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Comparing Synchronous and Asynchronous Learning Environments during Process of Learning German as A Third Language in Terms of Enhancing Students' Metacognitive Awareness

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Abstract

The present study dealt with exploring to what extent asynchronous virtual learning environment (ASVLE) and synchronous virtual learning environment (SVLE) enhance students' metacognitive awareness in L3 German learning process. During a five-week intervention, the students of the experimental group were taught L3 German synchronously through the BigBlueButton web conferencing system. In contrast, course notes, video-recordings were shared on Moodle Learning Management System (MLMS) asynchronously with those of the control group. The study was conducted on 72 undergraduates and assessed based on the pre-and post-tests of the Metacognitive Awareness Inventory (MAI) and semi-structured interviews. The findings indicated that SVLE improved the MAI scores of students in the experimental group. In addition, the findings obtained from the interviews revealed that the interaction between student-instructors in SVLE increased the students' motivation and engagements into the courses compared to ASVLE. As for ASVLE, there was no evidence about the enhancements of the students of control group in terms of metacognitive awareness before and after intervention. Transactional distance and poor quality of the relationship between students and instructor caused students to give up learning L3 German.

Keywords: German as a third language, metacognitive awareness, asynchronous and synchronous learning environments, Moodle Learning Management System, non-linguistics undergraduates

1. Introduction

The question of whether metacognition has an important effect on enhancing learners' awareness of managing their cognitive processes and organizing their own learning strategies in second language (henceforth L2) acquisition has received a growing attention from scholars for four decades. To answer this question, many researchers focused on the investigation of a series of teaching methods in terms of learners' metacognitive awareness in L2 acquisition such as flipped classroom (Yilmaz & Boydas, 2017), metacognitive strategy instruction (Teng, 2016, 2018, 2019, 2020), reflective journaling (Alt & Raichel, 2020), e-video portfolio environment (Altıok et al., 2019). Such innovative initiatives are often concerned with the delivery of various metacognitive instructions in the traditional classroom setting, including various prompts how to organize learners' cognitive process and how to use their own learning strategies to achieve a specific task in the face of difficulties experienced during L2 English learning process. In addition, the research on the integration of digital technologies into the learning process and the exploration of the effectiveness of their possible potentials on learning outcomes of learners and their metacognitive awareness includes the comparison of traditional classroom setting with learning environments equipped with educational technologies. However, almost nothing has been said on the issue of what it means to use virtual platforms in enhancing learners' metacognitive awareness in language acquisition.

The flexibility of virtual platforms has created a field for educational research. The concept of virtual platform, which has gained a growing interest for the last ten years (Chen et al., 2020), is often referred to as online learning in the literature. Especially, its importance has increased even more with the outbreak of the COVID-19 pandemic all over the world. Although online learning has been addressed in the context of distance education as a research topic of foreign language studies in many countries for many years, it has never been seen before that

face-to-face education has completely been moved to online virtual platforms compulsorily. Online learning was conducted synchronously and asynchronously during this process. However, it may be said that some challenges such as design of course contents, assessment and administration of exams and learning outcomes, and engagement of learners into online courses were experienced by both learners and instructors. In the context, it is essential that learners are metacognitively aware of the nature of this new learning settings in order to overcome the difficulties in question. Particularly, learners with different levels of metacognitive awareness may show different academic performance and success while learning L2 (Teng, 2020). Moreover, students with poor metacognitive skills may fail in L2 acquisition, and have to struggle more in online learning, traditional face-to-face learning, and learning settings integrated with different technologies (see Melissa Ng Lee Yen, 2018; Bacon & Mackinnon, 2014; Azevedo et al., 2004). Students with low level of metacognitive awareness may fail to develop cognitive strategies and control their own learning process during the process of their L2 acquisition. Therefore, metacognitive skills, control of learning, autonomy of students, and regulation of cognitive process can be acquired and developed in online virtual platforms (Barker & Gossman, 2013; Jewitt et al., 2011; Kistsantas & Chow, 2007; Yen et al., 2005; as cited in Melissa Ng Lee Yen, 2018).

To overcome this issue, the present study compared synchronous virtual learning environment (SVLE) and asynchronous virtual learning environment (ASVLE) in order to explore their impacts on students' metacognitive awareness during L3 German learning process. SVLE involved a synchronous learning process in which online courses were supported by a web conference system. In contrast, ASVLE was a learning environment in which video-recordings were delivered to the students. The students had the opportunity to access course contents on Moodle Learning Management System (LMS) of the university whenever they wanted. The comparison of two different virtual learning environments in terms of students' metacognitive awareness may be beneficial for students to increase the quality of their learning performances and gain the ability to regulate their cognitive processes while learning a foreign language. To better understand the issue in question, the present study attempted to explore the effect of SVLE and ASVLE on the enhancement of non-linguistics students' metacognitive awareness during L3 German learning process. For this purpose, the four main research questions addressed are as follows:

- To what extent does ASVLE enhance metacognitive awareness of students in the control group?
- To what extent does SVLE enhance metacognitive awareness of students in the experimental group?
- Is there any significant difference between the levels of the students' metacognitive awareness in both groups before and after the intervention?
- What are the students' views on learning L3 German in SVLE and ASVLE in terms of metacognitive awareness?

2. Literature Review

2.1 Metacognitive Awareness in L2 Acquisition

The concept of metacognition, first introduced by Flavell (1979), is defined as the ability of an individual to control and direct his/her own thoughts and cognitive processes (Reisoğlu et al., 2020; Maftoon & Alamdari, 2020; Scott & Berman, 2013; Livingstone, 2003; Brown, 1987; Flavell, 1979). In broader sense, the metacognition deals with individuals' awareness for using various learning strategies and organizing the learning processes (Teng 2020). In doing so, it requires using high-level skills such as planning, using appropriate strategies and skills, making predictions about individuals' own performance, and adjusting their learning levels in order to solve a problem (Pei & Suwanthep, 2019). However, some psychologists and scholars (e.g., Üstünbaş, 2020; Scott & Berman, 2013; Livingstone, 2003) claimed that the existing definitions of metacognition include a conceptual complexity. Therefore, the literature in question has witnessed new attempts to redefine the concept of metacognition. These efforts took place without rigid definitions, instead, metacognition was addressed from different dimensions (Öztürk & Kurtuluş, 2017). What's certain, however, is that many researchers (e.g., Alt & Raichel, 2020; Kallio et al., 2018; Mastrothanais et al., 2018; Bergey et al., 2015; Veenman et al., 2014; Nelson, 1996) agree on the two basic components of metacognition - knowledge of cognition and regulation of cognition - coined by Schraw and Dennison (1994).

Knowledge of cognition pertains to the awareness of distinguishing what should or should not be done, and what is exactly right or wrong (Alt & Raichel, 2020). This knowledge is gained through cognitive processes, and it refers to the process of controlling cognitive activities and achieving cognitive goals (Murphy, 2008; Young & Fry, 2008). It involves three of the eight factors representing the metacognitive awareness as follows: declarative, procedural, and conditional knowledge (Schraw et al., 2006; Schraw, 1998; Schraw & Dennison, 1994).

Declarative knowledge allows an individual to be aware of what affects his/her cognition, by using various variables such as strategy, skill, and task (Alt & Raichel, 2020; Teng, 2020; Hughes, 2019; De Backer et al., 2011; Veenman et al., 2006; Schraw, 1998; Schraw & Dennison, 1994). An individual with declarative knowledge can determine what influences his/her learning performance and can decide what cognitive strategies and skills he/she should use in order to surmount a specific task. As for procedural knowledge, it is the awareness of how an individual should follow the learning process to perform a specific task, and therefore what methods and techniques he/she should use to improve learning performance (Alt & Raichel, 2020; Hughes, 2019; De Backer et al., 2011; Schraw, 2001). This enables an individual to accomplish a task, by choosing the appropriate strategies within his/her knowledge in learning process. Finally, conditional knowledge seeks an answer to the question of why and when various cognitive strategies should be used (Alt & Raichel, 2020; Altıok et al., 2019; Larkin, 2009; Yore & Treagust, 2006; Hartman, 2001; Schraw & Moshman, 1995; Schraw & Dennison, 1994). In this way, an individual can rationally use appropriate cognitive strategies and apply appropriate usage procedures of strategies in the face of a situation that is likely to occur in the learning process.

