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Cooperative Error Detection in Online Learning: Focusing on Psychology ESP Students' Writing Accuracy and Their Learning Styles

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ABSTRACT

This research aimed to investigate the effect of cooperative error detection in an online context on ESP students' writing accuracy and their attitudes toward cooperative error correction. To achieve this aim, the researchers selected 60 ESP students after homogenization. The Barratt Impulsivity Scale (Barratt, 1995) was administered to the participants. The researcher randomly assigned the participants to two groups the experimental and control. The experimental group received the intervention for ten sessions. Skype was used in this group. The participants in this group were divided into six groups of 5 members each. Then, in each session, the students were given a descriptive topic and they were supposed to write and share their writing in their groups. Other members of each group had to check each member's writing and, in case of a problem, underline the mistakes and share them with the group. Finally, they sent the revised writing to the teacher. In the control group, the participants had to write about the same descriptive topic. They wrote and gave their writing to the teacher who corrected it. The conventional method was used in the control group. The results showed that the participants in the experimental group performed significantly better than those in the control group. In terms of learning style, both reflective and impulsive ESP students benefited equally from the intervention. In addition, participants in the experimental group who received the treatment had positive attitudes toward cooperative error detection, seeing it as something positive and fun.

KEYWORDS: Attitude; Cooperative Learning; Error Detection; ESP Students; Psychology; Writing Accuracy

INTRODUCTION

Proficiency in a language necessitates competence in both productive and receptive skills. English language acquisition is typified by the attainment of proficiency in the four fundamental language skills and the ability to apply them contextually through various strategies. Writing, as a form of written expression, encompasses the conveyance of emotions, ideas, experiences, and factual information. Furthermore, language learners must adeptly acquire this productive skill to cater to their professional and academic demands (Raza Khan & Zulfiqar, 2022). Writing is widely acknowledged as a pivotal productive skill, particularly within academic

contexts, as articulated by Challob (2021). This is exemplified when one seeks to craft essays or compose emails, underscoring the significance of possessing proficient writing abilities.

Learning to write in a second language is one of the most challenging aspects of second language learning. Writing is the most difficult and daunting language skill because it requires conscious effort and practice in creating, developing, and analyzing ideas (Jr & Mabuan, 2021). Perhaps this is not surprising, as even for those who speak English as a first language, the ability to write effectively is something that requires extensive and specialized instruction and has consequently spawned a vast freshman composition industry in various colleges and universities (Hyland, 2003). Within the field of second and foreign language teaching and learning, writing skill has found a central place in the current trends in research and pedagogy. Writing is believed to be the primary representation of language and the cornerstone of all language skills (Alharthi, 2021). It is an important tool for L2 learners not only in learning but also in communicating. As a productive skill, it provides them with the skills and qualities they need to deal successfully with real-life situations, especially in today's modern world where, thanks to recent technological advances, a person can convey a variety of messages to a near or far reader or readers.

Furthermore, when EFL learners are trying to master writing skills, they should be aware of the importance of accurate writing. According to Bui and Skehan (2018), accuracy is considered "the extent to which a learner follows the rule system of the target language" (p. 2). Accuracy in writing is extremely important in conveying the precise meaning of the written message (Sun & Zhang, 2023). When EFL learners are engaged in writing, it is undeniable that they will make mistakes and errors. ELT teachers, syllabus designers, and test developers have been studying such errors for a long time to find a way to deal with them properly and to provide appropriate feedback to learners (Keshavarz, 2006). Overlooking learners' mistakes can weaken their writing skills and lower the quality of their writing. This problem is even worse for ESP students because their major is not English and they are learning English to meet their specific needs. Therefore, they naturally have more difficulties with writing skills, especially writing accuracy.

The other factor that may have an impact on the writing performance of ESP students is the issue of their learning styles, which many teachers and researchers do not often take into account. Psychologically, learners have different learning styles that teachers need to be aware of. In this regard, Ellis (2000) pointed out that students' learning styles play a direct role in their success and learning. Other factors such as aptitude, age, personality, and cognitive style need to be considered in the process of learning a foreign language (Harley, 2000). This study has focused on two learning styles (impulsive and reflective). These styles have received less attention and only a few studies have focused on them. Liu and Xu (2011) stated that impulsive learners refer to those learners who prefer to find a solution to their problems, while reflective learners need more time to make a decision. For reflective learners, fluency and accuracy are very important, whereas for impulsive learners, accuracy is not a big issue and they make mistakes easily (Liu & Xu, 2011).

