module. Regarding their use experience, participants described their perceptions. Of all eight interviewees, five reported using digital scaffolding materials frequently in their online learning. Three examples are listed below:

I used some supportive materials in the learning process, and I got quite satisfying outcomes to solve my problems. (Wu)

The use of supportive materials strengthened my confidence in the EFL learning process. (Wang)

Online learning needed a teacher to provide support. ... Supportive materials acted the role. (Shen)

Participants' learning logs in LM3 showed an increase in participants' use rate of scaffolding materials. Almost all interviewee indicated that they made use of scaffolding materials in this module. The average use rate was 69.4%. It was higher than those in LM1 and LM2. Participants provided some detailed descriptions of their uses of scaffolding materials in LM3 as well. These materials were used to help them overcome learning obstacles in the process. For example:

Supportive materials were good helpers for my online English learning. I should have put them into use earlier. (Wu)

The provided supportive materials seemed to provide solutions to my learning problems, although some help was not so straightforward. (Wang)

With the differences of participants' understanding and uses of scaffolding materials in their online EFL learning, their learner autonomy displayed different levels in the process. In LM1, participants considered scaffolding materials to hinder the practice of learner autonomy. Their learning motivation with these resources was also low. Participants' perceptions changed in LM2. They would like to invest some

time in learning with supportive materials. They had some degrees of autonomy at this stage. However, they would escape from learning if they encountered some difficulties. In LM3, participants were willing to use scaffolding materials to facilitate their learning autonomously. They usually had their individually different ways to learn, which suited their own learning needs. They also indicated that they would like to use these resources to support their learning in the future. The following table lists the differences of participants' perceptions of scaffolding materials in three LMs:

Table 2 Participants' perceptions of supportive materials regarding learner autonomy in three LMs.

LM1	LM2	LM3
"Supportive materials seemed not to be reasonable for independent learning. They revealed the answers to a learning task directly, leaving no space for students to work it out by themselves." (Han)	"Is that right to ignore the supportive materials if I could accomplish all learning tasks correctly?" (Zhou)	"For most of the provided supportive materials in this module, I read for more than one time. By studying them I gained better understanding of the learning content." (Jiang)
"The learning, as far as I knew, was not counted as the formal English class. ... It did not matter if I left my mistakes behind without correcting them by referring to supportive materials." (Zheng)	"In the past, I had to bother my teachers when I had some problems with my learning. Now I could learn with these supportive materials. ... It enabled me to learn without teachers." (Wu)	"I am not sure if my way of learning with these supportive materials was correct, but I found that was suitable for my situation, though it was not the same with my peers'." (Shen)
	"Supportive materials seemed to be too demanding. They usually cost a huge number of my learning time. As the online learning was not compulsory, I would better skip them." (Han)	"From my experience in the online learning, supportive materials proved to be effective and efficient. It would be very likely for me to use them for learning after this study." (Zheng)

Participants' uses of digital scaffolding materials were different in linguistic learning and cultural knowledge learning. In linguistic learning, EFL students made intensive uses of these materials to facilitate their language development, particularly in lexical and grammatical aspects. For example:

Supportive materials were a tool that enabled me to know the new words, as well as to have a mastery of the grammatical knowledge. (Jiang)

Supportive materials could help me gain deeper understanding of a sentence by providing detailed analysis. That was hard to achieve all by myself. (Wu)

Participants' employment of scaffolding materials to facilitate their linguistic learning was observed in all three LMs. Besides, participants also sought assistance

from other sources, like teachers and peers, to gain better understanding of linguistic learning. For example:

If there is any grammatical point I need to pay special attention to in this sentence: “If this had not been invented, how many air crashes would have remained unsolved?” Its tense seems to be strange. (From Tutorial 2)

When should I use a subordinate clause in writing? What are the benefits of this structure in meaning expression? (From Tutorial 3)

In cultural knowledge learning, participants’ perceptions and uses of scaffolding materials experienced changes from LM1 to LM3. At the beginning of the online learning, participants found the intercultural scaffolding materials were difficult, and refused to use. At this stage, participants did not recognize the value of digital materials as scaffolding to language learning. It took some time before participants accepted. Participants’ autonomy in cultural knowledge learning was also observed to increase from a low degree in this process. The table below lists some typical points made by participants regarding the uses of scaffolding materials to promote intercultural awareness and autonomy in three LMs:

Table 3 Participants’ perceptions of supportive materials to promote intercultural learning in three LMs.