Regulation of cognition means conscious monitoring which includes control of both cognitive and emotional processes (Maftoon & Alamdari, 2020). An individual is aware of choosing appropriate learning strategies and adapting them to his/her own learning and cognitive processes. According to Alt and Raichel (2020), metacognitive regulation is a process in which an individual constantly evaluates what he/she knows and what he/she should know. To enable an individual to solve the problems encountered throughout learning process, it develops a regulation mechanism against possible problems that may arise (Khosa & Volet, 2014; Sart, 2014; Livingstone, 2003). In doing so, it follows some cognitive process and strategies. Schraw and Dennison (1994) defined them as five factors of metacognitive regulation as follow: planning, knowledge management, debugging, monitoring and evaluation. Planning refers to the process of choosing appropriate strategies and allocating the right cognitive resources to accomplish a specific task (Teng 2020; Altıok et al., 2019; Schraw & Moshman 1995; Schraw & Dennison 1994). Information management requires the use of a variety of skills and strategies, such as organizing, summarizing, and elaborating information (Schraw & Dennison 1994). Debugging is a strategy for understanding and fixing performance errors. Monitoring enables an individual to manage his/her cognitive processes while performing a task and to determine his/her performance in the learning process (Teng 2020; Schraw & Dennison 1994). Finally, evaluation is a process in which an individual assesses his/her own learning performance and the strategy chosen during learning process (Teng 2020; Alt & Raichel 2020; Schraw & Dennison 1994).

Many researchers (e.g., Anderson, 2002; 2012; Zimmerman & Schunk, 2011; Lyn et al., 2011; Veenman et al., 2004; Garner & Alexander, 1989) suggested that L2 learners need advanced metacognitive awareness to monitor their own cognitive processes and to organize appropriate cognitive strategies against various external factors affecting the improvement of language skills. In the context, a great effort was devoted to the investigation of the effect of metacognitive awareness on the acquisition of the four main language skills (Üstünbaş, 2020; Negretti, 2012; Vandergift, 2005; Sheorey & Mokhtari, 2001; Jun Zhang, 2001). The findings of the previous studies (e.g., Reisoğlu et al., 2020; Qin & Zhang, 2019; Teng & Reynolds, 2019; Negretti, 2012) presented an optimistic picture that learners with high level of metacognitive awareness had knowledge about foreign language teaching approaches and methods while learning a second language (especially L2 English) and used it to manage their own cognitive processes and strategies.

Based on the assumption that constructing a text is a cognitive process (Teng, 2016, 2020; Hacker et al., 2009), the relevant literature indicates that the correlation between L2 learners' metacognitive awareness and the writing performance was widely investigated (e.g., Teng, 2016, 2018, 2020; Beals, 2016; Negretti, 2012, 2015; Nguyen & Gu, 2013; Hertzog & Dunlosky, 2012). Related to this, Hacker, Keener and Kircher (2009) argued that metacognitive awareness enables L2 learners to solve the problems experienced in L2 writing process. On the other hand, Teng (2019, 2020) suggested that metacognitive strategies such as planning, organization and evaluation should be taught so that L2 learners can accomplish a specific writing task. In doing so, metacognitive guidance and feedback should be conveyed to learners throughout L2 writing process (Teng, 2019; Ruan, 2013). This enables learners to become aware of how to control their cognitive knowledge and make use of cognitive resources efficiently while writing a text (Negretti, 2012; Weigle, 2005). Thus, learners can identify their own weaknesses and strengths in L2 writing and acquire their own self-awareness (Ruan, 2013; Silva & Brice, 2004).

Another main focus of L2 studies paid attention by many scholars was the issue of whether teaching metacognitive strategy had an impact on learners' listening performance. Previous studies indicated that there was a significant correlation between listening skills and metacognitive awareness. They were the empirical studies supporting the idea that metacognitive awareness can be increased in the traditional classroom

environments (e.g, Maftoon & Alamdari, 2020; Wallace, 2020; Vandergrift & Cross, 2018; Wang & Treffers-Daller, 2017; Goh & Hu, 2014; Rahimirad & Shams 2014; Zeng, 2012; Vandergrift & Goh, 2012; Vandergrift & Tafaghodtari, 2010; Goh, 2008, 2002; Mareschal, 2007; Vandergrift et al., 2006; Vandergift, 2005; Goh, 1998). The findings revealed that L2 learners can develop more awareness about the factors affecting their listening and learning processes and learn new strategies from both their teachers and their friends (Vandergrift & Goh, 2012; Goh, 2008, 2010; Veenman et al., 2006). However, there were also studies reported that metacognitive strategy training had negative effects on improving students' listening skills (e.g., Graham & Santos, 2015; Cross, 2011). For example, Cross (2011), in his study conducted with advanced level L2 English learners, reported that metacognitive instruction had no significant effect on improving their listening skills. In the context, some scholars (e.g., Bozorgian, 2014; Vandergrift & Tafaghotari, 2010) suggested that learners can only benefit from dimensions of metacognitive awareness such as planning, evaluation, and problem-solving rather than improving their metacognitive awareness during the L2 listening process.

Soon after the introduction of metacognition into educational research (Flavell, 1979), considerable attention was paid to this concept. Since then, many empirical studies (e.g., Hong-Nam & Page, 2014; Zhang, 2010; Koda, 2007; Cohen, 2007; Griffith & Ruan, 2005; Sheorey & Mokhtari, 2001) were carried out to explore the effect of metacognitive awareness and strategic reading on the development of L2 reading competence. The findings pointed out that the mastery of learners in metacognitive reading strategies helps them improve their reading skills in L2. This requires raising learners' motivation and choosing appropriate subject of reading text (Üstünbaş, 2020; Pintrich, 2002). Thus, learners can highly become aware of how to control their cognitive processes and what strategies to use in reading comprehension (Zhang et al., 2008; Pintrich, 2002; Brenna, 1995).

However, the relevant literature indicates that studies on the correlation between speaking skills and metacognitive awareness are widely lacking compared to other language skills. In general, the relevant studies acknowledged that metacognitive knowledge offers a higher potential for improving learners' speaking skills in L2 acquisition (Idris, 2019; Tan & Tan, 2010). Research showed that metacognitive instruction, especially for young children, had a significant impact on the development of speaking skills (Nakatani, 2005; Kaderavek et al., 2004). In addition, individual characteristics were a determining factor in language learners' use of metacognitive strategies (Tan & Tan, 2010; Zhang & Goh, 2006). Related to this, Goh and Taib (2005) argued that individual characteristics such as age, gender, and language levels affected the level of L2 learners' metacognitive awareness and played an important role in regulating their own cognitive processes and choosing appropriate strategies while speaking in L2. They also reported that learners' speech autonomy in L2 was associated with the enhancement of metacognitive awareness. In doing so, learners evaluated themselves and chose appropriate strategies to improve their speaking performance. Learners with high level of metacognitive awareness improved their speaking skills, by identifying their own strengths and weaknesses in order to make it easier to overcome speech problems in L2 (Idris, 2019; Mavropalias & Andronidi, 2017; Nakhalah, 2016; Ghapanch & Taheryan, 2012; Pintrich & Shunk 2002).

Research provides a broad insight that metacognition is a key factor for managing a successful L2 acquisition process and presents a variety of assumptions that metacognitive knowledge should be taught to learners to regulate and assess their L2 learning processes. Many scholars (e.g., Doğan & Tuncer, 2017; Kim, 2013; Wenden, 1998) also emphasize that learners' knowledge of foreign language teaching approaches and methods and the integration of this knowledge into their own learning processes depend on metacognitive awareness. It is essential so that learners can perform a better learning performance and increase their academic success (Öz, 2016; Batang, 2015). To summarize, the studies, examining the link between metacognition and foreign language learning, underline that metacognitive awareness has an important effect on the development of foreign language skills. For this, they argued that metacognitive knowledge and strategy instruction should be provided to L2 learners.