Given the problems of ESP students in terms of writing accuracy and learning style, it can be suggested that the use of cooperative techniques can lead to an improvement in writing accuracy. The focus of the current study was on online cooperative error detection (OCED) and online group dynamic assessment (OGDA) as independent variables. In this respect, Pawlak (2009) noted that students can work cooperatively and learn better compared to individual learning. It can be said that a probable way to improve the writing accuracy of ESP students is through cooperative error detection. Cooperative error detection can be considered as the way through which learners in small groups learn with each other and they help each other to detect and analyze

their errors (Pawlak, 2009). The main objective of the error detection technique is that learners work in groups and peer-correct their written production. Cooperative error detection can be conducted in an online context and online platforms such as Skype or other types of social media. In comparison to lecture-directed learning, students who work cooperatively can obtain better academic outcomes (Johnson & Johnson, 1999). The other advantages of CL consist of more self-motivation, enhanced thinking skills, self-confidence, respect for others, and an improved attitude of learners toward learning (Alharthi, 2021). CL can assist the student to enhance their critical thinking and boost their communication and interpersonal skills (Johnson & Johnson, 1999). When students work in groups, they can learn from each other and they can do the tasks cooperatively and in a group.

Cooperative error detection is considered the way through which teachers group learners in small groups to work with each other and they assist the members of their group to distinguish possible errors in their final composition (Pawlak, 2009). As it was mentioned earlier, the major purpose is for students to work in groups and cooperatively and be able to distinguish their errors and if it is required correct them. Cooperative error detection generally refers to the way through which the process of distinguishing errors with the assistance of other members of the group will take place (Kezoui, 2015). It is viewed as a way of distinguishing errors through which learners are engaged in the process of identifying the errors by working together and taking the chances to correct errors each other (Pawlak, 2009).

REVIEW OF THE RELATED LITERATURE

THEORETICAL FRAMEWORK

The primary theoretical framework that underpins the current study is the Sociocultural Theory (SCT) proposed by Vygotsky (1978). Vygotsky's theory posits that culture and society are crucial factors in forming an individual's cognitive development. According to this theoretical perspective, the use of tools, such as language for communication, serves as a mechanism through which individuals construct their awareness and knowledge. Central to this theory is the idea that learning is inherently situated within a social context. The initial phase of knowledge acquisition occurs within a social framework, where individuals engage in interactive processes with others. This ongoing social interaction contributes to the gradual accumulation of new knowledge, eventually leading to its independent application in diverse contexts, a phenomenon Vygotsky referred to as "internalization" (Lantolf & Thorne, 2006).

This phenomenon signifies that the process of learning entails the transfer of external knowledge from the surrounding environment into the cognitive faculties of the individual. Particularly in the context of acquiring proficiency in a new language, learners invariably necessitate the assistance and guidance of their social peers to acquaint themselves with novel linguistic tasks. Once these tasks are internalized through collaborative interaction, learners subsequently attain the capability to autonomously engage in language-related activities. From the vantage point of SCT, this social interaction emerges as a potent catalyst that mediates the expansion and development of an individual's cognitive and linguistic capacities. It is within the social milieu that language acquires its significance and meaning, highlighting the intrinsic interconnectedness between language and the societal context (Lantolf & Thorne, 2006).