LM1	LM2	LM3
“Those provided supportive materials contained a lot of intercultural content and foreign historical stories. These were too abstract and obscure. I did not like to waste my time on them.” (Zhou)	“Supportive materials, from my learning experience, increased my learning burden.” (Wu)	“I believed supportive materials extended my language learning to a larger context, where learning was not only about grammar or vocabulary, but also about intercultural communication.” (Han)
“Intercultural materials seemed not to be valuable since they could not increase my scores in language tests.” (Yang)	“When I got some leisure time, I had a look at those supportive materials. ... They provided some cultural and historical information, which seemed to be quite interesting.” (Jiang)	“Supportive materials could be a good source of cultural knowledge. We could dig out many stories that lied beneath the texts.” (Wu)
	“Supportive materials could be a good tool to improve my cultural knowledge learning. However, it was difficult to find a balance between cultural knowledge learning and language [linguistic] learning.” (Shen)	

5. Discussion

This study noticed that participants changed their understanding and uses of digital supportive materials as scaffolding in the online EFL learning process. At the beginning stage, participants' understanding remained at the surface level. They simply considered these materials as reference answers to learning tasks, playing "an auxiliary role" that only worked through learning tasks in EFL learning (Yang, Table 1). Supportive materials were only treated to be "affiliated" with the learning tasks (Jiang, Table 1). It seemed that this group of EFL students did not realize the value of these materials as scaffolding to support in language learning, which should have helped them overcome obstacles in learning (Safadi & Rababah, 2012). Participants were unfamiliar with scaffolding materials in an autonomous learning context. Their understanding of these materials was primary and incomplete at this stage.

It did not take a long time before participants deepened the understanding. In line with empirical studies (Altin & Saracaloğlu, 2018; Lin & Chen, 2007), by engaging with more scaffolding materials, EFL students could accomplish the difficulty learning content that they could not do before (Han, Table 1). Supportive materials were used to help students overcome learning obstacle (Han, Yang, & Zheng, Table 1). It reflected that participants gradually recognized scaffolding materials as a helpful tool that bridged the gap between students' current language levels and their learning goals. As participants employed scaffolding materials to scaffold their learning, they also accepted the materials to facilitate their learning through diverse ways (Han, 2018), rather than simply working as reference answers.

With the acceptance of digital scaffolding materials in their EFL learning, participants also framed the scaffolding process in their individual ZPD. Scaffolding has a close association with ZPD that language learners are expected to develop their learning based on their own situations (Hammond & Gibbons, 2000; Verenikina, 2003). In this case, participants were noticed to use scaffolding materials in their own ways to promote their individually different learning, and achieved better learning outcomes (Yang, Table 1; Jiang & Shen, Table 2). This was different from their previous learning in the classroom, where Chinese university EFL students' learning is usually assigned and scheduled by teachers (Yan & He, 2010). It indicated that EFL students could independently use digital materials as scaffolding in ways that suited their own learning needs. Scaffolding materials, as reflected in this study, were acting a mediation role that was valuable to students' learning (Ash & Levitt, 2003), and could promote EFL learning to a higher level in students' individual ZPD without teacher's over-intervention (Khaliliaqdam, 2014).

Whilst participants employed more digital scaffolding materials to facilitate their EFL learning independently, their learner autonomy was promoted as well. Although digital scaffolding materials have been introduced into China for years (Li, 2017), like many other learning resources, scaffolding was limited to a traditional teacher-centred context (Wang, 2017), and was mostly selected, scheduled and assigned by teachers (Xu, 2012). Learning in an autonomous context, these students still expected their teachers to solve their learning problems (Zhou), instead of using

supportive materials independently to gain self-initiation and self-regulation in learning. Scaffolding materials did not successfully help them become autonomous in language learning at the beginning of the study. Chinese university EFL students remained passive receivers of scaffolding from teachers as less autonomous language learners (Nosratinia & Zaker, 2014).

Furthermore, some participants even considered scaffolding materials to hinder their autonomy, since the materials left “no space” for students’ independent work (Han, Table 2). By using digital scaffolding materials, students should have learned EFL in a “safe but challenging environment” (van Lier, 2006, p. 196), where their autonomy has the room to elevate at the same time as their language abilities improve. Participants’ primary and incomplete understanding of scaffolding materials at the initial stage of the online learning misled them. They did not systematically consider or use scaffolding materials as a facilitator of learner autonomy in EFL learning.

