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# Turkish-speaking students' writing performance in German as a foreign language (GFL) and their metacognitive awareness: An online collaborative writing instruction combined with metacognitive guidance

**Ahmet Tanır**

School of Foreign Languages, Iskenderun Technical University, 31200, İskenderun-Hatay, Türkiye.

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**ABSTRACT**

The present study investigates the effects of online collaborative writing instruction combined with metacognitive guidance on students' writing performance in German as a foreign language and their metacognitive awareness. For this purpose, a total of 90 students are randomly and equally divided into three groups: group with online collaborative writing instruction combined with metacognitive guidance (*on*-CWI+MG), group with face-to-face collaborative writing instruction combined with metacognitive guidance (*f2f*-CWI+MG) and group with in-class individual writing activities without metacognitive guidance (*i*-WRITE). Results revealed that the *on*-CWI+MG group showed the best writing performance and there was a complex interaction with the *f2f*-CWI+MG group in terms of metacognitive awareness. Moreover, the two basic levels of metacognitive awareness, knowledge about cognition and regulation of cognition, had a predictive effect on writing performance, with knowledge about cognition having a larger effect. Relevant implications for better understanding online collaborative writing instruction combined with metacognitive guidance are discussed.

**Keywords:** Metacognitive guidance, collaborative writing, online, face-to-face, German as a foreign language.

E-mail: ahmet.tanir@iste.edu.tr

## INTRODUCTION

Writing is a complex process that requires the coordination of cognitive and fine motor skills (Steinlen, 2018), in which learners use appropriate linguistic tools to express their thoughts (Rösler, 2012) and to achieve perfection in writing tasks (Kuyyogsuy, 2019). Writing has a psychological significance for learning (Nováková, 2020; Müller, 1997) and apparently helps learners not only to produce well-written texts but also to use their ability to better control their learning process and overcome difficulties (Tseng et al., 2006). In doing so, learners need to effectively use writing skills and strategies such as “the ability to rapidly access lexical items, a positive attitude towards writing, knowledge of text features, cognitive skills, visual-spatial performance” (Myhill and Fisher, 2010; cited in Steinlen, 2018, p. 43). The acquisition of such advanced thinking skills enables students to adapt effectively to the modern world (Akcaoglu et al., 2023), and to become active learners and successful writers.

However, the importance of German writing competence has long been emphasized and does not seem to enable learners to become more effective writers, especially in L1 (native or first language) and L2 (second or foreign

language) contexts. Moreover, there is a view among learners that writing is frustrating and difficult, especially in German as a foreign language (hereafter GFL) (Ortner, 2016). Some studies (Jaworska, 2011) adopting a corpus-based learning approach have reported that GFL learners are not yet able to fully produce academic texts in German and avoid complex structures, writing only simple texts on topics of their own interest. One reason that explains this finding could be the lack of students' knowledge and use of writing strategies (Ruan, 2014). More specifically, traditional writing instruction does not seem to prepare learners to overcome these challenges and develop critical thinking skills in writing (Torrance and Jeffery, 1999). To overcome such challenges, GFL learners may need guidance on metacognitive strategies to activate and sustain their thoughts, behaviors, and emotions while writing a text in German.

Many researchers (Hacker et al., 2009; Hayes, 2012; Hertzog and Dunlosky, 2012; Nguyen and Gu, 2013; Beals, 2016; Teng, 2016, 2019, 2020, 2022) claim that there is a direct relationship between the levels of students' metacognitive awareness and their writing performance. According to Teng (2020), metacognitive guidance enables learners to achieve their writing goals and make decisions about how to use them effectively. However, learners' writing performance and the quality of the writing they produce are influenced by individual differences (Steinlein, 2018) and different sociocultural affiliations (Teng 2022; Daiute and Dalton, 1993). Therefore, in addition to metacognitive instruction, encouraging learners to collaborate with their peers in GFL writing can be another way to improve their writing skills and enhance their performance. In this way, learners can successfully manage processes such as accessing exact information, reasoning, problem-solving, evaluating, and revising while producing a text in the target language (Storch, 2013) and become aware of their own thoughts (Hew and Cheung, 2010).

However, collaborative learning in a traditional classroom alone may not lead to significant improvement in GFL writing. Incorporating metacognitive writing strategies into collaborative learning may compensate for the limitations of individual differences (Teng, 2020), but may not help maximize the potential of metacognitive guidance. However, there is evidence that the different learning environments designed for GFL courses may result in learners having different levels of metacognitive awareness and language performance. For example, Tanır (2022) found that shy learners who could not express themselves in German in the traditional classroom performed better on online learning platforms and their metacognitive awareness statistically improved. Moreover, in 2020, for the first time in world history, a pandemic called COVID-19 threatened the entire human race, educational institutions were unexpectedly suspended, and quarantine procedures were initiated worldwide. In other words, face-to-face (F2F) education, which has been uninterrupted since the existence of mankind, was temporarily halted for the first time. In this context, some researchers (Gacs et al., 2020; Oskoz and Smith, 2020) have hypothesized that the COVID-19 pandemic could affect learners' and teachers' perceptions and knowledge of online foreign language learning and permanently change the future design and implementation of foreign language teaching methods, materials, and programs (Jin et al., 2022). Therefore, there are very few studies in the literature on how incorporating online collaborative writing instruction combined with metacognitive guidance can improve the writing performance and metacognitive awareness of not only GFL learners but also those of different second or foreign languages. To address this research gap, the present study aims to investigate the effects of online collaborative writing combined with metacognitive guidance on the writing performance of Turkish-speaking GFL students from different disciplines and their metacognitive awareness. The results are related to the development of writing skills and knowledge as well as different metacognitive and collaborative learning skills in GFL classrooms. Thus, increasing learners' metacognitive awareness in different learning environments can improve German learning and interaction with peers.

## LITERATURE REVIEW

### Metacognition and collaborative learning

Collaborative learning has been a research topic frequently addressed by educational researchers and psychologists since learner engagement and intrinsic motivation have gained prominence in foreign language learning (Hendrich, 2021). Collaborative learning is much more than working in groups or completing a task (Jeong and Hartley, 2018). The focus is on teaching collaborative strategies for overcoming challenges in a heterogeneous work environment composed of individuals with different learning backgrounds and characteristics (Hendrich, 2021; Green, 2007). In doing so, teachers act as guides or facilitators in collaborative learning environments (Teng, 2020; Slavin, 1980).

However, groups of learners may need to put in much more effort than is required for effective collaboration in collaborative learning environments (Järvelä et al., 2021). Some researchers (Näykki et al., 2017; Zambrano et al., 2019) have suggested that groups of learners may face emotional and social problems that interfere with the coordination of essential learning activities in such circumstances. One of the most important reasons for these problems may be that group members do not know what to do and how to behave when performing a task. Regarding this issue, Rogat and Adams-Wiggins (2014) pointed out that group members who fail to recognize challenging learning situations and the need to regulate them are unable to mobilize their strategy implementation

skills. In fact, this is where metacognition comes into play for effective collaboration.

Metacognition is defined as “the ability to control and direct one's own thoughts and cognitive processes” (Flavell, 1979; cited in Tanır, 2022, p. 169). According to Schraw and Dennison (1994), metacognition consists of two basic levels: knowledge about cognition and regulation of cognition. Accordingly, knowledge about cognition includes the ability to understand the strengths and weaknesses of an individual that affect his/her performance (declarative knowledge), the knowledge required to complete complex tasks (procedural knowledge), and the knowledge of how to use strategies to acquire knowledge (conditional knowledge) (Alt and Raichel, 2020). On the other hand, the regulation of cognition includes the selection of appropriate strategies and allocation of resources for learning (planning), a set of skills and strategies for organizing, elaborating, and summarizing information (information management), strategies for correcting errors in understanding and performance (debugging), self-assessment of the individual's ability to understand the goals of task performance (monitoring), and evaluation of task performance and learning efficiency (evaluation) (Maftoon and Alamdari, 2020). Thus, metacognition enables learners to monitor and adjust their cognitions, motivations, emotions, and behaviors at both individual and group levels (Hadwin et al., 2017). Clearly, groups of foreign language learners in collaborative learning environments can be enabled to recognize their social and motivational aspects through metacognition and successfully organize challenging tasks.

Metacognition is always an individual, internal, and mental process and is visible in the individual language learning process (e.g., I know what strategies I should use when writing). However, metacognition can emerge when the collaborative and socially shared embodiment of learning is externalized at the group level or in interaction with peers (cf. Järvelä et al., 2021). That is, learners can share their knowledge and strategies with other group members when they are faced with a difficult task. However, the extent to which peers value such contributions is important (Haataja et al., 2022). If knowledge sharing among peers in a group is ignored or disregarded, one cannot speak of effective group work and the possibility of developing effective collaboration (Khosa and Volet, 2014). Therefore, combining the collaborative foreign language learning process with metacognitive guidance can enable learners to acquire thinking skills and strategies that trigger peer collaboration.