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COOPERATIVE LEARNING (CL)

In the same vein, Becirovic et al. (2022) indicated some advantages of CL and claimed that by employing CL, the time students spend in a productive and useful way. When students work in a group, they can learn more effectively and the class is mostly learner-centered. Thus, learning occurs effectively. Besides, CL can influence the performance of students. In this respect, Yang, et al. (2022) also pointed out that when students work in a group, the level of boredom will be decreased. Besides, the students' troubling behavior also decreased significantly. In addition, working mutually on a task makes learners able to contribute ideas and information so all students are motivated to assist each other as well (Sharan & Shaulov, 1990). Furthermore, the engagement of students in each group is very important when they are trying to do a task. It can enhance positive relationships and construct social characters (Becirovic et al., 2022). According to Houari and Abdellah (2023), students can work cooperatively and learn better in comparison to individual learning. In this regard, it can be said that one possible way to reinforce the writing ability of EFL learners is by error detection cooperatively. Indeed, cooperative error detection can be viewed as the way through which learners in small groups learn with each other and they help each other to detect and analyze their errors (Pawlak, 2009). The main purpose of the error detection technique is that learners work in groups and peer-correct their written production. Cooperative error detection can be conducted in an online context and online platforms such as Skype or other types of social media.

EMPIRICAL BACKGROUND OF THE STUDY

In their study, Houari and Abdellah (2023) investigated written error correction through cooperative learning method among EFL learners. They concluded that cooperative written error correction can have a significantly positive effect on developing the writing skills of EFL learners. In the same vein, Li (2023) investigated the possible effect of collaborative writing instruction on the writing performance of EFL learners. The findings of His study showed the effectiveness of online collaborative writing instruction in developing the writing skills of Chinese EFL students.

In her study, Davari (2022) explored online reformulation and collaborative feedback on EFL learners' writing performance. The findings of her study reflected that online reformulation and collaborative feedback had a significantly positive effect on EFL learners' writing performance. Similarly, in her study, Meletiadou (2021) investigated the effect of peer assessment on EFL learners' writing. Her findings indicated that learners who got peer assessment had better writing scores and it proved the effectiveness of peer assessment. In their study, Fazilatfar, et al. (2018) examined the effect of the asynchronous online discussion forum on the Iranian EFL students' writing ability and attitudes. Their outcome indicated that the writing of the experimental group students significantly got better and the effectiveness of the asynchronous online discussion forum was proved.In the same line, in her study, Servetti (2010) investigated cooperative learning groups in a written correction task. The statistical results reflected that when cooperative learning is applied to error correction, students can have better performance. Thus, the effectiveness of cooperative error detection was proved.

In their study, Nagata and Nakatani (2010) performed a study that evaluated the effect of error detection on grammar sections to enhance learners' performance. The findings of their findings showed that the participants of the experimental group who employed error detection on grammar achieved higher scores in comparison to their counterparts. In the same vein, in their study, Abedi, et al. (2010) examined the effect of error correction vs. error detection on Iranian pre-intermediate EFL learners' writing achievement. In this respect, they concluded that the error correction had a more significant effect on EFL learners' writing achievement. Concerning learning styles, Chen (2021) investigated the relationship between reflective-impulsive cognitive styles and the oral proficiency of EFL learners. They concluded that learning style has a role in students' oral outcomes. Learners with different styles of learning have great differences in their performance. Reflective learners were better in speaking skills. Speaking like writing is regarded as productive.

Concerning the attitudes of L2 learners, Alhamami (2022) explored the attitudes of L2 learners toward online and face-to-face language pedagogical settings. He concluded that students had a more positive attitude toward face-to-face classes rather than online classes. In the same vein, in their study, Mizher, et al. (2022) explored the attitudes of EFL learners toward employing online learning during the Coronavirus pandemic. They concluded that the type of technology had a significantly direct effect on learners' attitudes. Furthermore, students had positive attitudes concerning online learning.

PURPOSE OF THE STUDY

This study aimed to investigate the effect of cooperative error detection in an online context on ESP students' writing accuracy and their attitude toward cooperative error detection. Given the aim of this study, the following research questions were addressed:

RQ_1: Does cooperative error detection in an online context affect reflective and impulsive psychology ESP learners' writing accuracy?

RQ_2: What are the attitudes of psychology ESP students toward online cooperative error detection?