2.2 Synchronous and Asynchronous Virtual Learning in L2 and Metacognitive Awareness

The minimal dimensions of digital technologies, and the increasing quality and the effectiveness of their features have diversified online virtual learning technologies. Especially, the widespread use of Web 2.0 technology in online learning (Yılmaz & Keser, 2016) has offered the synchronous and asynchronous learning approaches. Synchronous learning enables face-to-face interaction in a virtual environment via mostly videoconferencing systems and enables both instructors and learners to collaborate in real time (Lenkaitis, 2020; Healey, 2016). Previous studies (e.g., Strang et al. 2013; Falloon, 2011; Hrastinski, 2008) show that L2 learners have a positive trend in participating in online learning environments due to the opportunity for instant feedback and interactive communication performed in synchronous virtual environments. Furthermore, the findings indicate that synchronous virtual learning enhances learners' sense of connection with instructors and other peers

(Francescucci & Rohani, 2019; Watts, 2016). On the other hand, asynchronous virtual learning lacks opportunities to communicate with instructors, learners, and peers due to its flexible nature. In view of existing conditions, learners monitor learning process themselves and exhibit help-seeking behavior (Melissa Ng Lee Yen, 2018). This leads to a decrease in learners' participation in online sessions and asynchronous virtual learning remains a problem (Hew et al., 2010). The perception to get help from peers is considered as the reason of the unwillingness for asynchronous virtual learning (Wang, 2018; Melissa Ng Lee Yen, 2018). However, the flexibility to access learning materials regardless of place and time (Alkan & Bümen, 2020) can encourage shy learners to express themselves better in disputations on asynchronous learning platforms, compared to synchronous virtual learning (Yılmaz & Keser, 2016; Swain, 1996).

In recent years, web conference systems as the most important educational tool of virtual learning environments are widely used in L2 acquisition. These systems allow instructors to create virtual classrooms in which they can conduct the L2 courses synchronously or asynchronously. In doing this, instructors create meetings or courses equipped with various online resources such as real-time sharing of videos, files, instant messaging, and screen in order to promote the regulation and the exchange of L2 learners' knowledge. The findings of the previous studies on the use of web conference systems in L2 acquisition pointed out the positive effect of Zoom sessions on the academic performances of L2 English learners (e.g., Ayoub Al Maalouf, 2019; Chen et al., 2005; Wang & Chen, 2007; Harris & Hofer, 2009), the improvement of writing and reading skills in L2 English (Grosz-Glunchman, 2013; Ochonogor et al., 2012), and their effective use by the pre-service English teachers in creating course content (Lenkaitis, 2020). In general, the literature offers rich contents for the studies on English as a foreign language. However, there are also studies in the literature to examine the design of different web conference systems and their effectiveness in teaching L2 other than English. For example, Marull and Kumar (2020) designed and implemented an online Spanish program via VoiceThread events and MySpanishLab on Canvas, including two synchronous courses remoted by the language coaches. At the end of the intervention process, they administered a questionnaire to the L2 Spanish learners to explore their views on the design and the effectiveness of the online program in question. The findings showed that the learners attending synchronous Spanish courses were satisfied and the system was highly effective in improving their language skills and cultural knowledge. On the other hand, Ogbonna, Ibezim, and Obi (2019) conducted an empirical study on cognitive achievement in word processing with asynchronous and synchronous e-learning modes with secondary school students aged 10 to 12 years. They found that teaching word processing in both virtual learning environments cognitively increased students' academic achievement. However, they revealed that students taught through asynchronous e-learning showed higher cognitive achievement than those taught through synchronous e-learning. The findings of this study showed that there was no significant difference in the scores of the students in practical skill acquisition taught by synchronous or asynchronous e-learning with cognitive achievement test of word processing. Accordingly, they reported that there was no significant interaction effect between the student's gender and the average scores for acquiring practical word processing skills and the learning modes. This means that gender difference does not affect students' ability to gain word processing skills through e-learning modes.

However, to the author's best knowledge, amount of research is limited in the literature that address the issue of how online asynchronous and synchronous virtual learning environments affect L2 learners' metacognitive awareness. Current research completely remained outside the field of language learning studies. While addressing the issue of metacognition, they focused on comparing asynchronous learning with face-to-face learning (e.g., Yilmaz & Baydas, 2017; Sun, 2015; Herreid & Schiller, 2013; Michalsky et al., 2007; Cheung & Hew, 2004) or on influence of just synchronous platforms on learners' metacognitive awareness (e.g., Zheng et al., 2018; Ashenafi; 2017; Reinholz, 2016). Both online virtual learning environments may have positive or negative effects in terms of metacognitive awareness. In the context, studies on aforementioned issue are still needed.

3. The Present Study

3.1 Research Approach

The present study adopted a quasi-experimental design to explore the effects of synchronous and asynchronous virtual learning environments on undergraduates' metacognitive awareness during the learning process in German as a third language. All of the participants had not the opportunities to participate in online German courses in which the instant contents and the multimedia tasks were shared synchronously. Therefore, control and experimental groups were used during the virtual learning process. To examine the intervention results, the multiple sources of data collection were utilized, that is, metacognitive awareness inventory (MAI) and semi-structured interviews.

3.2 Participants

The participants (N=72; 29 men, 43 women) were the fourth-year non-linguistics undergraduates majoring in Tourism Management enrolled in a German III course in a state technical university in Turkey in the fall semester of 2020-2021 academic. All of the students have learned English as a second language since secondary school. According to the pre-test survey, their average year of learning English fell between 9 and 11 years with a mean of 9.5 years. On the other hand, they have learned German as a third language (L3) at university for three terms. However, they could learn L3 German only for one semester face to face in the traditional classroom environment. As of March 2020, face-to-face education has temporarily suspended due to COVID-19 pandemic, and the students had to attend German courses on the distance education platform of the university. Prior to the research, all students were contacted by e-mail and an online meeting was held to inform them about the aims and scope of the present study. However, the author observed that students experienced difficulties in adapting to online L3 German courses, and accordingly, there were a severely low student engagement in the first two weeks of the compulsory transition from face-to-face to distance education. Therefore, high participation of students in the research represented a crucial factor in minimizing potential problems that may adversely affect the intervention process. To overcome this issue, the students in both groups were informed that their participation in the pre-and post-tests and the five-week online German course would be reflected in the worth 40 % worth of their final exam grade. Then, they were divided into the experimental and control groups. They were not randomly assigned to the groups. The quality of the internet connection was the determinative factor in the distribution of students into groups. Therefore, the students who did not have internet connection problems were assigned to the experimental group (N=35). The others were defined as the control group (N=37). Before and after the intervention, the pre-and post-tests of MAI were administered to the students in both groups online. The students of the experimental group participated in the German III course synchronously on the virtual learning platform. In contrast, the students in the control group learned asynchronously.

3.3 Intervention Procedure

This section includes the intervention procedures of the present study. The integration of online virtual learning environment into the curriculum of both groups was presented in detail.

3.3.1 Online German III Course

Online German III course involved a well-planned learning process of the German prepositions. The author, in his study called "*Learning Difficulties in German as a Third Language Experienced by Turkish Undergraduate Students*", found that Turkish non-linguistics undergraduates had low awareness of distinguishing the German prepositions, especially while adjusting possessive pronouns and the definite or indefinite articles to the German case system (Tanir, 2020). The German language system includes four different types of prepositions: accusative, dative, genitive, and two-case (both accusative and dative). Prepositions telling place, time and direction are very complicated for the learners of German language (Douglas, 2020). Therefore, teaching the prepositions in two different virtual learning environments may be a functional word mediator that leads the students to be aware of their potentials regarding the metacognitive skills, as well as language skills and vocabulary acquisition. To achieve this, the German prepositions were taught online to the students during five weeks. The course contents designed by sharing sources such as pdf, video and note sharing on the digital whiteboard of the BigBlueButton was delivered synchronously and asynchronously by the author. One of the four types of the prepositions was taught each week. In the fifth week, the relevant subject was revised.