As mentioned above, the literature draws an optimistic picture that collaborative learning plays an important role in solving complex problems, building arguments, processing information, and building deeper knowledge, which encourages group feedback. However, this is directly related to the tendency of learners with high metacognitive awareness to organize knowledge and use the right strategies. To tackle this issue, collaborative writing instruction should be combined with metacognitive guidance in different learning contexts. Thus, learners from different learning backgrounds can acquire the skills of collaboration, critical thinking and using appropriate strategies while writing in the target language.

**Metacognitive guidance and writing in the foreign language classroom.**

Previous studies (Teng, 2016, 2019, 2020, 2022) have concluded that metacognitive guidance helps to improve learners' writing performance and develop their thinking skills. Metacognitive guidance encourages students to monitor and self-regulate their thinking processes so that they can become successful writers (Alfaifi, 2022). More precisely, students are expected to be their own evaluators. In doing so, metacognitive knowledge is stored at the source level during writing and serves as a source of information for the successful completion of the writing task (Lee and Mak, 2018). However, writing is a learned individual activity (Khan, 2022), and a teacher does not play a supporting and guiding role in this process (Hyland, 2003). Therefore, he/she should take measures to increase learners' metacognitive awareness (Pun and Gao, 2023). To achieve this, he/she can teach a range of writing strategies such as planning, text writing, and giving and receiving feedback (Bai, 2015). In this way, learners are not only encouraged to use strategies but their metacognitive awareness can also be strengthened.

However, almost all of the research examining the effects of metacognitive guidance on writing has focused on English as a foreign language (EFL) or English as a second language (ESL). Results showed that ESL/EFL learners who received metacognitive guidance were able to integrate metacognitive strategies more easily into a new and more difficult writing task (Teng, 2016). For example, Hacker, Keener, and Kircher (2009) observed that EFL learners who received metacognitive guidance increased their metacognitive awareness and, accordingly, were able to solve the problems they encountered in the EFL writing process. Regarding this, Teng (2019, 2022) suggested that teaching metacognitive strategies such as planning, self-regulation and evaluation could be behind English learners' successful performance in a particular writing task. This view is supported by the findings of Nguyen and Gu's (2013) study, which investigated the effects of metacognitive guidance on Vietnamese ESL learners' writing skills. They offered learners guidance on metacognitive skills such as planning, monitoring, and evaluation, and the results showed that students who acquired the relevant strategies achieved significantly higher writing scores compared to those who did not receive metacognitive guidance. On the other hand, Graham's (2006) meta-analysis of studies on metacognitive instruction showed that teaching

metacognitive strategies had a large effect on improving EFL/ESL learners' writing performance, and this positive effect was maintained over a long period of time. Similarly, Torrance and Galbraith (2006) concluded that metacognitive instruction had a positive effect on making learners aware of the strategies they use while writing in a second language and on reducing their processing demands.

Overall, the studies mentioned above provide a wide range of evidence that metacognitive guidance increases EFL/ESL learners' metacognitive awareness, encourages them to use appropriate strategies, and improves their writing performance while writing in the target language. Thus, metacognitive guidance can help GFL learners improve their writing performance and follow their own learning process.

**Online vs face-to-face collaborative writing combined with metacognitive guidance in the target language**

Some researchers (Astrid et al., 2021; Pan, 2010; Skipper and Douglas, 2015) have suggested that teacher feedback does not improve writing performance, does not encourage learners to review their own errors, and does not develop their awareness of reviewing and reorganizing their own writing processes. The reason why there is a such negative argument against teacher feedback may be because learners do not understand the purpose of the teacher's corrections and simply copy the error corrections without paying attention to the feedback. However, Yalch et al. (2019) claim that learners become more critical through peer interaction and the quality of their written products improves thanks to the feedback. Apart from these two scenarios, some learners may not be able to provide useful feedback on their peers' contributions, or they may be reluctant to express themselves due to cultural differences and may not have full confidence in their teachers' feedback (Astrid et al. 2021; Balkaya and Dellal, 2022). Therefore, it cannot be assumed that bringing a group of learners together for a foreign language writing task guarantees that they will work and learn properly as a group or individually. To overcome this issue, Järvelä et al. (2021) suggest that learners must develop a collective cognitive interdependence scheme on how to effectively communicate and coordinate their actions in order to appropriately distribute the available task knowledge among the groups and benefit from the quality of each group member's participation in solving the problem at hand. This support should be aimed primarily at developing not only knowledge about cognition (declarative knowledge, procedural knowledge, conditional knowledge) but also a metacognitive awareness of the regulation of cognition (planning, monitoring, information management, debugging, evaluation) while performing a writing task in a foreign language.

Teachers can mobilize learners' metacognition by asking them to set their own learning goals and to self-monitor and review their language development while assessing the collaborative writing process in a traditional classroom. Research draws an optimistic picture of the effect of F2F-collaborative writing instruction and metacognitive guidance on EFL/ESL writing performance. For example, Teng (2016), in his research with Chinese undergraduate students, found that the combination of collaborative learning and metacognitive instruction provided the most effective results on EFL writing in a traditional classroom setting. On the other hand, Santelmann et al. (2018), in their qualitative study with 17 graduate students at a U.S. university, employed metacognitive awareness in classroom activities to develop self-regulation and text strategies related to writing strategies. They found that these F2F activities improved graduates' metacognitive skills and thus their writing performance. Similarly, Cho et al. (2010) conducted a study with 601 undergraduate and graduate students from three U.S. universities, focusing on peer mutual evaluation of the writing system by using the self-monitoring strategy, one of the metacognitive strategies. The results showed that students were intentional about using self-monitoring strategies during writing and improved their writing performance as a result. Bol et al. (2012), in their study of 82 high school students, investigated the effects of in-class writing activities on students' individual and group metacognitive awareness and learning performance. The results indicated that the metacognitive awareness and performance of those who received group metacognition training were higher than those who received individual training. On the other hand, Teng (2019) conducted a mixed-methods study with three different conditions (group feedback instruction, self-explanation instruction, control group without metacognitive instruction) to investigate the effect of metacognitive instruction on the writing performance of 120 Chinese undergraduate students in a traditional classroom. The quantitative results showed that the group feedback instruction had the statistically largest effect on students' writing performance. The qualitative results of the study showed that students who received group feedback guidance had high task awareness and improved their ability to use metacognitive strategies. In another study with 220 Chinese undergraduate students, Teng (2022) investigated the effects of metacognitive overload on metacognitive awareness and EFL writing scores. He created four practice conditions to compare the effects on students' metacognitive awareness and EFL writing performance and to evaluate the predictive effect of metacognitive awareness on writing: cooperative writing with prompts, cooperative writing without prompts, individual writing with prompts, and individual writing without prompts. Similar to the results of his previous studies, he confirmed that the cooperative group showed the greatest improvement in metacognitive knowledge and organization. Moreover, of the two dimensions of

metacognition, regulation of cognition was a more significant predictor of EFL writing outcomes than knowledge about cognition.

The above studies show the positive effects of F2F collaborative writing instruction combined with metacognitive guidance on EFL/ESL learners' written performance. However, there is almost no research investigating the effect of collaborative writing instruction combined with metacognitive guidance on learners' writing performance and metacognitive awareness in the target language. Previous studies have addressed issues such as collaboration in online learning environments, the impact of online modes on learners' motivation and likelihood to interact with peers online, and the comparison of various online modes in terms of developing metacognitive awareness. For example, Hrastinski (2008) concluded that synchronous discussions increase motivation and learners are more likely to interact with each other than asynchronous discussions. In their meta-analysis, Means et al. (2013) confirmed that learners who collaborate with peers and instructors on online platforms perform better than single learners of online learning. On the other hand, Zheng et al. (2018) found that concurrent peer assessments statistically improved learners' metacognitive awareness. Similarly, Tanır (2022) investigated whether there is a significant difference in individual metacognitive awareness of GFL students in synchronous and asynchronous environments. The results show that GFL students in synchronous learning environments are particularly inclined to use metacognitive strategies and that their metacognitive awareness improves. Moreover, some researchers who have compared the effects of F2F learning and asynchronous learning on metacognitive awareness (Michalsky et al., 2007; Yılmaz and Baydaş, 2017) have found positive results in favor of asynchronous learning. In contrast, Garrison and Akyol (2015) argued that collaborative online learning environments do not promote metacognitive monitoring and information management in individual and group learners. Regarding this, many studies (Wang, 2018; Melissa Ng Lee Yen, 2018; Alkan and Bümen, 2020; Järvelä et al., 2021) have reported that learners adapt quickly to online learning environments but share surprisingly drip-feed information after collaboration. One reason that explains these findings may be related to the fact that learners who are bare of metacognitive awareness encounter problems such as disorientation and low performance in online learning settings (Karaoglan Yılmaz, 2022; Tak et al., 2022). In addition, metacognition may be hidden and very difficult to measure in different learning contexts (Lee and Mak, 2018). Therefore, it is crucial to provide external online support and guidance to develop learners' metacognitive awareness.

As described above, while F2F-collaborative learning and metacognitive guidance have shown positive results as reliable teaching methods in the classroom, they are not fully established in online learning settings. Both collaborative and individual efforts have shown positive effects of metacognitive guidance, but most of them do not provide models for collaborative writing instruction combined with metacognitive guidance while performing writing a task in different learning settings. Research on metacognitive guidance and collaborative writing is increasingly paid attention and this is the focus of the present study.