Through using scaffolding materials, participants were found to become more autonomous in the online learning process. Participants gradually showed the sign as more autonomous language learners (Garrison & Archer, 2000) that they could independently evaluate their current learning, and find resources as scaffolding to target their own learning problems (Shen & Zheng, Table 2). With more digital supportive materials that provided general support to students’ learning were incorporated into their EFL learning, participants became less dependent on teachers (Wu, Table 2). In this process, they attempted to shift the role to an active knowledge contributor, and engaged in the learning with an autonomous attitude. The use of scaffolding materials created a learning context that allowed for the elevation of learner autonomy (Lantolf & Appel, 1994), and helped students achieve the goal of autonomous learning that they could hardly do in a traditional classroom (Shi, Delahunty, & Gao, 2018).

Findings from the study showed that participants used supportive materials as a scaffolding tool to enhance their linguistic learning. As noticed in this study, student participants intensively used supportive materials to address their problems in linguistic aspects of the online EFL learning (Jiang & Wu). Consistent results regarding the effectiveness of supportive materials on linguistic learning were also found in empirical studies (Kageto, Sato, & Kirkpatrick, 2012; Lin & Tseng, 2012). It suggested that linguistic learning, particularly grammatical and lexical learning, was a major purpose of participants’ employment of supportive materials in autonomous EFL learning. Participants’ learning with supportive materials largely focused on this aspect of language development. Supportive materials were used to help EFL students have better performance in linguistic learning.

This finding reflected that scaffolding materials helped Chinese university EFL students have high autonomy in linguistic learning. Chinese university EFL students are usually keen to their problems in linguistic learning, and have strong motivation to revise the mistakes in related domains (Gao, 2007; Yang, 2017). In this case, student participants actively solved their obstacles in linguistic learning through seeking scaffolding from the provided supportive materials. This group of

participants displayed strong motivation to pursue further development of linguistic abilities and knowledge. Furthermore, participants obtained scaffolding from a wide range of sources, like teachers and peers, to gain better understanding of the learning (Tutorial 2 & 3). They used supportive materials and other scaffolding to promote their linguistic learning to a higher level (Khaliliaqdam, 2014). It indicated that EFL students were not limited by the provided learning resources, but were motivated to improve their learning through seeking resources from a broader context. They were characterized as “high autonomous learners” (Poole, 2005) in linguistic learning.

In cultural content learning, participants’ perceptions and uses of digital supportive materials as scaffolding was different in three LMs. At the beginning of their online learning, participants did not put the provided intercultural supportive materials into use, but considered them as “burden” (Wu & Zhou, Table 3) to their EFL learning. As a form of scaffolding, digital supportive materials should have helped EFL students better plan their learning, and reduce learning burden to achieve satisfying learning outcomes, particularly in autonomous learning (Ge, Xiong, & Xiong, 2016; Lim & Lee, 2007). Participants’ perceptions of supportive materials indicated their low degree of autonomy in cultural knowledge learning. Their motivation in cultural knowledge learning was not as high as that in linguistic learning either (Jiang & Shen, Table 3). Considering from this perspective, Chinese university EFL students were just “partly autonomous” (Shahriar, Pathan, & Sohail, 2013) in language learning at this stage.

Student participants’ initial perceptions and uses of supportive materials as observable outcome were not all correct but a reflection of their long-term EFL learning experience in a test-oriented context. Learning EFL in this context, students’ focuses are largely put on the success of linguistic learning (Renandya & Hu, 2018). The test-oriented approach narrows EFL learning, and has deep influence on students in China (Gu & Liu, 2005). In this study, participants were less autonomous to develop their intercultural awareness (Yang, Table 3), while they employed resources in order to obtain high scores in language tests. It is not appropriate to consider grammatical and lexical knowledge to outweigh intercultural awareness in foreign language learning (Dervin & Liddicoat, 2013). Participants’ learning also went against the advocates made by the Chinese government policy (MoE, 2018). At the early stage, participants’ uses of supportive materials might not scaffold their EFL learning, or support their language development in a well-rounded way.

As the study found, participants’ autonomy in cultural knowledge learning was promoted as more scaffolding materials were used, and deeper understanding was gained in the learning process. Participants gradually realized the effects of scaffolding on cultural learning (Han, Jiang, & Wu, Table 3). This finding suggested that Chinese EFL students could be autonomous learners in cultural knowledge learning if they were provided appropriate scaffolding. Considering from the perspective of students’ cultural knowledge learning, the use of scaffolding extended their language development to a larger context, covering a wider range of learning content (Malushko, 2015). As found in this study, with scaffolding, Chinese EFL students became autonomous in both linguistic and cultural knowledge learning,

which was different from some previous indications that Chinese students had low motivation for cultural content learning, particularly in an autonomous context (Gan, Humphreys, & Hamp - Lyons, 2004; Yu & Wang, 2009).