METHODOLOGY

CONTEXT AND PARTICIPANTS

The explanatory sequential mixed method design (also referred to as the explanatory design) occurs in two distinct interactive phases. This design starts with the collection and analysis of quantitative data, which has the priority for addressing the questions of the study. This first phase is followed by the subsequent collection and analysis of qualitative data. The second, qualitative phase of the study is designed so that it follows from the results of the first, quantitative phase. The participants were 60 undergraduate ESP students from Islamic Azad University, Gonbade Kavoos Branch (field of psychology), Gonbade Kavoos, Iran. These participants were selected through convenience sampling (Chen & Dörnyei, 2007). This university is located in the southern part of Iran. The rationale for selecting this university was that it was where the researcher was studying and teaching. All of these participants had the same condition. They were in intermediate level of proficiency and of both genders. Their age ranged from 20 to 27. Their mother tongue was Persian and they have never lived or stayed in any foreign country longer than two weeks.

Table 1 indicates the demography of the participants.

Table 1

Demography of the Participants

Undergraduate students	N = 60
Field of study	Psychology
Country	Iran
First language	Persian
Foreign language	English
City	Gonbade Kavoos
Gender	Male (n = 28) and female (n = 32)
Age	20 to 27 years old

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INSTRUMENTS

For collecting the required data for the present study, the following instruments were applied. The following subsections explain each instrument in detail.

OXFORD QUICK PLACEMENT TEST (OQPT)

The OQPT consists of 60 multiple-choice items which determine a student's general language ability and can place learners in the appropriate level for a language course. This test is different from most other placement tests. Not only does it test grammar and vocabulary, but it also tests how learners use that knowledge to understand meaning in communication, helping students to practice using English naturally and confidently and get prepared for real-world situations. Table 2 summarizes the scoring method and placement of the students in different proficiency levels. The students of this study were intermediate scoring between 30 and 47. The reliability index for OQPT was assessed after conducting a pilot study and turned out to be 89 using the Cronbach Alpha method. Besides, the content validity of the OQPT was accredited by three experienced EFL teachers.

IMPULSIVENESS SCALE (1995)

Impulsiveness Scale (Patton et al., 1995) was conducted among the participants to determine their reflective and impulsive learning styles. This questionnaire was used for this purpose before by Rastegar and Safari (2017) and it is assumed that it is viewed as a valid one. Impulsiveness Scale includes 30 item self-report questionnaire' with three second-order factors, and six first-order factors and is scored according to the Likert scale from 1 "Rarely-Never", 2 "Occasionally", 3 "Often", to 4 "Almost always/Always". All parts of this questionnaire were used in this study. Three experts in TEFL verified the content validity of this scale. Besides, the Cronbach Alpha reliability value for the Impulsiveness Scale was measured to be .86 in the pilot study done with 30 intermediate ESP students who shared similar characteristics with the participants of the main study.

TOPIC-BASED ESSAY WRITING AS PRE-TEST AND POST-TEST

The researcher selected topics from the participants' course book that were suitable for intermediate learners. Then, the students were asked to write an essay of 300-350 words. The genre of writing was cause and effect. The topic was related to psychology. In addition, a pilot study was carried out with 30 intermediate students to estimate the reliability of the writing test. The reliability of the writing test was estimated at .91 using inter-rater reliability methods. The two raters scored the writing papers in terms of accuracy, and the Pearson Product Moment Correlation Coefficient was conducted to calculate the Correlation Coefficient between the scores of the two raters which turned out to be .91.

SEMI-STRUCTURED INTERVIEW PROTOCOL

The purpose of the qualitative phase of the study was to explore and explain the results obtained on statistical tests and to gather in-depth and firsthand detailed accounts of the attitudes of the participants through the semi-structured interview (Creswell, 1998). In fact, by employing semi-structured interviews, the researcher interviewed 10 ESP students in the experimental group (i.e., online cooperative error detection) to determine the attitudes of the male and female ESP students towards the treatment.

The content validity of the interview protocol was approved through the review of the items of the interview by two TEFL university instructors who evaluated the questions in terms of comprehensibility, clarity, and relevance. The interview protocol was piloted on two participants who were chosen purposefully from among those who seemed more extroverted in expressing their ideas. Then, the order of the questions was reviewed to some extent and further probing questions were provided.