### The present study

Collaborative learning and metacognitive guidance are closely related to instructional approaches (Teng 2020). Writing a text in German for learners can be a complex and hand-wringing process. Therefore, in the present study, it is thought that the challenges that stand in front of the learners of the German language, which is often referred to as “Life is too short to learn German”, to produce texts at the academic level can be overcome with collaborative writing instruction combined with metacognitive guidance. As mentioned above, many studies have concluded that the combination of metacognitive guidance and collaborative learning in-class writing activities improves learners' thinking skills, strategy use, and performance. However, there is no study investigating the effect of adapting this teaching approach to online learning settings on language learners' writing performance and metacognitive awareness. To the best of the author's knowledge, no attention has been paid to this topic in the context of foreign or second language teaching in the world or Turkey. In today's world, education and teaching are still perceived as activities that take place in traditional classrooms where learners and teachers come together. However, in learning platforms where learners are out of the classroom, the transactional distance is large and learning is done through collaborative technologies, not all measures have been taken to address their needs, learning goals, and thinking skills. To achieve the research objectives, the following questions were addressed in the present study:

- To what extent do the different teaching procedures improve GFL students' writing performance?
- To what extent do the different teaching procedures improve GFL students' metacognitive awareness?
- Is there a correlation between metacognitive awareness and GFL writing performance? If so, to what extent does it influence GFL students' writing performance?

## MATERIALS AND METHODS

### Research design

To investigate the effects of online collaborative writing instruction combined with metacognitive guidance on GFL

students' writing performance and metacognitive awareness, the present study adopted a quasi-experimental longitudinal study with pre-test/post-test/delayed post-test measures. The present study used quantitative data to obtain measurable information through statistical analysis and to assess the development of metacognitive awareness and writing performance validly and reliably in relation to independent variables. The independent variables of the study were online collaborative writing instruction combined with metacognitive guidance (*on*-CWI+MG), face-to-face collaborative writing instruction combined with metacognitive guidance (*f2f*-CWI+MG) and in-class individual writing activities without metacognitive guidance (*i*-WRITE). The dependent variables were the metacognitive awareness inventory and the writing tests. Two experimental groups (EG-1= *on*-CWI+MG; EG-2= *f2f*-CWI+MG) and one control group (*i*-WRITE) were formed for the study.

## Participants

Quantitative data were obtained from 90 fourth-year students (male = 38; female = 52) from three different academic disciplines (Aviation Management, Gastronomy and Culinary Arts, and Tourism Management) enrolled in the German IV course at a state technical university in Turkey. The participants were selected according to the quota sampling, one of the non-probability sampling methods. As the effects of the COVID-19 pandemic subsided, face-to-face classes resumed in the spring semester of the 2021-2022 academic year, but university administrators gave some departments a choice between continuing their courses in person or online. Therefore, aviation management students continued to learn German online, while those from the two departments in question were taught in person. The ages of the students ranged from 20 to 22 years old. Their native language was Turkish, and they learned English as a foreign language and German as a second foreign language. All students learned German to fulfill the language requirements of their department. Initially, 109 students were included in the present study, but 19 of them were excluded due to absenteeism and low writing proficiency. Finally, 90 participants were divided equally and randomly into three groups.

## Instruments

### *Writing tests before and after intervention*

To assess students' GFL writing competence, the argumentative essay, one of the most commonly required writing genres in universities at universities (Caulfield, 2021), was used as a writing test. An argumentative essay requires the students to research a topic; gather, construct, and evaluate evidence; and form a concise opinion on the topic (Purdue Online Writing Lab, 2022). For this purpose, the students were given a topic titled "*Being a Student in Turkey.*" They were asked to reflect on their university experiences and discuss what they could do to better prepare themselves for professional life and how their education could benefit them. With this in mind, it was assumed that this prompt could capture a wide range of content, language, and opinions (Doolan and Miller, 2012). The validity and reliability measurements showed that the writing test had an acceptable internal consistency for both the pre-test (Cronbach's $\alpha$ = 0.84) and post-test (Cronbach's $\alpha$ = 0.90), indicating that the results had high reliability (Tayyar and Dilşeker, 2012).

### *Delayed writing test*

The delayed writing test was administered to all students in the research group as a post-test four weeks after the end of the intervention phase. The purpose of this test was to assess the students' learning and skills throughout the writing program using a more difficult writing task. In contrast to the pre- and post-tests, this task required students to write an argumentative essay entitled "*The Use of Mobile Technologies in Foreign Language Learning.*" The goal was to give students the opportunity to use and assess their higher-order thinking and argumentation skills. The administration time and scoring system of this test were the same as the pre- and post-tests. The test showed acceptable internal consistency (Cronbach's $\alpha$ = 0.92).

### *Essay evaluation procedure*

A writing scale adapted from the CEFR German Writing Skills Assessment Rubric (Fasoglio et al., 2015) and the AP® German Language and Culture rubric for the argumentative essay (2018) was used to assess students' argumentative essays. The scale consisted of five components: task performance, coherence and cohesion, vocabulary, grammatical accuracy, and orthography. The scale's scoring system allowed five points for each component and the maximum score a student could receive was 25. The scoring was done by two highly experienced German teachers. To obtain consistent data for all components of the scale and to accurately predict the developmental process of students' writing skills, the raters were unaware of the treatment conditions of the assessment and the identity of the participants (Teng, 2020). Due to the high level of agreement between the two raters, a third rater was not requested.

### *Metacognitive awareness inventory*

In the present study, the Metacognitive Awareness

Inventory (MAI) developed by Schraw and Dennison (1994) was used to determine to what extent the levels of students' metacognitive awareness improved during the GFL writing process. However, the MAI focuses on general studies and therefore, its items were modified for this study to adapt them to metacognition in the context of writing in GFL classes. For example, the item "*I understand my intellectual strengths and weaknesses*" was changed to "*I understand my intellectual strengths and weaknesses while writing a text in German*." MAI consists of two basic levels: knowledge about cognition and regulation of cognition. The level of knowledge about cognition consisted of 3 sub-dimensions: declarative knowledge, procedural knowledge, and conditional knowledge. On the other hand, the regulation of cognition includes 5 sub-dimensions: planning, monitoring, information management, debugging, and evaluation. MAI contained a total of 52 items with "correct" and "incorrect" options. Each correct response was scored 1 point, and incorrect responses were scored 0 points. The total score for each dimension corresponded to the total score obtained from the subdimensions of the metacognitive awareness inventory. For example, declarative knowledge included 8 items. Those who answered each question correctly received a total of 8 points for that dimension. The pre-test (Cronbach's $\alpha$ = 0.81) post-test (Cronbach's $\alpha$ = 0.91) and delayed test (Cronbach's $\alpha$ = 0.88) scores for MAI had acceptable internal consistency.

## Intervention procedure

### *General information about the German IV-course*

The students in the three groups participated equally and fully in the German course IV. They were taught by a single lecturer, used the same textbook (MEMO Wortschatz- und Fertigkeitstraining zum Zertifikat Deutsch als Fremdsprache) and performed the same tasks. Moreover, this was the only German course offered at the university and apart from this course, the students had no opportunity to practice writing in German. Throughout the study, the groups were exposed to different teaching procedures. Experimental Group-1 (*on*-CWI+MG) received collaborative writing instruction combined with metacognitive guidance synchronously via the BigBlueBotton web conferencing system on the information management system designed for distance education programs of the university. Experimental Group-2 (*f2f*-CWI+MG) received the same curriculum face-to-face in a traditional classroom setting. In contrast, the students in the control group (*i*-WRITE) participated in in-class individual writing activities but did not receive metacognitive guidance.

### *Measures for the groups*

The GFL writing instruction, which was designed as a combination of metacognitive guidance and collaborative writing instruction for the present study, covered a period of 10 weeks for both experimental groups. By the nature of collaborative learning, six groups of 5 students each were formed in both experimental groups.

During the first week, the experimental groups participated in sessions, lasting 2 hours of instruction (45 min each), on metacognitive guidance in the learning contexts in question. The students were informed about the two basic levels of metacognition (knowledge about cognition and regulation of cognition) and their importance for writing was emphasized. In this context, they were introduced to the metacognitive self-inquiry and self-regulation principles identified for the present study (Table 1).

**Table 1.** Principles to promote metacognitive awareness in GFL writing.

| Basic levels | Subdimensions | The questions promoting metacognition in the GFL writing process |
|---|---|---|
| Knowledge about cognition | Declarative knowledge | (1) Can you identify what influences your written expression in German? If so, take notes. |
| | Procedural knowledge | (2) Can you decide what methods and techniques you should use to improve your writing performance in German writing process? If yes, please explain your reasoning? |
| | Conditional knowledge | (3) Can you decide when and how to use the methods and techniques you know when writing something in German? If so, please explain. |
| Regulation of cognition | Planning | (1) How do you plan the process of choosing and using appropriate strategies when writing in German? |
| | Information management | (2) How do you organize, develop, and summarize your German writing strategies and skills? |
| | Monitoring | (3) If you notice a slowdown in your writing performance, how do you go about improving it? |
| | Debugging | (4) How can you pace your performance and control your learning process when writing in German? |
| | Evaluation | (5) When you write something in German, how do you evaluate your writing strategies and performance? |

The aim was to guide the students to realize their own potential and figure out how to approach solving a problem. The students in both experimental groups were given a simple individual collaborative writing task to model issues related to self-inquiry and self-regulation. In this way, actions were taken to help them individually acquire metacognitive awareness and effectively transfer it to the collaborative learning process.