3.3.2 Learning Environments

The present study focused on examining the effects of two different online virtual learning environments in L3 German learning process on students' metacognitive awareness. These learning environments were designed synchronously and asynchronously on Moodle learning management system (LMS). All interventions such as online meetings, course notes, activities, instructions, pre-and post-test were delivered by the author through Moodle LMS. Thanks to the Moodle LMS, the author could keep track of which student accessed the course contents and how much time they spent for learning L3 German.

To conduct German III course and engage remote students online, BigBlueButton, a web conferencing system being integrated into the Moodle LMS was used. This system enabled both students to synchronously attend online courses and the author to create video-recordings delivered asynchronously. During the intervention, different virtual classrooms were created for each week. In doing so, separate names were assigned to them for both control and experimental groups. For example, the online course for the experimental group was configured as "28 October-Week 1-German Prepositions with Accusative-Synchronous Online Course". In contrast, the control group was specified as "28 October-Week 1-German Prepositions with Accusative-Asynchronous Online

Course".

3.3.3 Control Group

German III course was held asynchronously with the students of the control group. Course notes and exercises created in pdf format were made available to students on the Moodle LMS. The course recitation about weekly topics were videotaped using the BigBlueButton web conferencing and the video-recordings were shared with students on the Moodle LMS. To answer students' questions about the topics, a chatting room was used on the Moodle LMS. Course feedback was given to them asynchronously.

3.3.4 Experimental Group

The students of the experimental group were exposed to the synchronous learning process. To better distinguish the positive or negative changes in students' metacognitive awareness levels in SVLE and ASVLE, German III course was instructed through BigBlueButton, one of the most preferred web conference systems in higher education, adhering to the characteristics of synchronous learning. The author, the instructor of the relevant course, created a virtual classroom on Moodle LMS 10 minutes before course hour, and the notification was sent to the students. The students accessed online courses synchronously by using their personal computers or their mobile devices such as smartphone, tablet pc and laptop. The PDF files and videos of course content was synchronously shared with students on the whiteboard of BigBlueButton. The contents were supported with activities which manage students to improve their listening, writing, and speaking skills. To put it more precisely, the traditional learning process in the classroom environment was moved to the online virtual platform. There was a mutual interaction between the students and the author. The course contents and feedbacks were eventualised instantly, and any attempt other than the synchronous online courses was avoided.

3.4 Instrumentation

3.4.1 Metacognitive Awareness Inventory (MAI)

To measure the levels of the students' metacognitive awareness, Metacognitive Awareness Inventory (MAI) which Schraw and Dennison (1994) developed and proved its validity, was used as a data collection tool in the present study. The instrument includes a total of randomly arranged 52 items, representing the eight factors of metacognitive awareness under two main components of metacognition as follows: knowledge of cognition and regulation of cognition. The knowledge of cognition includes three factors: declarative knowledge (8 items), procedural knowledge (4 items), conditional knowledge (5 items). On the other hand, regulation of cognition is based on five factors: planning (7 items), information management strategies (10 items), comprehension monitoring (7 items), debugging strategies (5 items) and evaluation (6 items) (see Schraw & Dennison, 1994, pp. 462-463).

MAI was developed in English as a 5-point Likert-type scale. In the present study, the Turkish version of MAI adapted by Akin, Abaci and Cetin (2007) was administered to the students online before and after the virtual learning process. Scoring ranged from 1 and 5 points. The students were asked to mark one of the variations on the items of MAI as follows: always false (1 point), sometimes false (2 points), neutral (3 points), sometimes true (4 points) or always true (5 points). The reliability of the MAI was ensured with a Cronbach’s alpha coefficient of 0.78 for the pre-test and 0.83 for the post-test. This means that it has a good internal consistency.

3.4.2 Semi-structured Interview

Semi-structured interviews were conducted to capture students' perceptions of how learning L3 German in online synchronous and asynchronous virtual learning environments affects their metacognitive awareness. Using a random sampling, a total of 10 students, including 5 students from both the experimental and control groups, were selected. After the intervention, interviews were administered to each student synchronously on the Moodle LMS through BigBlueButton web conferencing. Interviews lasted 20 minutes on average for each student.

The semi-structured interview form consisted of 8 questions in total, corresponding to each factor of 8 factors of metacognitive awareness coined by Schraw and Dennison (1994). The questions were prepared by the author. To ensure trustworthiness, questions were consulted on a lecturer in the field of German Language Teaching and a specialist in educational sciences. Considering feedback from consultors, interview form was finalized. The interview questions were as shown in Table 1:

Table 1. Interview Questions administered to the students in both groups after interventions

Components	Factors	Interview Questions
Knowledge of Cognition	Declarative knowledge	While learning German on virtual platforms, can you realize what affects your learning German? If yes, please explain?
	Procedural knowledge	Can you decide what methods and techniques you should use to increase your learning performance in German learning process? If yes, please explain?
	Conditional Knowledge	Can you decide when and how to use the learning methods and techniques you know? If yes, please explain?
Regulation of Cognition	Planning	How do you plan the process of choosing and applying the appropriate learning strategies while learning German?
	Information management	How do you organize, detail, and summarize your foreign language learning strategies and skills?
	Monitoring	When you experience any slowdown in your learning performance, what strategy would you develop to increase it?
	Debugging	How can you determine the pace of your performance while learning German and manage your learning process?
	Evaluation	How would you evaluate your learning strategies and learning performance while learning German?

3.5 Data Analysis

The present study sought to explore the effects of learning L3 German in the virtual learning environments on students' metacognitive awareness. To achieve the research goals, qualitative and quantitative data were collected from the students in control and experimental groups before and after intervention.

The obtained quantitative data were analysed using IBM SPSS Statistics 20.0 program. In the analysis process, various statistical tests were conducted according to the type of data. Initially, the Shapiro-Wilks test run to check the normality of all statistical data sets. It was revealed that the pre-and post-test results showed the normal distribution in both groups (pre-test> .208; post-test> .212). After conducting test of normality, the parametric paired samples t-test was run to analyse the pre-test and post-test scores of both groups. Each group was measured twice, resulting in pairs of determination of whether the mean difference between pre-and post-test before and after intervention (https://www.statisticssolutions.com/). Finally, parametric independent samples t-test was used for pair comparison of different groups. Accordingly, the significance level of the relevant variable for the groups was determined as $p < .05$.

The qualitative data obtained from interviews were analysed using a six-step process of thematic analysis developed by Braun and Clarke (2006). To ensure trustworthiness of analysis, the interview transcripts were analysed by author and a lecturer from the Department of German Language Teaching. First, transcripts were read and reread to identify potential topics. In the second phase, the initial codes were generated that could be relevant for answering the research question. The starting codes were underlined and listed. These codes gave an overview of all data from the study during the analysis. Third, the codes reported in the transcript of each interview were reviewed and key potential topics were identified that reflect the views of each student. The fourth phase deals with the comparison of the data set. The topics were refined and those that did not match the relevant research question were discarded. Then each topic was defined, spelling out exactly what it was supposed to convey, and understanding the data. In this context, a concise and easily understandable name was given for each topic.

4. Results

In this section, the results of the present study were addressed under two subheadings as follows: results of statistical analysis and results of thematic analysis.

4.1 Results of Statistical Analysis

4.1.1 RQ.1. To What Extent does ASVLE Enhance Metacognitive Awareness of Students in Control Group?

To explore whether there was a significant increase on their metacognitive awareness, a MAI was administered to students in control group before and after ASVLE intervention. As shown in Table 2, the results of the paired sample t-test comparing the pre-and post-tests of MAI showed that there was not statistically significant difference between the tests ($t = -.261$, $p > .796$). The findings indicated that asynchronous virtual learning did not have a statistical effect on enhancing students' metacognitive awareness.