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PROCEDURE

Before starting the experiment, topic-based paragraph writing as the pretest was administered to measure the writing ability of the learners before the actual treatment. After dividing the participants into two groups the experimental and the control, the intervention started. Online cooperative error detection was used as the treatment in the experimental group. Because of the coronavirus pandemic, all classes were online and through Skype. Thus, learners are familiar with this application as well.

In the experimental group, the researcher grouped students into six five-member groups. The teacher also supervised each group activity separately. For each session, 30 minutes were devoted to writing. The objective of online cooperative error detection was explained to the participants of this group. In each session, a descriptive topic was given to participants of this group to write 250 to 300 paragraphs about it. After finishing, their writing the participants of this group identified and corrected the grammatical errors in each other writing in the group. Each group tried to correct the members of its group to gain better scores. The students simply shared their writing in their groups.

Other members of that group tried to find the errors of that learner and corrected them. This process continued until all learners of each group passed this stage. For example, when a group had 4 members, each member's writing was supervised three times by the other member of that group. In a case, where there was an error but the members did not find out, the teacher made the feedback more explicit. In each session, the writing of learners was scored individually and the mean score for each group was signified. To do this, the teacher wanted to motivate the students to compete with each other and make their writing better.

In the control group, the participants had to write about the same descriptive topic. They wrote and gave their writing to the teacher and she corrected them. Before and after the intervention, the writing test was administered as the pretest and the posttest. Besides, the researcher interviewed the participants of the experimental group to find out their attitudes toward cooperative error detection.

DATA ANALYSIS

To investigate the first research question of this study, both descriptive and inferential statistics were used to analyze the survey data. The descriptive statistics presented the number, mean, standard deviation, and standard error of means. In addition, the researcher used ANCOVA to compare the scores of students of both groups.

The analysis of verbal report data in this study relied primarily on content coding (Schreier, 2014). After transcribing the spoken data, researchers segmented the data and assigned codes to classify the segments. The bottom-up (also known as inductive or data-driven) approach (Flick, 2014), was used in the current research, in which the researchers identified patterns in the data and grouped segments that follow these patterns into categories, which were then labeled and their characteristics outlined.

HOMOGENEITY RESULTS FROM OPT

To select homogeneity intermediate participants, the researcher gave OQPT to 90 ESP students. The results gained on OQPT are outlined in Table 3. According to Table 2, the mean, median, and mode of the OPT scores before homogenizing were 35.53, 35.50, and 36 respectively. These central parameters are close to one another denoting that the OPT scores are normally distributed around the mean. Moreover, according to Table 3, the

ratios of skewness and kurtosis over their respective standard errors are not beyond the ranges of +/- 1.96 showing that the OQPT scores are normally distributed.

Table 2

Descriptive Statistics for OPT before Homogenizing

N	Mean	Median	Mode	SD	Skewness Ratio	Kurtosis Ratio
90	35.53	35.50	36	6.62	.037	-.729

To check the assumption of the reliability of covariates, Cronbach's Alpha was checked. Results showed that the covariate was measured reliably (r = .835). To do the analysis, the assumptions of linearity of the relationship between a dependent variable and the covariate, and the homogeneity of regression slopes were also checked.

ADDRESSING THE FIRST RESEARCH QUESTION

As seen in Table 3, the linear relationship between the post-test of writing accuracy and the covariate of writing accuracy was significant (F = 30.85, p < .001), therefore the linearity assumption was met.

Table 3

Linear Relationship between the Post-test and Covariate of Writing Accuracy

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	1510.983	20	75.549	2.013	.030
	Linearity	1158.083	1	1158.083	30.851	.000
	Deviation from Linearity	352.900	19	18.574	.495	.949
Within Groups		1464.000	39	37.538		
Total		2974.983	59			

Table 4 reflects that the significant value associated with Levene's test (.11) exceeded the selected significant level (.05) and so the homogeneity of variance assumption was not violated for writing accuracy scores in the two groups.