In the second week, during the first 45-minute session, problems in GFL writing were discussed and verbal instructions were given about the meaning, features and principles of collaborative writing as a solution. To achieve this, the principles adapted from the characteristics of collaborative writing proposed by Lunsford (1991) were taught verbally to the students (Table 2). First, collaborative task types such as higher-order thinking, division of labor, and expertise were introduced. The aim was to ensure that the group members clearly understood what a particular collaborative writing task entailed and what was required of each of them. Second, task descriptions (author, reviewer, and editor) were created to ensure that each group member played an active role in the tasks, that the workload was distributed as evenly as possible, and that time was managed appropriately to reduce stress on group members. Third, self-inquiry strategies such as reasoning and argumentation were emphasized to ensure that group members were engaged in the writing task and considered all aspects. Finally, the collaboratively written texts were shared among the groups and techniques for giving and receiving group feedback were taught verbally. The texts produced were read, reviewed, and given group feedback through written notes, especially considering questions such as "How? Why? and What is the context?" In the second 45-minute session, these principles were modeled through a simple writing task to help students better manage and understand the collaborative writing process.

**Table 2.** General principles for an effective collaborative writing task.

| Collaboration | Tasks | Procedure |
|---|---|---|
| Task type | Higher-order thinking | Define and discuss what exactly is the problem behind the given writing task. |
| | Division of labor | If a task cannot be completed by one person within a limited time, the workload should be divided. |
| | Expertise | Each group member should take more responsibility in their area of expertise. |
| Task description | Author | One of the group members takes the main task of writing the argumentative text. |
| | Reviewer | He/she checks the semantic integrity and coherence of the text and reads it to other group members. |
| | Editor | He/she checks and formalizes the grammatical discrepancies of the text. |
| Self-inquiry | Reasoning | In the given task, the method used to solve the problem, the definitions and the results obtained must correspond to the real knowledge. |
| | Argumentation | The arguments put forward must be evidence-based. |
| Group feedback | | Suggest specific and understandable practical changes that each group member can make to improve their learning. |

As of the third week, students were asked to write argumentative essays in German in groups for eight weeks, following the metacognitive awareness and collaborative writing guidelines mentioned above. For this purpose, the guidelines were distributed to each group in Turkish. Members of the *on*-CWI+MG group performed all writing tasks synchronously using the BigBlueBotton web conferencing system, while those in the *f2f*-CWI+MG group completed them in a traditional classroom setting. The lecturer acted as a moderator in both groups, i.e., choosing the main topic of the weekly writing task from the textbook "*MEMO Wortschatz- und Fertigkeitstraining zum Zertifikat Deutsch als Fremdsprache*", instructing the students on relevant topics and observing them throughout the research process. Both experimental groups attended 2 lessons per week (90 min in total). However, since it was not possible to control the subgroups of the *on*-CWI+MG group at the same time, the intervention process for each subgroup was spread over 6 days a week.

However, individual in-class writing activities without metacognitive guidance were applied to the students in the *i*-WRITE group. During the first two weeks, students were verbally introduced to how to use methods and techniques such as note-taking, summarizing, critical, creative, free writing, writing from word and concept pools, writing from text and the senses, and were asked to write an argumentative essay individually and the activities were modeled. For eight weeks, students wrote argumentative essays individually on the same topics simultaneously with the experimental groups. The lecturer collected their

essays after the task completion each week and gave written feedback to them.

### Procedure

A meeting was held with the students to inform them about the purpose of the present study and its intervention process after the necessary approvals for the present study had been obtained from the Scientific Research and Publication Ethics Committee of the University. Before the intervention, the MAI pre-test was first administered to the students in the three groups. Two days later, a writing test, i.e., the pre-test, was administered. From the second week onwards, the intervention process started, which will last for a total of 10 weeks. During the first week after the intervention phase ended, the post-tests for MAI and writing tests were administered to the students. After 4 weeks, the students in three groups completed the delayed test for the writing test and MAI. The research process took 16 weeks in total and was supervised by the author, the only GFL lecturer at the university. However, precautions were taken to ensure that students did not use printed dictionaries, mobile dictionary apps, or online translation services (e.g., Google Translate, Deepl translator...etc.) to reliably test their actual German knowledge and skills during the writing process. In this regard, the tests were accompanied by a total of 6 invigilators for the three groups (*on*-CWI+MG, *f2f*-CWI+MG and *i*-WRITE) and students were asked to leave their smartphones on the instructor's desk in the classroom.

### Data analysis

The quantitative data of the present study (obtained from writing tests and metacognitive awareness inventory) were analyzed using SPSS 24 statistical software. To examine the statistical significance of within-subject (time: pre-test, post-test, and delayed-test) and between-subject (group: *on*-CWI+MG, *f2f*-CWI+MG and *i*-WRITE) effects and interaction effects (time × group), two-way mixed-model repeated-measures ANOVAs were performed. The assumption of normality was checked by examining skewness and kurtosis coefficients of pre-, post-, and delayed-test scores. Accordingly, the skewness coefficients for all dependent variables ranged between -.174 and .254, whereas kurtosis coefficients ranged between -1.401 and .503. Based on the fact that the skewness values were within the limits of ±3 and kurtosis values were within the limits of ±10 (Can et al., 2021; Kline, 2016), it was assumed that the data were normally distributed. On the other hand, Spearman Rho correlation analysis was performed to evaluate the correlation between metacognitive awareness and writing performance. Finally, a multiple linear regression analysis was used to measure the predictive effects of two basic levels of metacognitive awareness, namely knowledge about cognition and regulation of cognition, on writing performance. The level of significance was set at 0.05.

## RESULTS

### Effects of different teaching procedures on GFL students' writing performance

Table 3 exhibits the descriptive statistics of the pre-test, post-test, and delayed test for the writing performance of the three groups. Accordingly, the means for pre-test scores of the students of *i*-WRITE, *on*-CWI+MG and *f2f*-CWI+MG were 9.78, 9.58, and 9.30 (*SD* =.89, .77, and .89), respectively. After the intervention, the three groups were observed to increase their writing scores on the post-test. The *on*-CWI+MG group achieved the highest mean score of 22.60 (*SD* = .90), an increase of 13.02 points compared to the pre-test. This was followed by the *f2f*-CWI group (*M* = 17.95; *SD* = 2.49), an increase of 8.65 points. The lowest mean value was in the *i*-WRITE group (*M* = 11.51; *SD* = 1.71), an increase of 1.73 points. On the other hand, the mean scores on the delayed test seemed to decrease across the groups. The *on*-CWI+MG group maintained the highest mean score of 21.63 (*SD* = .95), an increase of 12.05 points compared to the pre-test. Likewise, the *f2f*-CWI+MG group seemed to maintain the highest mean score of 17.76 (*SD* = 2.45) for the delayed test, an increase of 8.46 points. However, the mean score of the *i*-WRITE group was only slightly higher than the pre-test (*M* = 10.95; *SD* = 1.56), an increase of 1.17 points.

**Table 3.** Descriptive statistics on GFL writing performance.

| Time | N | *on*-CWI+MG | | *f2f*-CWI+MG | | *i*-WRITE | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD | N | M | SD |
| Pre-test | 30 | 9.58 | .77 | 9.30 | .89 | 9.78 | .89 | 90 | 9.55 | .87 |
| Post-test | 30 | 22.60 | .90 | 17.95 | 2.49 | 11.51 | 1.71 | 90 | 17.35 | 4.91 |
| Delayed test | 30 | 21.63 | .95 | 17.76 | 2.45 | 10.95 | 1.56 | 90 | 16.78 | 4.77 |

Before performing two-way mixed-model repeated-measures ANOVAs, the assumptions for performing the analysis were checked. Box's M test showed that the observed covariance matrices of the dependent variable

were not equal across groups, Box's $M$ = 54.080, $F$ (12, 36680.538) = 4.281, $p$ < .05. Therefore, Pillai's Trace test was continued for further analysis. Results are exhibited in Table 4.