Table 2. Paired sample t-test result for control group

Test	N	Mean	SD	T-value
Pre-test	37	166.75	24.69	-.261
Post-test	37	168.16	25.83	

*p <.05.

Table 3 shows the eight factors of Metacognitive Awareness Inventory (MAI) representing metacognitive awareness. Accordingly, the paired samples t-test analysis of MAI showed that there were no significant differences on students' perceptions of declarative knowledge (t = 1.641, p > .110), procedural knowledge (t = -.346, p > .731), conditional knowledge (t = -.036, p > .971), planning (t = -.420, p > .677), information management (t = -.660, p > .513), monitoring (t = -.477, p>.636), debugging (t = -.981, p > .333) and evaluation (t = -.610, p > .546) at the level of significance p <.05.

Table 3. Paired sample t-test results of MAI for control group

Factors	Pre-test		Post-test	
	N=37		N=37	
	Mean	SD	Mean	SD
Declarative knowledge	25.56	4.74	23.72	5.12
Procedural knowledge	13.37	2.39	13.59	2.84
Conditional Knowledge	16.21	3.17	16.24	3.31
Planning	22.70	4.78	23.13	4.69
Information management	32.18	5.67	33.10	6.98
Monitoring	21.83	4.03	22.24	3.45
Debugging	15.86	3.19	16.62	3.54
Evaluation	19.00	4.18	19.48	3.78

*p <.05.

From these implications, it may be assumed that ASVLE has no impact on enhancing the metacognitive awareness of students in L3 German learning process. In addition, asynchronous learning gives an idea that it does not perform well in terms of declarative knowledge, which is one of the factors that enhances metacognitive awareness.

4.1.2 R.Q.2. To what extent does SVLE enhance metacognitive awareness of students in experimental group?

Table 4 shows the paired sample t-test result for metacognitive awareness of students in the experimental group. Before and after SVLE intervention, there was a significant difference between pre-and post-test scores of the students (t= -3.780, p<.001). This indicated that synchronous virtual learning had a significant impact on enhancing metacognitive awareness of the students in experimental group during L3 German learning process.

Table 4. Paired sample t-test result for experimental group

Test	N	Mean	SD	T-value
Pre-test	35	168.31	21.46	-3.780
Post-test	35	189.11	20.37	

*p <.05.

As shown in Table 5, the eight factors of metacognitive awareness were statistically analysed in further detail. The statistical results showed that there were no significant differences on students' perceptions of procedural knowledge (t = -1.529, p > .135) and planning (t = -1.156, p > .276). This means that students cannot acquire the procedural knowledge skills that they need to follow their own learning processes and improve their learning performance while learning L3 German in SVLE, consequently they have difficulty in planning how to allocate the right cognitive resources. The reason to explain this finding can be shown that metacognitive guidance was not provided to the students during learning process. However, there was a significant difference in the factors of declarative knowledge (t = -2.561, p < .015), conditional knowledge (t = -5.512, p < .000), information management (t = -2.622, p < .013), monitoring (t = -4.552, p <.000), debugging (t = -3.295, p < .002) and evaluation (t = -2.146, p < .039).

Table 5. Paired sample t-test results of MAI for experimental group

Factors	Pre-test N=35		Post-test N=35	
	Mean	SD	Mean	SD
Declarative knowledge	24.80	4.20	28.34	5.86
Procedural knowledge	12.97	3.01	14.20	3.33
Conditional Knowledge	15.45	3.09	19.20	2.32
Planning	23.54	4.60	24.91	4.55
Information management	33.42	5.90	36.74	5.11
Monitoring	22.02	3.80	25.88	2.42
Debugging	16.40	2.85	18.48	2.85
Evaluation	19.68	3.57	21.34	2.63

*p <.05.

Therefore, SVLE helped students of the experimental group perceive the factors such as declarative knowledge, conditional knowledge, information management, monitoring, debugging and evaluation, affecting the development of students' metacognitive awareness.

4.1.3 R.Q.3. Is There Any Significant Difference between the Levels of the Students' Metacognitive Awareness in Both Groups before and after the Intervention?

Before learning L3 German in ASVLE and SVLE, the pre-test of MAI was administered to students in both groups to check whether they had a homogeneity in terms of metacognitive awareness. As shown in Table 6, the independent t-test results showed that the experimental and control groups did not have a significant difference between their pre-tests ($t = -.286$, $p > .776$). Accordingly, the two groups were equally metacognitively aware before the current interventions.

After the interventions, MAI was administered again to students in both groups. The independent t-test results showed that there was a significant difference for the post-tests between the experimental and control groups ($t = -3.832$, $p < .000$). This indicated that SVLE had a statistically significant effect on enhancing students' metacognitive awareness.

Table 6. Independent t-test results of pre-and post-test between both groups

		Pre-test			Post-test		
Groups	N	Mean	SD	T-value	Mean	SD	T -value
Experimental	35	168.31	21.46	-.286	189.11	20.37	-3.832
Control	37	166.75	24.69		168.16	25.83	

*p <.05.

The independent t-test was run to examine the factors affecting the metacognitive awareness of students in both groups. As shown in Table 7, the post-test results indicated that significant differences occurred in students' perception of declarative knowledge (t= -3.544, p<.001), conditional knowledge (t= -4.362, p<.000), information management (t= -2.528, p<.014), monitoring (t= -5.206, p<.000), debugging (t= -2.464, p<.016) and evaluation (t= -2.427, p<.018). However, there was no significant differences on their perceptions of procedural knowledge (t= -.827, p>.409) and planning (t= -1.632, p>107). These results suggest that SVLE can significantly affect the factors of metacognitive awareness, excluding procedural knowledge and planning.

Table 7. Independent t-test results of MAI for post-tests between both groups

			Pre-test			Post-test		
Factors	**Groups**	**N**	**Mean**	**SD**	**T-value**	**Mean**	**SD**	**T-value**
Declarative Knowledge	Control	37	25.56	4.74	.728	23.72	5.12	-3.544
	Experimental	35	24.80	4.20		28.34	5.86	
Procedural Knowledge	Control	37	16.21	3.17	1.028	13.59	2.84	-.827
	Experimental	35	15.45	3.09		14.20	3.33	
Conditional Knowledge	Control	37	13.37	2.39	.632	16.24	3.31	-4.404
	Experimental	35	12.97	3.01		19.20	2.32	
Planning	Control	37	22.70	4.78	-.759	23.13	4.69	-1.632
	Experimental	35	23.54	4.60		24.91	4.55	
Information Management	Control	37	32.18	5.67	-.907	33.10	6.98	-2.528
	Experimental	35	33.42	5.90		36.74	5.11	
Monitoring	Control	37	21.83	4.03	-.206	22.24	3.45	-5.206
	Experimental	35	22.02	3.80		25.88	2.42	
Debugging	Control	37	15.86	3.19	-.750	16.62	3.54	-2.464
	Experimental	35	16.40	2.85		18.48	2.85	
Evaluation	Control	37	19.00	4.18	-.748	19.48	3.78	-2.427
	Experimental	35	19.68	3.57		21.34	2.63	

*p <.05.

The statistical results show that SVLE enhances students' metacognitive awareness during L3 German learning process compared to ASVLE. On the other hand, it was revealed that ASVLE does not significantly affect students' metacognitive awareness.

4.2 Results of Thematic Analysis

The students' views were sought to better understand the effects of the SVLE and ASVLE on their metacognitive awareness during L3 German learning process. In this regard, this section provides a broad insight into the main themes that emerged from the data of the two different groups outlined separately for each virtual learning environment.

4.2.1 Results of Thematic Analysis related to SVLE

The students' answers of the SVLE were categorized into four main themes: instructor behavior, curriculum design, readiness, and self-confidence.