Table 4

Levene's Test of Equality of Error Variances for Writing Accuracy Scores by Group

Levene Statistic	df1	df2	Sig.
2.268	3	56	.114

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The next assumption relates to the homogeneity of regression slopes. As outlined in Table 5 below, the results indicated that the significance level of the interaction (Group*Pre-test) between the group and the pre-test of total writing accuracy ($F_{(1, 54)} = 2.35$, $p = .13$, $p > .05$) and between learning style and pre-test of total writing accuracy ($F_{(1, 54)} = 2.11$, $p = .15$, $p > .05$) was above .05 and, therefore, not statistically significant. This means that the pre-test and post-test of writing accuracy scores in the experimental and control groups as well as impulsive and reflective groups enjoyed the assumption of homogeneity of regression slopes.

Table 5

Homogeneity of Regression Slopes for Writing Accuracy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1214.276	5	242.855	19.796	.000	.647
Intercept	185.517	1	185.517	15.122	.000	.219
Group	19.753	1	19.753	1.610	.210	.029
REFL	27.294	1	27.294	2.225	.142	.040
Group * Pretest	28.864	1	28.864	2.353	.131	.042
Learning style * Pretest	25.858	1	25.858	2.108	.152	.038
Error	662.457	54	12.268			
Total	261392.000	60				
Corrected Total	1876.733	59				

In addition, Table 6 shows that the writing accuracy mean score for reflective students is greater than impulsive ones on both the pre-test and post-test. For instance, in the cooperative group, the pre-test means for reflective ($M = 63.85$, $SD = 5.03$) and impulsive ($M = 60.82$, $SD = 6.61$) participants raised equally to the post-test means for reflective (M = 68.15, $SD = 5.79$) and impulsive ($M = 66.47$, $SD = 5.66$) ones.

Table 7

Descriptive Statistics of Writing Accuracy Scores by Group and Learning Style (Pre-test & Post-test)

	Group	Learning style	Mean	S	N
Pre-test	Cooperative	Reflective	63.85	5.031	13
		Impulsive	60.82	6.607	17
		Total	62.13	6.073	30
	Control	Reflective	64.15	4.688	13
		Impulsive	59.65	6.244	17
		Total	61.60	5.980	30
Post-test	Cooperative	Reflective	68.15	5.786	13
		Impulsive	66.47	5.658	17
		Total	67.20	5.678	30
	Control	Reflective	65.46	6.253	13
		Impulsive	63.47	4.474	17
		Total	64.33	5.313	30

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Table 7 summarizes the results of the two-way ANCOVA. After adjusting for the writing accuracy scores on the pre-test, there was a significant difference among the writing accuracy means of the two groups of cooperative error detection and control on the post-test ($F_{(1, 55)} = 7.04$, p = .01, $p < .05$, partial eta squared = .11). But, as seen in Table 8, two-way ANCOVA results detected no significant effect for learning style ($F_{(1, 55)} = .23$, $p = .63$, p >.05, partial eta squared = .005); accordingly, it can be claimed that learning style (reflectivity & impulsivity) has no significant effect on ESP students' writing accuracy.

Moreover, as it is evident from Table 7, there was a strong relationship between the pre-intervention and post-intervention scores on the total writing accuracy ($F_{(1, 55)} = 77.71$, $p = .000$). This means the writing accuracy scores gained on the pre-test affect the writing accuracy scores gained on the post-test. Additionally, Table 8 shows that the partial eta squared (effect size) value is .59.

Table 7
Tests of Between-Subjects Effects on Writing Accuracy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1166.324a	4	291.581	22.574	.000	.621
Intercept	239.079	1	239.079	18.510	.000	.252
Pre-test	1003.708	1	1003.708	77.707	.000	.586
Group	90.895	1	90.895	7.037	.010	.113
Learning style	3.029	1	3.029	.235	.630	.005
Group*Learning style	4.742E-5	1	4.742E-5	.000	.998	.000
Error	710.409	55	12.917			
Total	261392.000	60				
Corrected Total	1876.733	59				

ADDRESSING THE SECOND RESEARCH QUESTION

The objective of the tenth research question was to explore the attitude of the ESP students concerning the application of online cooperative error detection. For this aim, the researcher selected 12 ESP students who were members of the second experimental group and they had the experience of online cooperative error detection. The researcher interviewed them and recorded their voices. After that, she transcribed the recorded interviews for each ESP student and read the transcriptions. The researcher analyzed the codes and constructed themes to reach broader communication and meaning for answering the seventh research question appropriately.