**Table 4.** Results of the two-way mixed-model repeated-measures ANOVAs for GFL writing performance by time and groups.

| Source | *df* | *F* | *p* | Partial $\eta^2$ |
|---|---|---|---|---|
| Between subject effects | | | | |
| Group | 2 | 355.901 | .000** | .891 |
| Error | 87 | | | |
| | | | | |
| Within subject effects | | | | |
| Time | 2 | 947.162 | .000** | .957 |
| Time × Group | 2 | 36.467 | .000** | .456 |
| Error | 86 | | | |

Results indicated that the time effect had a statistically significant impact on students' GFL writing performance, $F$ (2, 86) = 947.162, $p$ < .05, Partial $\eta^2$ = .957, large effect. This meant that students in each group improved their writing scores over time. Findings also revealed a significant effect of group (i.e., intervention), $F$ (2, 87) = 355.901, $p$ < .05, Partial $\eta^2$ =.891, large effect, indicating that the GFL writing performance among the groups differed statistically. Then, results demonstrated a significant interaction effect of time × group, $F$ (2, 86) = 36.467, $p$ < .05, Partial $\eta^2$ = .456, large effect. As shown in Figure 1, the interaction effect of time × group appertained to all three groups.

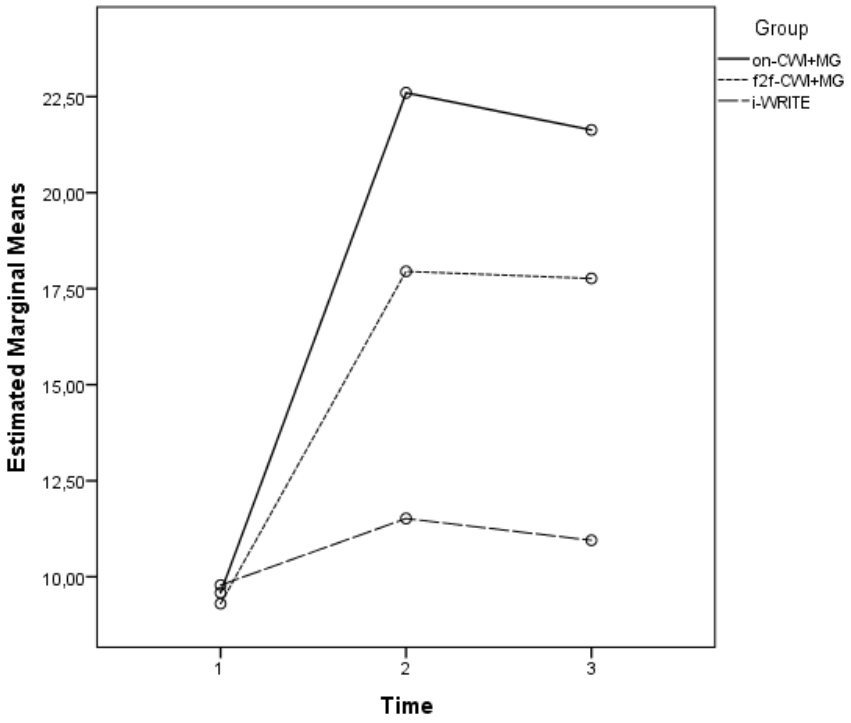


**Figure 1.** Interaction effect of time × group.

Levene's test was performed to test the equality of variance between groups. Levene's test showed that equality of variance was achieved for the pre-test ($F$ (2,87) = 1.100, $p$ = .337), but not for the post-test ($F$ (2,87) = 8.626, $p$ < .05) and delayed test ($F$ (2,87) = 9.394, $p$ < .05). For this reason, Tamhane's T2 was preferred for post hoc

analysis.

Tamhane's T2 group post hoc test for comparisons of groups on the post-test revealed that students in the *on*-CWI+MG group performed better than those in the *f2f*-CWI+MG group ($d$ = 2.48; $p$ < .05) and those *i*-WRITE group ($d$ = 8.11; $p$ < .05) while writing an argumentative essay in German. In addition, students in the *f2f*-CWI+MG group performed better than those in the *i*-WRITE group ($d$ = 3.01; $p$ < .05). That is, the *i*-WRITE group performed worse than both experimental groups on the post-test.

Tamhane's T2 group post hoc test for comparisons of groups on the delayed test revealed that students in the *on*-CWI+MG group performed better than those in the *f2f*-CWI+MG group ($d$ = 2.08; $p$ < .05) and those *i*-WRITE group ($d$ = 8.26; $p$ < .05). Likewise, students in the *f2f*-CWI+MG group performed better than those in the *i*-WRITE group ($d$ = 3.31; $p$ < .05). Overall, these comparisons indicated that online collaborative writing instruction combined with metacognitive guidance designed for the present study provides more advantages than its F2F-version. Moreover, the difference in GFL writing achieved through collaborative writing combined with metacognitive guidance was statistically different compared to individual writing.

## Effects of different teaching procedures on GFL students' metacognitive awareness

Table 5 exhibits the descriptive statistics for the pre-test, post-test, and delayed test of the three groups for knowledge about cognition, one of the two basic levels of MAI, by time and intervention. Prior to the intervention, mean scores of the three groups for the pre-test were 3.60, 3.63 and 4.20 ($SD$ = 1.00, .76 and 1.03) for declarative knowledge, 2.40, 1.80 and 2.00 ($SD$ = .67, .71 and .64) for procedural knowledge and 3.06, 3.26 and 2.90 ($SD$ =.73, .73 and .66) for conditional knowledge, respectively. Results indicated that mean scores for the three subdimensions of knowledge about cognition between the three groups varied slightly. After the intervention, improvement was noted in all three groups. The greatest improvement on the post-test was observed for declarative knowledge in each group. The *on*-CWI+MG group ($M$ = 6.83, $SD$ = 1.14) showed a higher tendency for this than the *f2f*-CWI+MG group ($M$ = 6.03, $SD$ = .92). The least improvement was noted in the *i*-WRITE group ($M$ = 5.96, $SD$ = .88). However, the three groups performed less well than expected for procedural and conditional knowledge. The *on*-CWI+MG group increased its mean score on the post-test for conditional knowledge ($M$ =3.73, $SD$ =.63) compared to the pre-test whereas it lagged behind the *f2f*-CWI+MG group for procedural knowledge ($M$ = 3.40, $SD$ = .56). In addition, mean scores in the *i*-WRITE group for both subdimensions were behind the experimental groups, but the difference was not very high. As exhibited in Table 5, the mean scores in the *on*-CWI+MG group for procedural and conditional knowledge on the delayed test were maintained whereas a small difference emerged for declarative knowledge. Likewise, the *i*-WRITE group maintained their mean scores despite minor variations. Interestingly, a marginal decrease was observed in the mean score of the *f2f*-CWI+MG for conditional knowledge and it lagged behind that in the pre-test (Table 5).

**Table 5.** Descriptive statistics on knowledge about cognition, one of the two basic levels of metacognitive awareness.

| Knowledge about cognition | Time | *on*-CWI+MG (N=30) | | *f2f*-CWI+MG (N=30) | | *i*-WRITE (N=30) | | Total (N=90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD | M | SD |
| Declaratives knowledge | Pre-test | 3.60 | 1.00 | 3.63 | .76 | 4.20 | 1.03 | 3.81 | .97 |
| | Post-test | 6.83 | 1.14 | 6.03 | .92 | 5.96 | .88 | 6.27 | 1.06 |
| | Delayed-test | 6.23 | .85 | 5.63 | .88 | 4.83 | 1.17 | 5.56 | 1.13 |
| Procedural knowledge | Pre-test | 2.40 | .67 | 1.80 | .71 | 2.00 | .64 | 2.06 | .71 |
| | Post-test | 3.40 | .56 | 3.20 | .61 | 2.80 | .61 | 3.13 | .63 |
| | Delayed-test | 3.40 | .67 | 2.86 | .73 | 2.43 | .50 | 2.90 | .75 |
| Conditional knowledge | Pre-test | 3.06 | .73 | 3.26 | .73 | 2.90 | .66 | 3.07 | .72 |
| | Post-test | 3.73 | .63 | 3.66 | .92 | 3.26 | .78 | 3.55 | .80 |
| | Delayed-test | 3.73 | .58 | 3.06 | .69 | 3.06 | .36 | 3.28 | .64 |

Before performing two-way mixed-model repeated-measures ANOVAs, the assumptions for performing the analysis were checked. Box's M test showed that the observed covariance matrices of the dependent variable were equal between groups, Box's $M$ = 19.132, $F$ (12, 36680.538) = 1.514, $p$ = .111. For this reason, Wilks'

lambda test was decided to continue analysis. Results are exhibited in Table 6.

Results revealed that the time effect had a statistically significant effect on students' knowledge about cognition, $F$ (2, 87) = 183.287, $p$ < .05, Partial $\eta^2$ = .810, large effect. Further analysis showed a significant effect on a group (i.e., intervention), $F$ (2, 87) = 31.232, $p$ < .05, Partial $\eta^2$ = .418, large effect, indicating that the levels of metacognitive awareness of students in each group in terms of knowledge about cognition were statistically different. Then, the result indicated the interaction effect of time × group was statistically significant, $F$ (2, 87) = 8.320, $p$ < .05, Partial $\eta^2$ = .162, large effect.