Instructor Behavior: Students who learned L3 German in SVLE often highlighted the instructor behavior when evaluating the interviews. All of them considered it as a way that they become aware of what affects their L3 German learning process in SVLE. For example, Mervenur commented on this as following:

> *Looking for new ways to further improve my knowledge on German language on this virtual platform depends on your way of teaching. Because your constant telling us what and how to learn makes me look for new ways of learning in my mind.* [SVLE-Interview, Mervenur]

The fact that instructor gives each student the right equally to speak German in SVLE enables students to attend online courses actively. This also encourages high participation of students in courses taught in virtual environments. As the student's motivation increases, it causes them to develop new methods and techniques, especially carry out methods they think are appropriate for them in the learning process to improve their German vocabulary and speaking skills.

> *Your efforts to help us learn German in lessons encourage me to increase my interest in the lesson and to look for different resources and learning environments to improve my field. I am especially aware of my speaking skills, and I need to improve my vocabulary so that I can speak better.* [SVLE-Interview, Büşra]

On the other hand, the instructor behavior enables students to acquire the skills to use learning strategies while learning German in SVLE. In doing so, it helps them decide when and how they should be used.

> *Your understanding of language teaching based on improving speaking skills actually meets my expectations in foreign language learning. This encourages me to put effort into how I can better improve my German speaking skills. For this purpose, while learning German prepositions, we determine a topic with my friend and establish dialogues among ourselves. In this way, we realized that our speaking skills improved over time*

and the permanence of our learning outcomes increased. [SVLE-Interview, Çağla Pınar]

Moreover, the organization and follow-up of the learning processes of the students is related to the instructor behavior.

I am making my plans, taking into account your advice on how we should learn while learning German. [SVLE-Interview, Mert]

The students agreed that SVLE provides more flexibility to engage in interactive learning activities than the traditional classroom setting. In particular, the feeling of comfort in SVLE encouraged them to spend more time learning German outside of online courses, and they searched for various course materials on the Google search engine to consolidate what they had learned. They provided substantial evidence that the instructor not only provided guidance in conducting the online course, but also in selecting appropriate course content and using Google search criteria effectively. This raised awareness of how students should themselves assess learning inputs and outcomes in SVLE. Batuhan commented on this regard as follows:

I think that learning German in SVLE is more effective than learning face to face. I constantly have to think about a lot of things like what I wear today or how weather will be today when I have to go to university. This makes me constantly focus on other things outside of the courses. I make myself a coffee at home and only focus on the course. There is nothing else that occupies my mind. As for the course, I believe there is more intimacy between you and us on online platforms. This inevitably increases my interest in the lesson and encourages learning. I browse through many resources on Google, following the learning advice you gave us in class. If these sources don't give a clear answer to the question in my head, I'm out. [SVLE-Interview, Batuhan]

As mentioned above, the instructor behavior enabled students to demonstrate a high metacognitive awareness while learning L3 German in SVLE. While presenting evidence on all factors affecting the knowledge of cognition, the students paid attention to only three factors related to the regulation of cognition, such as planning, knowledge management, and evaluation. Accordingly, it can be said that one of the main factors in increasing students' metacognitive awareness in the SVLE is the behavior of the instructor.

Curriculum Design: All students commented on the curriculum designed for learning L3 German in SVLE. In a consistent way, they stated that the curriculum design was appropriate for their proficiency level in German and helped them have an insight into what they should learn:

The course notes and exercises you uploaded to Moodle LMS give me an idea of what and how I should learn. Especially, the way you plan the lesson helps me to find direct answers to the questions in my mind in my one-to-one studies after online courses [SVLE-Interview, Mervenur]

In addition, curriculum design enabled students to adopt a positive attitude towards SVLE and increase their motivation towards online courses. As a result, they provided evidence that they gained the ability to develop their own learning methods and techniques while learning German. Batuhan answered the question of whether learning L3 German in SVLE helped him gain the ability to decide which methods and techniques he should use to improve his learning performance, as follows:

At first, I had difficulty in learning German in SVLE because I thought for years that face-to-face learning was more effective. However, the way the online course is taught and the course notes that I can understand increased my motivation. This provoked me to find new ways to improve my German. For example, I watch German movies with German subtitles to improve my listening skills. This allows me to understand how German words are pronounced and improve my vocabulary. [SVLE-Interview, Batuhan]

However, the interviews showed that there was a divergence of students' perceptions of whether their learning strategies for current SVLE provide the same impact on other virtual learning platforms. To tackle a particular issue, the students had ability of when and how to use methods. They had a dilemma about cross-platform integration. Çağla Pınar clarified this divergence as follows:

I take consideration into the curriculum schedule in learning German. For example, I am not trying myself to learn how to use German prepositions according to their types, without taking lessons from you. In doing so, I first retrack the online courses at first and then I review course notes, and finally I do exercises to assess whether I understand the subject. This is my way and method of learning. But I'm worried if I can use this method effectively on other platforms as well. [SVLE-Interview, Çağla Pınar]

Even though Çağla Pınar's comments seem to reflect the dilemma about the conditional knowledge, it is clear that she can metacognitively regulate her learning process in L3 German. It may be assumed that the appropriate

curriculum design acts as a mediator in perceiving the metacognitive factors such as planning, information management, debugging and evaluation. In other words, the SVLE enhances the students' metacognitive awareness during the L3 German learning process.

Readiness: All students emphasized a variety of cognitive patterns such as the previous experiences with distance learning, positive attitudes towards learning German in SVLE and high motivation. These provided remarkable evidence for students' readiness to learning German in SVLE. In this context, readiness facilitates students' metacognitive awareness of adopting new learning environments.

> *When I was in my freshman year, I was simultaneously taking compulsory Turkish courses I and II from the distance education platform of our university. I am familiar with this learning style, although the curriculum is not designed as effectively as in the online German course. Since I did not have any difficulties in adaptation, I had no problems using the distance education platform, accessing the course contents, and following the online courses. This gives an idea of what strategy I should follow while learning German in this environment.* [SVLE-Interview, Büşra]

As quoted above, Büşra's prior knowledge of Moodle LMSs ensured her to exhibit appropriate behaviors while learning German in SVLE. Most of the students stated that their readiness for web-based learning applications was capable of evaluating their interests, learning methods and the current system:

> *While learning English, I would prefer to learn from online sources rather than printed sources. Since I am very familiar with such online learning resources, I think I know very well, for example, how to search for unknown words, where and how to find resources that I think are suitable for my language level. This makes learning German in SVLE more meaningful than learning it face to face.* [SVLE-Interview, Mert]

> *I signed up for an e-certificate program last year. As the name suggests, the courses related to this certificate program were conducted remotely. Likewise, BigBlueButton web conferencing was used for online courses. Since I am used to this system, I have an idea about how I should learn to set my learning pace.* [SVLE-Interview, Batuhan]

> *Also, I am studying at the Open Education Faculty, Department of Business Administration. Some courses are taught synchronously. However, we, students, communicate with the instructor by writing from the chat room. We do not have the opportunity to communicate verbally on that platform. Actually, this situation helped me to learn and evaluate these platforms and to develop a learning method.* [SVLE-Interview, Çağla Pınar]

The fact that the students already have learning experience in such platforms clearly shows that they are already ready for these learning environments. This makes it possible for the students to organize their learning strategies and cognitive processes. In other words, it's about their metacognitive awareness.

Self-confidence: All of the students commented on issues related to self-confidence. This included a variety of behavioral patterns such as sense of comfort, willingness to speak German, participation rates and requests for online courses. Students stated that learning German in SVLE increased their self-confidence. For example, with respect to this, Büşra said:

> *You constantly asked us to speak German during the online courses. This led me speak German. The more I want to speak, the more my self-confidence increases day by day.* [SVLE-Interview, Büşra]

A remarkable detail about self-confidence emphasized in the interviews is of particular importance. Mert said as follows:

> *Compared to face-to-face learning, learning German in SVLE makes me feel more comfortable. I refrain from my friends, especially in the classroom environment. The feeling of distance increased my self-confidence, especially in speaking and listening skills while learning German in SVLE. That's why I decided that speaking and listening skills are closely related while learning German and that I should focus more on developing these skills.* [SVLE-Interview, Mert]

As quoted above, Mert emphasized that SVLE has a significant impact on the development of listening and speaking skills. Shy students feel more comfortable at SVLE, which increases their self-confidence in performing specific learning tasks in German.