After analyzing the interview data from 12 verbatim transcripts, 189 significant statements were extracted. Some instances of such significant statements with their formulated meanings are given in Table 8. Each statement was read carefully to extract the intended meaning and concepts behind it. For instance, Table 9 shows some statements made by one of the ESP students as interviewees and he pointed out that "online cooperative error detection has two main advantages. The first benefit is that there is no need to go to real classes and it helps me to save time. The other advantage of this type of learning is that sometimes I escape my error unintentionally, by using online cooperative error detection my group members can pay attention to my

composition and recognize the problem. It helps me to pay attention to my composition in other contexts" was emanated.

Furthermore, Table 8 also provides other instances in which one ESP student states that "until now I never pay attention to my writing skill. I always wrote without being sure about my correctness. I never had this experience. Working in the group in an online setting and correcting our composition with feedback from our group members assisted me in reinforcing my writing skills. Before that, I ignored my grammatical mistakes. I think online cooperative error detection can be regarded as one of the effective methods of boosting the writing skills of ESP students. Furthermore, before that teachers never pay attention to our writing skills at university".

Table 8
Selected Instances of Significant Statements with their Formulated Meanings (ESP Students' Attitude)

Significant Statement	Formulated Meaning
1) Online cooperative error detection has two main advantages. The first benefit is that there is no need to go to real classes and it helps me to save time. The other advantage of this type of learning is that sometimes I escape my error unintentionally, by using online cooperative error detection my group members can pay attention to my composition and recognize the problem. It helps me to pay attention to my composition in other contexts	I like this technique (Online cooperative error detection) since it is online and I can pay attention to my errors.
2) Until now I never paid attention to my writing skill. I always wrote without being sure about my correctness. I never had this experience. Working in the group in an online setting and correcting our composition with feedback from our group members assisted me in reinforcing my writing skills. Before that, I ignored my grammatical mistakes. I think online cooperative error detection can be regarded as one of the effective methods of boosting the writing skills of ESP students. Furthermore, before that teachers never pay attention to our writing skills at university.	Working in groups and error detection can be regarded as one of the best methods for boosting the writing skills of ESP students.
3) I think cooperative error detection can enhance the concentration of ESP students concerning their writing. Before that many teachers never paid attention to writing skills and students never were serious about it. This method assists me to focus on my writing skills by paying attention to the correct use of grammar. This method somehow can reinforce the writing accuracy of ESP students and it leads to an effective outcome.	Cooperative error detection is an effective method. By using this technique, students can get better outcomes.
4) In the university context, it is the first time that I focused on my writing skills. I think teachers should make use of such an interesting method and make the atmosphere of class interesting to ESP students. By utilizing cooperative error detection, students can work in a fun environment. Moreover, using social networks such as Skype helps students to have access to data at any time and at any place.	Using methods such as cooperative error detection can make the atmosphere of class fun/ Besides, time and place obstacles will be removed by teaching through social networks.

To reach the final themes, the researcher evaluated the formulated meanings pondering over them. The objective is to reach larger categories signifying the major problems. For instance, in Table 9, from the formulated meaning "I like this technique (Online cooperative error detection) since it is online and I can pay attention to my errors", "interest in online learning" was drawn. In the other example, as Table 9 indicates "working in a group and error detection can be regarded as one of the best methods for boosting the writing skill of ESP students", the theme "effectiveness of group work and cooperative error detection" was derived.
Table 9

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Instance of Four Theme Clusters with their Associated Formulated Meanings (ESP Students' Attitude)

Formulated Meaning	Theme Cluster
1) I like this technique (Online cooperative error detection) since it is online and I can pay attention to my errors.	Interest in online learning
2) Working in a group and error detection can be regarded as one of the best methods for boosting the writing skills of ESP students.	effectiveness of group work and cooperative error detection
3) Cooperative error detection is an effective method. By using this technique, students can get better outcomes.	Washback effects
4) Using methods such as cooperative error detection can make the atmosphere of class fun. Besides, time and place obstacles will be removed by teaching through social networks.	Making fun atmosphere