**Table 6.** Results of two-way mixed ANOVA for repeated measures for knowledge about cognition by time and group.

| Source | *df* | *F* | *p* | Partial $\eta^2$ |
|---|---|---|---|---|
| Between subject effects | | | | |
| Group | 2 | 31.232 | .000** | .418 |
| Error | 87 | | | |
| | | | | |
| Within subject effects | | | | |
| Time | 2 | 183.287 | .000** | .810 |
| Time × Group | 2 | 8.320 | .000** | .162 |
| Error | 87 | | | |

Levene's test was performed to test the equality of variance between groups. Levene's test showed that equality of variance was achieved for the pre-test ($F$ (2, 87) = .149, $p$ = .862), post-test ($F$ (2, 87) = .000, $p$ = 1.00) and delayed test ($F$ (2, 87) = 1.339, $p$ = .268) for knowledge about cognition, one of the two basic levels of MAI. For this reason, Bonferroni was preferred for the post-hoc analysis.

Bonferroni post hoc test for comparisons of groups on the post-test revealed that students' declarative knowledge in the *on*-CWI+MG group improved better than those in the *f2f*-CWI+MG group (d = .77, p < .05) and those in the *i*-WRITE group ($d$ = .85, $p$ < .05). Although the students in the *on*-CWI+MG group seemed to outperform those in the *f2f*-CWI+MG group, no significant differences were measured up in terms of procedural knowledge ($d$ = .34, $p$ = .589) and conditional knowledge ($d$ = .08, $p$ = 1.000). However, no significant difference between the *on*-CWI+MG and the *i*-WRITE groups was not observed for conditional knowledge ($d$ = .66, $p$ = .074).

Bonferroni post hoc test for comparisons of groups on the delayed test indicated that students in the *on*-CWI+MG group improved better than those in the *f2f*-CWI+MG group in terms of procedural knowledge ($d$ = .77, $p$ < .05) and conditional knowledge ($d$ = 1.05, $p$ < .05). However, there was no significant difference between these two groups in terms of declarative knowledge ($d$ = .69, $p$ = .062). In addition, the students in the *on*-CWI+MG group had a higher metacognitive awareness in each subdimension of knowledge about cognition (declarative knowledge: $d$ = 1.36, $p$ < .05; procedural knowledge: $d$ = 1.64, $p$ < .05; conditional knowledge: $d$ = 1.38, $p$ < .05). Likewise, the students in the *f2f*-CWI+MG group improved better than those in the *i*-WRITE group in terms of declarative knowledge ($d$ = .77, $p$ < .05), procedural knowledge ($d$ = .68, $p$ < .05). However, there was no significant difference between these groups in term of declarative knowledge.

Table 7 exhibits the descriptive statistics of the pre-test, post-test, and delayed test scores for the three groups in terms of the regulation of cognition, one of the two basic levels of MAI, by time and intervention. Prior to the intervention, the mean scores of the three groups on the pre-test were 4.46, 3.90 and 4.13 ($SD$ = 1.00, .92 and .68) for planning, 4.66, 4.46 and 3.90 ($SD$ = .92, 1.40 and .80) for monitoring, 5.40, 5.76 and 5.40 ($SD$ = 1.45, 1.07 and 1.06) for information management, 3.06, 3.00 and 2.76 ($SD$ = .69, .74 and .62) for debugging and 3.10, 3.00 and 3.40 ($SD$ = .95, .74 and .72) for evaluation, respectively. After the intervention, improvement was observed in all groups. The greatest improvement was noted in the *on*-CWI+MG group for information management ($M$ = 8.10, $SD$ = 1.06), debugging ($M$ = 4.56, $SD$ = .50), and evaluation ($M$ = 5.20, $SD$ = .76), the subdimensions of regulation of cognition. However, means scores in the *f2f*-CWI+MG group on the post-test were higher than those in the *on*-CWI+MG group for planning ($M$ = 5.96, $SD$ = 1.92). In addition, mean scores in the *i*-WRITE group lagged behind those in the o*n*-CWI+MG group for all subdimensions, but its mean score for debugging ($M$ = 4.10, $SD$ = .66) was slightly higher than that in the *f2f*-CWI+MG group. Mean scores on the delayed test varied in all groups. An increasing tendency was observed in the *on*-CWI+MG group for planning ($M$ = 6.03, $SD$ = .88) and monitoring ($M$ = 5.63, $SD$ = 1.71). Interestingly, the *i*-WRITE group maintained mean scores for planning ($M$ = 5.06, $SD$ = 1.08) and monitoring ($M$ = 4.26, $SD$ = .63). However, mean scores in the *f2f*-CWI+MG group declined for all dimensions of regulation of cognition.

**Table 7.** Descriptive statistics for the regulation of cognition, one of the two basic levels of metacognitive awareness.

| Regulation of cognition | Time | *on*-CWI+MG (N=30) | | *f2f*-CWI+MG (N=30) | | *i*-WRITE (N=30) | | Total (N=90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD | M | SD |
| Planning | Pre-test | 4.46 | 1.00 | 3.90 | .92 | 4.13 | .68 | 4.16 | .90 |
| | Post-test | 5.73 | 1.33 | 5.96 | .92 | 5.06 | 1.01 | 5.58 | 1.16 |
| | Delayed-test | 6.03 | .88 | 4.90 | .88 | 5.06 | 1.08 | 5.33 | 1.07 |
| Monitoring | Pre-test | 4.66 | .92 | 4.46 | 1.40 | 3.90 | .80 | 4.34 | 1.11 |
| | Post-test | 5.03 | 1.15 | 4.90 | .95 | 3.86 | .86 | 4.60 | 1.11 |
| | Delayed-test | 5.63 | .71 | 4.83 | .74 | 4.26 | .63 | 4.91 | .89 |
| Information management | Pre-test | 5.40 | 1.45 | 5.76 | 1.07 | 5.40 | 1.06 | 5.52 | 1.21 |
| | Post-test | 8.10 | 1.06 | 7.23 | 1.04 | 6.60 | 1.61 | 7.31 | 1.39 |
| | Delayed-test | 7.33 | 1.06 | 6.56 | 1.19 | 5.43 | .89 | 6.44 | 1.30 |
| Debugging | Pre-test | 3.06 | .69 | 3.00 | .74 | 2.76 | .62 | 2.94 | .69 |
| | Post-test | 4.56 | .50 | 4.30 | .74 | 4.10 | .66 | 4.32 | .66 |
| | Delayed-test | 3.93 | .73 | 3.73 | .63 | 3.56 | .50 | 3.74 | .64 |
| Evaluation | Pre-test | 3.10 | .95 | 3.00 | .74 | 3.40 | .72 | 3.16 | .82 |
| | Post-test | 5.20 | .76 | 4.66 | .80 | 4.00 | .78 | 4.62 | .91 |
| | Delayed-test | 4.60 | .62 | 3.86 | .77 | 3.63 | .96 | 4.03 | .89 |

Before performing two-way mixed-model repeated-measures ANOVAs, the assumptions for performing the analysis were checked. Box's M test showed that the observed covariance matrices of the dependent variable were equal between groups, Box's $M$ = 14.737, $F$ (12, 36680.538) = 1.166, $p$ = .301. For this reason, Wilks' lambda test was decided to continue analysis.

As exhibited in Table 8, results revealed that the time effect had a statistically significant effect on students' regulation of cognition, $F$ (2, 87) = 258.504, $p$ < .05, Partial $\eta^2$ = .857, large effect, along with a significant effect for group (i.e., intervention), $F$ (2, 147) = 47.726, $p$ < .05, Partial $\eta^2$ = .523, large effect. In addition, the results showed that the interaction effect time × group was also statistically significant, $F$ (2, 87) = 12.822, $p$ < .05, Partial $\eta^2$ = .230, large effect.

**Table 8.** Results of two-way mixed ANOVA for repeated measures for regulation of cognition by time and group.

| Source | *df* | *F* | *p* | Partial $\eta^2$ |
|---|---|---|---|---|
| Between subject effects | | | | |
| Group | 2 | 47.726 | .000** | .523 |
| Error | 87 | | | |
| Within subject effects | | | | |
| Time | 2 | 258.504 | .000** | .857 |
| Time × Group | 2 | 12.822 | .000** | .230 |
| Error | 87 | | | |

Levene's test was performed to test the equality of variance between groups. Levene's test showed that equality of variance was achieved for the pre-test ($F$ (2, 87) = .727, $p$ = .486), post-test ($F$ (2, 87) = 1.167, $p$ = .316) and delayed test ($F$ (2, 87) = 1.517, $p$ = .225) for the regulation of cognition, one of the two basic levels of MAI. For this reason, Bonferroni was preferred for the post hoc analysis.

Bonferroni post hoc test for comparisons of groups on the post-test revealed that students in the *on*-CWI+MG group improved better than those in the *f2f*-CWI+MG

group in terms of information management ($d$ = .82, $p$ < .05) and evaluation ($d$ = .69, $p$ < .05). However, there was no significant difference between two groups fin terms of monitoring ($d$ = .12, $p$ = 1.000) and debugging ($d$ = .41, $p$ = .341), indicating that each student in these two groups similarly had similar metacognitive awareness of relevant aspects of the organization of cognition. In addition, students in the *on*-CWI+MG group performed less well than those in the *f2f*-CWI+MG group in terms of planning ($d$ = -.20, $p$ = 1.000), but no significant differences were detected between them. Although students in the *on*-CWI+MG group outperformed those in the *i*-WRITE group ($d$ = .56, $p$ = .066), there was no significant difference between them in terms of planning. However, students in the *f2f*-CWI+MG group improved better than those in the *i*-WRITE group in terms of planning ($d$ = .93, $p$ < .05), monitoring ($d$ = 1.14, $p$ < .05) and evaluation ($d$ = .83, $p$ < .05) whereas there was no significant difference between them in terms of information management ($d$ = .28, $p$ = .167) and debugging ($d$ = .41, $p$ = .702).