The development of participants' EFL learning with scaffolding materials was not a linear process. As found from this study, students developed their perceptions and uses of supportive materials through attempting, monitoring and reviewing their learning activities (Han; Tutorial 3). They also made many mistakes in the process, and then revised them by seeking assistance from the supportive materials and the teacher (see Tutorial 3). As Eckerth and Tavakoli (2012) have put, learning with new materials is more like a recursive process with revision and relearning, as well as opportunities to engage with the resources in the long term. It took time before participants could make full use of supportive materials as a new scaffolding tool to support their EFL learning. In this process, they should be allowed for the room to make errors and mistakes (Barnard & Campbell, 2005), and had access to teacher's instant instructions (Wang; Tutorial 1 & 3). Besides, appropriate encouragement was also of importance for EFL students, particularly in an autonomous learning context (Baz, Balcikanli, & Cephe, 2018).

6. Conclusion

This case study has explored Chinese university EFL students' perceptions of using digital scaffolding materials in an autonomous language learning context. Findings from the study showed gradual changes of students' perceptions of scaffolding materials to their EFL learning. At the beginning stage of the learning, students simply treated supportive materials as reference answers to learning tasks, rather than a scaffolding tool to address their learning problems, or enhancing their learner autonomy in diverse ways. After weeks' learning, participants gradually realized the positive effects of supportive materials on scaffolding their language development in the individual ZPD, and attempted to use them to promote their autonomy in language learning.

It should be noted that students' perceptions and uses of supportive materials were different in their linguistic learning and cultural knowledge learning. Participants were relatively more autonomous in linguistic learning, but their engagement with scaffolding materials in cultural knowledge learning began at a low level. Their autonomy in cultural knowledge learning was elevated as they gradually realized the scaffolding effects, and used them to address their learning obstacles in the sense.

The changes of EFL students' perceptions of scaffolding materials in autonomous learning was not a linear process, but a recursive one with students' revision and relearning. It is advised to allow the room for students to make errors and mistakes in their attempts of using supportive materials to scaffold their learning. Teacher's instant instructions were also important to encourage students to have positive perceptions of the learning.

Only three modules of online EFL learning were provided in this case study. A longer process of the investigation of EFL students' perceptions and uses of supportive materials should be taken into consideration, which may obtain more empirical evidence for future studies in related topics.

Acknowledgments

This work is supported by the Fundamental Research Funds for the Central Universities of China (Grant number: SWU2009501).

References

- [1] Altin, M., & Saracaloğlu, A. S. (2018). Effect of reading comprehension instruction enriched with cultural materials on English learning. *Cogent Education*, 5.
- [2] Ash, D., & Levitt, K. (2003). Working within the zone of proximal development: Formative assessment as professional development. *Journal of Science Teacher Education*, 14(1), 23-48.
- [3] Benson, P. (2013). *Teaching and researching: Autonomy in language learning*. New York, NY: Routledge.
- [4] Betts, G. (2004). Fostering autonomous learners through levels of differentiation. *Roeper Review*, 26(4), 190-191.
- [5] Blin, F. (2004). CALL and the development of learner autonomy: Towards an activity-theoretical perspective. *ReCALL*, 16(2), 377-395.
- [6] Brush, T. A., & Saye, J. W. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment. *The Journal of Interactive Online Learning*, 1(2), 1-12.
- [7] Dang, T. T. (2010). Learner autonomy in EFL studies in Vietnam: A discussion from sociocultural perspective. *English Language Teaching*, 3(2), 3.
- [8] De Guerrero, M. C., & Villamil, O. S. (2000). Activating the ZPD: Mutual scaffolding in L2 peer revision. *The Modern Language Journal*, 84(1), 51-68.
- [9] Dunn, W. E., & Lantolf, J. P. (1998). Vygotsky's zone of proximal development and Krashen's i+ 1: Incommensurable constructs; incommensurable theories. *Language learning*, 48(3), 411-442.
- [10] Han, Y. J. (2018). Flipping tech-enhanced, content-based EAP courses with online content. In *Innovations in Flipping the Language Classroom* (pp. 203-220). Singapore: Springer.
- [11] Hegelheimer, V., & Lee, J. (2012). The role of technology in teaching and researching writing. In M. Warschauer, H. Reinders, & M. Thomas (Eds.), *Contemporary computer-assisted language learning* (pp. 287-302). London, England: A&C Black.
- [12] Ge, J., Xiong, C. P., & Xiong, Y. P. (2016). Proposal and Evaluation of an SNS-Based Model for Learning of English as a Foreign Language. In *International Conference on Blending Learning* (pp. 163-174). Cham, Switzerland: Springer.