On the other hand, the high level of self-esteem in SVLE enabled the students to become aware of their abilities and develop their learning strategies in this context. Similarly, most of the students commented on this as follows:

> *I feel more comfortable in the SVLE. This encourages me to learn German. The more I achieve something in German, the more confident I become. The SVLE allows me to search for new working resources so that I can*

develop myself further. [SVLE-Interview, Batuhan]

4.2.1 Results of Thematic Analysis related to ASVLE

In the present study, student's views were sought to determine the effect of learning German in ASVLE on students' metacognitive awareness. As a result of the interview analysis, students' views were discussed and interpreted under three main themes as follows: retroactive interference, language anxiety and L2 English exposure.

Retroactive Interference: The students were asked whether they were aware of what affected their learning processes while learning L3 German in order to capture their perceptions of ASVLE in terms of metacognitive awareness. Most of the students stated that they had forgotten their prior knowledge about linguistic characteristic of German language. Some of them commented on this question as follows:

When I watch the video-recordings of the course, there are points that I do not understand. I cannot find new answers in my mind because I cannot get instant feedback to these questions. I am very confused about which of the German prepositions are dative and accusative, especially since I cannot exactly remember the cases of the German nouns I learned in the past. [ASVLE-Interview, İrfan]

When I have a question in face-to-face learning, I can ask the teacher directly and find answers to the questions in my mind. But I don't have such opportunity in ASVLE. While watching the video-recordings, I try to remember the missing information about the genders of the nouns in my mind through prepositions, but I cannot remember. Frankly, I have no idea what course I should take to learn them. [ASVLE-Interview, Bilge]

The genders of German nouns differ according to the case of nouns in a sentence. Due to the imperfect knowledge, this case resulted in the confusion of students who do not have good knowledge about the gender of German nouns. Alev commented on the issue as follows:

I am confused about the genders of German nouns. Especially their order in sentences and the diversification of the prepositions in the context of the genders causes dilemma. If I had learned face to face, I could somehow succeed it. However, the ASVLE makes me less interested in the course and decrease my enthusiasm to learn German. I want to learn the subject from my friends, but they do not also know it exactly. Therefore, I watch the video-recordings to just pass the course. [ASVLE-Interview, Alev]

As can be understood from the comments above, the students try to get help from their friends in ASVLE. When they do not get the feedback from the instructor or the peers whenever they want, their reluctance to learn German increase, and this causes a lack of motivation. The nature of ASVLE prevents the students from evaluating their own learning performance and developing new methods. In other words, the results showed that learning German in the ASVLE do not raise the metacognitive awareness of the students.

Challenges: The students interviewed often commented on the difficulties encountered during the L3 German learning process in ASVLE. They reported to have difficulty in focusing on the subject due to the lengthy of the video-recordings. In addition, they hesitated to ask the instructor about a subject they did not understand. This led an uncertainty of how to organize their learning process. Some of them expressed this situation as follows:

I get bored very quickly because the sound recordings are long. As such, I am reluctant to learn German. I do not necessarily want to develop any method or strategy for learning German. [ASVLE-Interview, Sezer]

When I do not understand the subject, I think I will ask you later because I cannot ask you questions immediately. but then I forget about it. This causes me to get away from learning German. [ASVLE-Interview, Gülçe]

I look at the lecture notes while watching the video-recordings. But there are always places I don't understand. I must definitely ask the instructor to understand the subject. Otherwise, I can't learn. This inevitably causes me to stay away from the subject and after a while I lose my connection with the lesson. [ASVLE-Interview, Bilge]

On the other hand, difficulties experienced in ASVLE caused students to disconnect from the normal learning process after a while. İrfan explained this situation as follows:

I do not perceive ASVLE as a learning. Because this is no different for me than videos uploaded to Youtube or other social media accounts. As such, I am detached without learning. And after a while I don't even feel the need to watch video-recordings anymore. this situation distracts me from the feeling of learning German. [ASVLE-Interview, İrfan]

L2 English Exposure: To remove the obstacles to the management of L3 German learning process in the ASVLE,

the students tried to benefit from their past experiences while learning L2 English. In broader sense, it was rather attempts to adapt learning strategies stemming from the linguistic characteristics of English to German. Thus, they ignored the linguistic characteristics of German. These results show that the learning strategies developed by the students in the English learning process have a negative impact on their learning experiences of other languages.

> *While trying to learn German, I generally tried to compare the language features of English with German. However, this confused me even more. Because English does not have articles like German. this had the opposite effect. Frankly, I have no idea what method I should follow.* [ASVLE-Interview, Gülçe]
>
> *When I was learning English, I usually learned by writing. because I am someone who learns by writing. Even if I watch video-recordings, there are some points that confuse me. I am in a dilemma right now.* [ASVLE-Interview, Alev]

The fact that students have been learning English for many years has led them to follow methods focused on learning English in learning German as a third language. However, the fact that each student has different learning styles has narrowed the intervention areas in the German learning process at ASVLE. This inevitably reduced the students' desire to learn German.

5. Discussion

The reality is that foreign language learning has gone on being carried out in physical settings or virtual platforms that individuals have the opportunity to access from the past. This led individuals to adapt themselves and develop new learning strategies, depending on the unique characteristics of each learning setting. Therefore, it was important to investigate to what extent he/she is metacognitively aware of regulating and managing his /her thoughts and cognitive processes during learning process in order to better understand the quality of a foreign language learning process of an individual. To explore the status of metacognitive awareness in the language learning process, previous research (Altıok et al., 2019; Yilmaz & Baydas, 2017; Zheng et al., 2018) compared traditional classroom environment with technology-oriented settings. However, for the first time, education compulsorily moved to virtual platforms worldwide due to the COVID-19 outbreak. The courses were usually carried out synchronously or asynchronously. The unorthodox new teaching setting necessitated the exploration of a new possible potential. That's why the present study aimed to explore to what extent the intervention carried out on SVLE and ASVLE enhanced the metacognitive awareness of non-linguistic undergraduates while learning L3 German. To provide a broader insight about the effectiveness of virtual environments on metacognitive awareness, multiple data sources were analysed, that is, quantitative and qualitative findings.

The quantitative data presented several major findings. First, the post-test MAI scores of the students of the experimental group were significantly higher than the pre-test MAI scores ($t= -3.780$, $p< .05$). However, there was no significant difference between the MAI pre-test and post-test scores of the students of control group ($t= -.261$, $p< .05$). It indicates that SVLE enhances the metacognitive awareness of students while learning L3 German. On the other hand, it suggests that ASVLE has no impact on students' metacognitive awareness. These results reveal that conducting foreign language courses and giving instant feedback synchronously can improve students' metacognitive awareness. The relevant literature presents an optimistic picture showing that synchronously learning a foreign language has a positive effect on students' metacognitive awareness, though there are no studies comparing the effect of learning foreign languages in SVLE and ASVLE on students 'metacognitive awareness. In the context, the results closely aligned to those from the study by Altıok, Başer and Yükseltürk (2019), revealing that learning English as a foreign language through e-video portfolios had a significant impact on students' metacognitive awareness compared to face-to-face learning. Similarly, in their study related to peer assessment in synchronous and asynchronous discussions, Zheng et al. (2018) found that synchronous peer assessment statistically improved the students' metacognitive awareness. However, there are findings in favour of asynchronous learning, demonstrating that it has a significant impact on metacognitive awareness (Yilmaz & Baydas, 2017; Michalsky et al., 2007). One reason to explain these differences in the literature may be because they stem from different teaching contexts, learner types, education level, academic discipline, technological innovations. To author's thought, students' metacognitive awareness levels will differ depending on different academic disciplines and technological innovations.