Bonferroni post hoc test for comparisons of groups on the delayed test showed that students in the *on*-CWI+MG group improved better than those in the *f2f*-CWI+MG group in terms of planning ($d$ = 1.28, $p$ < .05), monitoring ($d$ = 1.10, $p$ < .05), information management ($d$ = .68, $p$ < .05) and evaluation ($d$ = 1.05, $p$ < .05) in the subdimensions of the regulation of cognition of MAI. However, students in the *on*-CWI+MG group outperformed those in the *f2f*-CWI+MG ($d$ = .29, $p$ = .678) and the *i*-WRITE groups ($d$ = .59, $p$ = .084) in terms of debugging, but no significant difference between the three groups was detected for this dimension. Students in the *f2f*-CWI+MG group improved better than those in the *i*-WRITE group in terms of monitoring ($d$ = .82, $p$ < .05) and information management ($d$ = 1.07, $p$ < .05). In addition, there was no significant difference between the two groups in terms of debugging ($d$ = .29, $p$ = .937) and evaluation ($d$ = .26, $p$ = .785) although students in the *f2f*-CWI+MG group performed better than those in the *i*-WRITE group. However, the *i*-WRITE group outperformed the *f2f*-CWI+MG group in terms of planning (d = -.16, p = 1.000), one of the subdimensions of the regulation of cognition of MAI, but the difference between them was not significant.

Overall, the results showed that metacognitive guidance improved the metacognitive awareness of students in both experimental groups. However, metacognitive guidance provided in the online learning setting designed for the present study was found to be more beneficial than that in the traditional classroom.

## Correlation between metacognitive awareness and GFL writing performance

Since no equality of variance was achieved between groups for the post- and delayed tests of the writing test, the Spearman-Rho correlation coefficient was calculated to assess the correlation between GFL students' writing performance and their metacognitive awareness. The results of the Spearman-Rho correlation analysis are exhibited in Table 9.

**Table 9.** Correlation between writing scores and metacognitive awareness in writing tests.

| Test | Correlation (*WS* und *KC*) | Correlation (*WS* und *RC*) | Correlation (*KC* und *RC*) |
|---|---|---|---|
| Pre-test | $\rho$ = -.122 ($p$ = .251) | $\rho$ = -.054 ($p$ = .614) | $\rho$ = .013 ($p$ = .906) |
| Post-test | $\rho$ = .500 ($p$ = .000) | $\rho$ = .721 ($p$ = .000) | $\rho$ = .423 ($p$ = .000) |
| Delayed-test | $\rho$ = .734 ($p$ = .000) | $\rho$ = .701 ($p$ = .000) | $\rho$ = .621 ($p$ = .000) |

*WS* = writing scores, *KC* = knowledge about cognition, *RC* = regulation of cognition, $\rho$ = Spearman's rank correlation coefficient
*The correlation is significant at the 0.001 level (2-tailed).

Prior to the intervention, a negative correlation between students' writing scores and their metacognitive awareness in terms of knowledge about cognition was observed, but this relationship was not significant. Results also indicated that there was a negative correlation between students' writing scores and metacognitive awareness in relation to the regulation of cognition, but this relationship was not significant. However, a positive correlation between the two basic levels of metacognitive awareness, knowledge of cognition and regulation of cognition, was also not significant. This pattern in the present study can be explained by the fact that students did not receive metacognitive instruction prior to the intervention.

Results revealed that there was a positive and significant correlation between the two basic levels of metacognitive awareness, knowledge about cognition and regulation of cognition, and writing scores for the post-test and delayed test in all three groups. That is to say, if a student's awareness in both dimensions of metacognition (knowledge about cognition and regulation of cognition) improves, his/her GFL writing scores will also increase. Finally, a significant and positive correlation was detected between knowledge about cognition and regulation of cognition for the post-test and delayed test.

A multivariate linear regression analysis was performed to identify the predictive dimensions of metacognitive awareness that contribute to changes in GFL writing

performance. Results indicated that a significant regression model was revealed, $F$ (2, 87) = 63.43, $p$ < .001, and 58% of the variance in the dependent variable (Adjusted $R^2$ = .584) was explained by the independent variables. Accordingly, knowledge about cognition, one of the two basic levels of metacognitive awareness, positively and significantly predicted writing scores, $\beta$ = .49, $t$ (87) = 5.588, $p$ < .001, $pr^2$ = .26, large effect. Moreover, regulation of cognition, another basic level of metacognitive awareness, positively and significantly predicted writing performance, $\beta$ = .35, $t$ (87) = 3.931, $p$ < .001, $pr^2$ = .15, large effect. Although the results showed a positive and significant relationship between knowledge about cognition and regulation of cognition, the dimension of knowledge about cognition played an important role in explaining GFL writing development; the variance explained by the knowledge about cognition was larger than that explained by regulation of cognition.

## DISCUSSION

Primary purpose of the present study was to conduct a comparative investigation of the effects of online collaborative writing instruction combined with metacognitive guidance on students' GFL writing performance and their metacognitive awareness. In this regard, three groups exposed to three different teaching procedures were included in the study: *on*-CWI+MG (online collaborative writing instruction combined with metacognitive guidance = Experimental Group-1), *f2f*-CWI+MG (face-to-face collaborative writing instruction combined with metacognitive guidance = Experimental Group-2) and *i*-WRITE (in-class individual writing activities without metacognitive guidance = Control Group).

Students' writing performance prior to the intervention was worse than expected. After only 20 hours of intervention, results revealed a remarkable increase in GFL writing scores across the three groups. Thus, collaborative writing seems to be a viable and effective approach to improving students' GFL writing skills. The findings of the present study aligned with previous research (Storch, 2005; Shehadeh, 2011; Zhang, 2018, 2019a, 2019b; Yanguas, 2020; Teng, 2016, 2019, 2020, 2022) concluding that collaborative writing instruction promotes students' writing skills and outcomes in the EFL/ESL context. One of the most important pieces of evidence from the present study suggested that students in both experimental groups receiving collaborative writing instruction combined with metacognitive awareness scored higher than those in the control group participating only in individual in-class writing activities without metacognitive guidance while writing an argumentative essay in German. One reason that explains this finding could be that metacognitive guidance facilitated natural collaboration among students with different learning backgrounds. That is, it could enable students to develop their high-level thinking skills and use their creativity in the writing process. Moreover, the teaching procedure in the present study, which was performed through a combination of metacognitive guidance and collaborative instruction, may enable students to extend their metacognitive skills to a delayed and more challenging writing task situation. Therefore, this finding was consistent with previous studies (Nguyen and Gu, 2013; Ong and Zhang, 2013; Teng, 2016, 2019, 2020, 2022) incorporating metacognitive instruction into collaborative writing. However, results revealed that students in the *on*-CWI+MG group who synchronously wrote an argumentative essay in German on the collaborative learning platform created by BigBlueBotton, an open-source web conferencing system for online classes, improved their GFL writing proficiency and outperformed their counterparts exposed to the same intervention in the traditional classroom setting, i.e., students in the *f2f*-CWI+MG group. These findings of the present study aligned with those of previous studies (Bikowski and Vithanage, 2016; Hsu, 2019; Wang, 2019; Rahimi and Fathi, 2021; Li and Mak, 2022) that revealed the positive role of technology-enhanced collaborative instruction in improving students' writing performance. One possible explanation for this may be that the learner-centered nature of synchronous learning creates a favorable environment for GFL students to collaboratively mediate and improve their peers' writing skills. Therefore, the present study suggested that GFL students were able to better collaborate and achieve their potential writing performance by mediating their own and their peers' metacognitive skills on the synchronous learning platform.