- [13] Khaliliaqdam, S. (2014). ZPD, scaffolding and basic speech development in EFL context. *Procedia-Social and Behavioral Sciences*, 98, 891-897.
- [14] Lantolf, J. P., & Appel, G. (1994). *Vygotskian approaches to second language research*. Santa Barbara, CA: Greenwood Publishing Group.
- [15] Levitt, F. (2017). Exploring the use of MALL with a scaffolded multi-sensory, structured language approach to support development of literacy skills among second-chance EFL learners at a technological-vocational secondary school in Israel (Doctoral dissertation). Retrieved from <http://sro.sussex.ac.uk/72418/1/Levitt%2C%20Fern.pdf>
- [16] Li, D. N. (2017). Autonomy in scaffolding as learning in teacher-student negotiation of meaning in a university EFL classroom. *Chinese Journal of Applied Linguistics*, 40(4), 410-430.
- [17] Lin, H., & Chen, T. (2007). Reading authentic EFL text using visualization and advance organizers in a multimedia learning environment. *Language Learning & Technology*, 11(3), 83-106.
- [18] Lin, C. C., & Tseng, Y. F. (2012). Videos and Animations for Vocabulary Learning: A Study on Difficult Words. *Turkish Online Journal of Educational Technology-TOJET*, 11(4), 346-355.
- [19] Lim, C. J., & Lee, S. (2007). Pedagogical usability checklist for ESL/EFL e-learning websites. *Journal of Convergence Information Technology*, 2(3), 67-76.
- [20] Luhach, S. (2016). Content analysis of process based writing in web-supported environment at bits Pilani and its possible implications. *BELT-Brazilian English Language Teaching Journal*, 7(1), 64-79.
- [21] Ohta, A. S. (2000). Rethinking interaction in SLA: Developmentally appropriate assistance in the Zone of Proximal Development and the acquisition of L2 grammar. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 51–78). Oxford, England: Oxford University Press.
- [22] Oliver, K., & Hannafin, M. J. (2000). Student management of web-based hypermedia resources during open-ended problem solving. *The Journal of Educational Research*, 94(2), 75-92.
- [23] Opperman, A. (2016). The application of culturally-relevant instructional scaffolding techniques into English language learning (Doctoral dissertation). Retrieved from <https://search.proquest.com/openview/dbd0a034d9e5f20c79dd4837/1?pq-origsite=gscholar&cbl=18750&diss=y>.
- [24] Safadi, E., & Rababah, G. (2012). The effect of scaffolding instruction on reading comprehension skills. *International Journal of Language Studies*, 6(2), 1-38.
- [25] Shi, L., Delahunty, J., & Gao, X. (2018). Constraints preventing Chinese EFL teachers from putting their stated beliefs into teaching practice. *Professional Development in Education*, 1-16.
- [26] Smith, K., & Craig, H. (2013). Enhancing the autonomous use of CALL: A new curriculum model in EFL. *CALICO Journal*, 30(2), 252-278.
- [27] Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children*, 23(3), 34-41.
- [28] Yen, A. M. N. L. (2018). The influence of self-regulation processes on metacognition in a virtual learning environment. *Educational Studies*, 1-17.

Appendices A

Example: Learning Module 2: Australian inventions

Supportive material 6: the audio script

The screenshot shows a digital learning interface for 'Australian inventions'. At the top, there is a navigation bar with 'Linguacces' and two buttons: '首页' (Home) and '微课程' (Micro-course). Below this, the page title 'Australian inventions' is displayed. There are three main tabs: 'Video', 'Radio program', and 'Letter to the Editor'. The 'Radio program' tab is currently selected. On the left side, there is a video player interface with playback controls (play, pause, stop, previous, next) and two buttons: 'Script' and 'Notes'. The 'Script' button is highlighted. On the right side, a 'Script' window is open, displaying a dialogue between Jack and Peter Potts. The dialogue discusses various Australian inventions, including the gramophone, the black box, the gramophone, the torpedo, the splayd, and the washing down. The script is formatted with speaker names in bold and their dialogue in regular text.

Appendices B

Guide questions for interviews:

1. For what purpose did you use supportive materials for EFL learning?
2. What do you think of supportive materials in your EFL learning?
3. What effects supportive materials had on your EFL learning?
4. How did you use supportive materials in your EFL learning?
5. How did you solve your learning problems in your EFL learning?
6. What do you think of the linguistic content (grammar and vocabulary) in supportive materials?
7. What do you think of the intercultural content in supportive materials?
8. Do you have any expectation of supportive materials?