Second, with respect to the eight factors of metacognitive awareness, the findings showed that there was a statistically significant difference between the MAI pre-and post-tests scores of the experimental group supported with SVLE excluding "procedural knowledge of metacognition" and "planning as a metacognitive regulation". Similarly, Altıok, Başer and Yükseltürk (2019) found that video portfolio technology did not

enhance debugging and declarative knowledge of students in L2 English learning process. Furthermore, in their study comparing collaborative online and face-to-face environments in terms of metacognition, Garrison & Akyol (2015) indicated that collaborative online environments did not promote metacognitive monitoring and information management of the students. Based on these findings, the present study suggested that the reason why SVLE did not have impact on improving the awareness of procedural knowledge and planning may be because metacognitive instruction or guidance were not provided to the students. However, Teng (2020) suggested that metacognitive instruction developed the awareness of metacognitive regulation whereas there was non-significant correlation between metacognition instruction and knowledge of metacognition. One reason to explain this finding may be that students have difficulty in building awareness to set what strategies and methods they should use in various teaching contexts. On the other hand, the findings indicated that there was no significant difference between the MAI pre- and post-test scores of control group in ASVLE in terms of the eight factors of metacognition. On contrast, a decrease was observed against the post-test in the students' perceptions of declarative knowledge. This means that students were not aware of what skills and strategies to use while organizing their cognitive processes. The reason to explain this finding may be suggested that low motivation stemming from the poor interaction between student-instructor in ASVLE and the lack of instant feedback on the subject taught during learning process gets the students off foreign language learning.

The qualitative findings were consistent with the statistical results. The findings from the interviews indicated that learning L3 German in SVLE improved students' metacognitive awareness. Accordingly, the improvement of students' metacognitive awareness while learning L3 German in SVLE was dependent on instructor behavior, curriculum design, readiness and self-confidence. First, the findings indicated that instructor behavior has an important factor in improving students' course engagements, motivation, and language skills. The quality of the relationship between instructor and students enabled students to acquire the ability to develop their own learning strategies and use them during the learning process. In the context, students devoted more time to learning L3 German and created their own learning contents. The students who were in close contact with digital technologies searched for course content, for example on the Google search engine, that they thought of being suitable for their learning goals. Second, curriculum design raised their awareness of especially how they should manage their own knowledge. In doing so, they paid attention to whether the course materials were suitable for their language level and whether they were capable of answering the questions in their mind. Third, all these efforts positively affected students' readiness levels. Readiness enabled students to easily adapt to learning German in SVLE. More precisely, it increased the rate and responsibility of attending online courses. This finding indicated that readiness as acquisition of behaviors for learning L3 German in SVLE was concerned with metacognitive awareness. Fourth, SVLE made the students highly self-confident. It increased the awareness of students with high level of self-confidence in the context of developing new methods and evaluating learning processes. With respect to ASVLE, the findings were in line with quantitative results. It reveals that the ASVLE had no impact on improving students' metacognitive awareness while learning L3 German. Besides, it suggests that metacognitive awareness correlated with all process of learning L3 German during the intervention in ASVLE. The inferences from the findings pointed out three factors, revealing that ASVLE affects negatively learning process in L3 German of the students, as follows: retroactive interference, challenges, and L2 English exposure. First, retroactive interference was related to forgetting previous knowledge of German and confusing new learning outcomes. Since the students did not synchronously attend courses in ASVLE, they were confused when they did not have the opportunity to immediately ask and get answers to the subjects that they had difficulty in understanding. Asynchronous learning caused students to disconnect from the learning process after a while. Second, students had challenges with understanding the courses and the way of actions of ASVLE. As a result, ASVLE was not seen by students as a real learning environment and process. In their own words, the students saw course notes and video-recordings shared in ASVLE as no different from the functions of online resources shared on social media or other platforms. Finally, it is necessary to clarify L2 English exposure, one of the most important findings revealed from interviews. This means the transfer of the learning difficulties experienced by students in learning L2 English to the German learning process. Students who could not manage their language learning processes and performances in ASVLE resorted to past English learning experiences. This situation caused students to have a negative attitude towards learning German and to decrease their motivation.

The findings of the present study were closely compatible with those from the study by Offir, Lev and Bazelel (2008), investigating the effect of teacher-student relationship on students' successes and satisfactions in the process of synchronous and asynchronous learning as a distance learning model. They argued that synchronous learning increased the students' learning success and the quality of education. In doing so, students paid much attention to materials delivered by instructors and realized how important it was to remember these in order to be

successful. However, they found that synchronous learning reduced the quality of communication between students and teachers, leading to misunderstandings and reduced students' learning performance. Similarly, in their meta-analysis study, Means et al., (2013) concluded that the students who collaborated with their peers and teachers on online platforms showed greater learning performance than those who learn independently online. Hrastinski (2008) concluded that synchronous discussions increased students' motivation and, students were more eager to interact with each other than those in asynchronous discussions. Zheng et al., (2018) suggested that students acquired higher order thinking skills and demonstrated a tendency to learn from their peers after synchronous discussions. This was an indication that their metacognitive awareness was improving. According to Schraw and Dennison (1994), metacognitive awareness enables students to become aware of their weaknesses and strengths. This study demonstrated that students who learn foreign languages in SVLEs can decide what affects their learning process, how and when they should use learning strategies. They were able to identify the factors affecting their learning performances, and to develop new strategies in response to current conditions, by reviewing and evaluating all learning processes and learning strategies. However, students who learned foreign language in ASVLE felt unable because they could not instantly get feedback when they had difficulty in understanding new course subjects. After asynchronous learning, they knew less about their learning situations and cognitive processes. They could not monitor, plan, organize their learning processes and recognize their weaknesses and strengths. However, there are positive results showing that ASVLE increases students' metacognitive awareness. In their studies comparing asynchronous learning embedded within metacognitive instruction with face-to-face learning embedded within metacognitive instruction, Mickalsky, Zion and Mevarech (2007) found that students became more aware of their cognitive processes in the asynchronous learning environment as they had more time to think to accomplish a task. They argued that this arised from the communication types in the different teaching contexts. They suggested that especially written communication in asynchronous environments improved students' metacognitive awareness much more than oral communication in face-to-face learning environments.

6. Conclusion

The level of metacognitive awareness has positive or negative effects on students' language learning processes. Students need to organize their cognitive processes and have adequate knowledge in order to realize their own skills and potentials. Therefore, designing technology-enhanced learning environments and curriculum are suggested to increase the level of students' metacognitive awareness. The SVLE designed using web conferencing system can be exemplify for this type of learning approach. The effectiveness of synchronous and asynchronous learning environments in terms of metacognitive awareness during foreign language learning was investigated in the present study. In conclusion, it was determined that the level of undergraduates' metacognitive awareness increased while learning foreign language in SVLE. Despite some limitations of the present study, it is hoped that SVLE will encourage and guide further research in different research contexts based on the results obtained. Conducting research with more participants and samples will make the demonstrability of SVLE's positive effect in terms of metacognitive awareness stronger.

7. Limitations and Suggestions for Further Research

The present study had some limitations as in every research. First, the participants consisted of the students who had similar language level, cultural background, and education level in relatively small sample size. Therefore, students with similar levels of language may have shown similar development in terms of metacognitive awareness while learning a foreign language in SVLEs. In addition, it has not been investigated to what extent the gender variable will affect the results of the present study. Therefore, generalizing the results should be avoided. Further research should focus on research involving students from different age groups and different cultures.

Second, metacognitive instruction was not given in the present study. Metacognitive instruction may cause different results in two different virtual learning environments. In addition, students' attitudes towards learning foreign languages in the virtual learning environments may have different results in their levels of metacognitive awareness. Therefore, it will be interesting to investigate the effect of students' attitudes on their levels of metacognitive awareness.

Finally, the present study indicated that SVLE increased the levels of students' metacognitive awareness. It is recommended to investigate the effect of the level of metacognitive awareness on the development of students' language skills. Therefore, future research may investigate whether SVLE will improve these aspects of students.

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