Related to the students' outcomes on metacognitive awareness, results indicated that the three groups developed an awareness of each subdimension of knowledge about cognition after the intervention. The highest improvement was observed among students in the *on*-CWI+MG group, followed by the *f2f*-CWI+MG group and the *i*-WRITE group. These findings of the present study contradicted previous studies (Veenman et al., 2006; Teng, 2016) in which the effect of group metacognitive training on metacognitive knowledge in EFL/ESL writing was negatively evaluated. The reason why there is such a discrepancy between the studies may be explained because each target language has its own linguistic characteristics and accordingly learners face different learning challenges. For example, grammatical genders in German are one of the most difficult linguistic features (Arzt and Kost, 2016), especially for learners of the German language who are unfamiliar with any concept of grammatical gender in both their native language, Turkish, and their foreign or second language, English. Every noun in German has a grammatical gender, and there is no clear logic behind the gender distinction for abstract and inanimate entities (Komarova, 2022). Due to additional difficulties in the grammatical system of the target language, students may be exposed to much more

individual effort and cognitive load while writing an argumentative essay. Therefore, knowledge about cognition has an impact on linguistic competence (Guo, 2018), and the results revealed that students highly developed an awareness of knowledge about cognition throughout the GFL writing process. In addition, there was a significant effect on test duration, indicating that the scores of each group increased over time. Group practice also had a significant effect, indicating that the knowledge about cognition of the groups is statistically different. A significant interaction effect between time and intervention was also found. This means that there were significant differences between learning contexts to which groups are exposed and over time. This means that each group demonstrated different levels of improvement of knowledge about cognition over time in the learning contexts to which they were exposed. For example, the post-test and delayed test results revealed that the *on*-CWI+MG group developed more awareness of the subdimensions of knowledge about cognition than the other two groups. These findings of the present study were closely in line with those of previous studies (Zheng et al., 2018; Altıok et al., 2019; Tanır, 2022) demonstrating the positive effect of foreign or second language learning on online platforms on students' metacognition. In addition, there was a significant difference between the experimental groups receiving collaborative writing instruction combined with metacognitive guidance and the control group participating in individual in-class writing activities without metacognitive guidance in terms of procedural and conditional knowledge, the subdimensions of knowledge about cognition. One possible explanation may be that metacognitive guidance improves students' metacognitive awareness in terms of knowledge about cognition and effectively adapts it to the collaborative writing process regardless of different learning contexts. Thus, this finding echoes previous studies (Backer et al., 2012; Teng, 2022) suggesting that the learning environment created by combining collaborative writing and metacognitive instruction is potentially useful for gaining deep insights into the adaptation of students' metacognitive knowledge. However, no significant differences were detected across all groups in terms of declarative knowledge. This may be explained by the fact that each student had a high ability to understand their strengths and weaknesses that affected their own performance throughout the writing process. Therefore, the present study suggests that declarative knowledge is hidden and difficult to detect.

The post- and delayed tests revealed that all groups improved in all dimensions of regulation of cognition, one of the two basic levels of MAI. The *on*-CWI+MG group achieved the highest mean scores, followed by the *f2f*-CWI+MG and *i*-WRITE group. These findings of the present study were consistent with those of previous studies (Teng, 2016, 2020; Mevarech and Amrany, 2008; Veenman et al., 2006) concluding that group metacognitive instruction led students to have a higher awareness of metacognitive regulation. Improvement in the regulation of cognition may be thus explained by the significant effect of test duration on the post- and delayed tests. In addition, a significant interaction effect of time and intervention indicated that all groups demonstrated different levels of improvement on all subdimensions of the regulation of cognition over time in the learning contexts to which they were exposed. There was a significant difference between the experimental groups in favor of the *on*-CWI+MG group in terms of information management and evaluation, but not in terms of planning, monitoring, and debugging. This finding contradicted previous studies (Michalsky et al., 2007; Yılmaz and Baydaş, 2017; Altıok et al., 2019; Tanır, 2022) concluding that receiving metacognitive instruction on online platforms led to greater awareness of each facet of metacognitive regulation compared to face-to-face learning. This may be thus explained by the fact that there is often a mismatch between metacognition constructs that propose more than one element and empirical data (Pintrich et al., 2000; Garrison and Akyol, 2015). Moreover, collaborative learning creates an appropriate and effective learner-centered learning environment where students can use language effectively and can provide information about students' self-regulation and self-efficacy beliefs, especially in writing. Thus, metacognitive guidance reflects research findings that collaborative learning environments enable students to actively organize writing tasks by solving writing problems and applying and managing the necessary strategies (Csizér and Tankó, 2017; Fathi et al., 2019; Rahimi and Fathi, 2021). Considering this situation, it may be suggested that the experimental groups receiving metacognitive instruction benefited from metacognitive instructions in the GFL writing process and improved their writing performance by internalizing them. However, an unexpected finding was that students in the *i*-WRITE group also improved their awareness of the regulation of cognition. Although students receiving collaborative instruction combined with metacognitive guidance scored higher than those in the *i*-WRITE group, there was no significant difference in terms of planning, one of the subdimensions of regulation of cognition. One explanation is that individual learning leads students to improve their awareness of the regulation of cognition without the need for any metacognitive guidance. This may be due to the latent and difficult-to-measure nature of metacognition, i.e., its self-reflective nature. In this context, students are more likely to develop an awareness of metacognitive regulation in terms of planning that provokes students to choose appropriate strategies and allocate the right resources to complete the task successfully while writing an argumentative essay.

On the other hand, the results of the present study showed the predictive effects of the knowledge of cognition and the regulation of cognition on GFL writing scores. As students' metacognitive awareness increased, their writing

scores also increased. These findings complement previous studies that have identified metacognition as a strong predictor of academic learning (Blankson and Blair, 2016; Teng, 2022) and the positive relationship between group metacognition support and writing (Zinchuk, 2015; Teng, 2016, 2019, 2020). Another important piece of evidence for the present study is that it points to a consistent interaction between metacognition and writing. This interaction is demonstrated by the strong correlations between students' writing scores and knowledge about cognition, as well as between writing scores and regulation of cognition, on the post- and delayed tests. Accordingly, students who did not show improvement in both knowledge about cognition and regulation of cognition might not significantly enhance their writing skills. This conclusion does not coincide with other studies (Teng, 2019a; Teng and Huang, 2019; Teng and Zhang, 2016); therefore, according to the present study, a student with a high level of metacognitive awareness, while writing a task in German, firstly relies on his/her knowledge about cognition, which refers to the steps of identifying the problem (declarative knowledge), deciding the best method to solve the problem (procedural knowledge), and applying the determined method (conditional knowledge); secondly, he/she uses self-regulatory strategies related to organizing internalized knowledge to use it more efficiently (information management), managing time to complete the task as soon as possible (planning), implementing the measures taken and methods used in the process (monitoring), improving potential problems (debugging), and revisiting the whole process (evaluation). This kind of metacognitive awareness may help students choose the right strategies and determine whether the strategies they choose work well or not. In addition, the last important finding of the present study is that knowledge about cognition had a greater predictive effect on students' writing scores than regulation of cognition. When considered together with previous research (Nguyen and Gu, 2013; Teng and Huang, 2019; Teng, 2020), the predictive effect of regulation of cognition is not consistent with the findings of the present study. Two important arguments may be put forward to explain this conclusion. First, it may be explained by the short intervention period of the study (only 20 hours). Secondly, the complex language structure of German may be explained by the fact that students first internalize knowledge about cognition and then increase their awareness of the regulation of cognition. In conclusion, metacognitive guidance can help students overcome their writing problems and can be an important element in preventing factors that may lead to discouragement in the writing process.

## CONCLUSION, PEDAGOGICAL IMPLICATIONS, AND LIMITATIONS

The findings obtained from the present study offer some theoretical and practical implications. First, it was found that students in the *on*-CWI+MG group successfully combined the collaborative writing instruction and metacognitive guidance in the online learning platform and applied it to GFL writing tasks. This is in line with Gestalt learning theory (Ikehara, 1999), which states that students should gain the ability to apply the knowledge they have acquired in online learning platforms to new situations (Teng, 2020). To complete an effective writing task in online environments, students should be encouraged to apply and transfer their internalized skills and knowledge in writing tasks.

Second, metacognitive guidance in different learning contexts may result in students having similar levels of metacognitive awareness. In the present study, there was no significant difference for each subdimension of metacognitive awareness between the *on*-CWI+MG group (online) and *f2f*-CWI+MG group (F2F) learning approaches but writing performance between the two groups was significantly in favor of the *on*-CWI+MG group. Since metacognitive awareness is individual, online collaborative writing instruction may have manipulated students' writing scores. Moreover, in the present study, the acquisition of the dimensions of metacognitive awareness was very difficult compared to the research time duration. Therefore, planned and long-term guidance might be needed to increase students' level of metacognitive awareness in online environments.

Third, students may have a lower level of metacognitive awareness in terms of the regulation of cognition. The performances in the sub-dimensions related to the regulation of cognition were highly difficult for GFL students in the present study. Therefore, students should be guided more so that they can acquire metacognitive strategies. For example, instructors should take remedial measures to provide students with knowledge and encourage them to use planning and debugging strategies more effectively.

Finally, metacognitive awareness was found to have a predictive effect on GFL writing performance. In this case, metacognitive guidance provided in different learning contexts seems to strengthen group members' interaction in collaborative writing tasks in different learning contexts and increase the possibility of collaboration among individuals with different learning backgrounds. Therefore, students with higher levels of metacognitive awareness showed better performance in collaborative writing tasks.

There were some limitations in the present research. First, the participants were of Turkish origin and their number was limited. Similar results may or may not be found among students of other ethnic groups. In addition, the gender factor, and the differences between the departments of the students were not considered in the present study. For example, there is research evidence that female students outperform male students in choosing appropriate strategies and using them in online learning platforms (Heirweg et al., 2019; Liu et al., 2021). Finally,

the online learning platform in the present study was synchronous. In this context, future research should focus on whether online collaborative writing depends on metacognitive awareness.

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