A) Interest in Online Learning

Many ESP students liked the online setting and it emerged as one of the important themes based on the analysis of the interview. The participants of the experimental group stated that they favored learning to write through Skype in an online context. ESP students believe that using online social networks assists them in saving their time and money for going to university. They believed that taking part in online classes causes the obstacles of time and place will be removed. They can have access to the content at any time and any place. Besides, in online classes, it is possible to save and document the information utilizing a cellphone or laptop and they can learn based on their speed. Moreover, the participants believed that when they were at home and sat or slept comfortably, the quality of learning was enhanced. In a home environment, students can eat, drink, sleep, and do many things else. That is why they feel better in such an environment.

Furthermore, some believe that online learning can be also useful for impulsive learners as they participate in group-based activities more than in a real environment. However, most of the interviewees pointed out the advantages of online learning, and some of them reported some problems concerning this kind of learning. They believed that in face-to-face classes, they have effective communication and they find out and focus better. They also stated that in a virtual environment, cheating is possible. Furthermore, in face-to-face classes, students have active participation. However, these ESP students pointed out some negative points about online learning, but they found online cooperative error detection was an interesting method and assisted them in having better writing skills, especially in terms of accuracy.
For example, one of the ESP student interviewees commented:

By taking part in online classes, the obstacles of time and place were removed. Therefore, students at any
time and any place can have access to the lessons and content. Besides, it assists us, in saving our money
and time for taking part in real classes at university. Online learning also helps me to boost my digital literacy since I need to work with different applications for different tasks. S5

Another ESP student stated:

For taking part in online classes, it is essential to have a laptop or computer with good speed of Internet.
For example for taking part in this online class, my laptop did not work well. Therefore, I borrowed my brother's laptop. Besides, when I connected to my home Wi-Fi, it was good, but it was not good with mobile data. S8

Finally, the following excerpt related to the comfortable atmosphere of online learning was taken from the comments of one of the interviewees:

When I took part in online learning, most of the time, I was at home and relaxed. That is why I had good

concentration on my tasks and I think such an environment helped me to have better learning quality and feel better in such an environment. Besides, through Skype, if I had any problem, I could ask the teacher comfortably without stress.
S10

B) Effectiveness of group work and cooperative error detection

Some ESP students emphasized the usefulness of group work and cooperative learning. They believe that this kind of learning can assist them in mastering different language skills better and it has positive effects on their performance. When they have any problems, their classmates can help them to solve the problem. Besides, cooperative error detection was regarded as a technique that assisted ESP students in paying attention to each other's composition to find any probable errors. Thus, it helped ESP students to focus on their writing more. With this technique, they became familiar with different kinds of errors in their composition or their classmates. Thus, before they provide their outcome, they will revise it and they find their error and revise it. Furthermore, some ESP students believed that teachers should make use of this method even in face-to-face classes. They believed that it assisted them in reinforcing their writing in a fun environment. Some of them believed that ESP teachers should know more about methods such as cooperative error detection. They also need to focus on the writing skills of students. Based on the outcomes of the interview, it can be said that ESP students had a positive attitude concerning cooperative error detection. For instance, one ESP student who was a member of the experimental group stated:

Before that, I never focused on my writing skills. Many ESP teachers also ignored it and they just wanted us to memorize a list of technical words and phrases. Thus, I never thought about the method for reinforcing my writing skills. Cooperative error detection assisted me to concentrate on my composition and now I think my writing is better than before. S 11

The other ESP student commented that

When the teacher explained the cooperative error detection method, at first I thought it was not interesting.
After I took part in classes, I found out it assisted me in boosting my writing in general and writing accuracy in particular. Moreover, when students work in groups, they act better and it has a positive effect on their performance. S6

C) Washback effects

Pedagogic values of online cooperative error detection turned out to be the other main category that appeared through analyzing the qualitative data. The outcomes showed that psychology ESP students had a positive attitude concerning the pedagogic values of cooperative error detection through Skype after participating in this writing course. They believed that utilizing such a method assisted them to focus on their outcomes and it attracted attention to the process of writing teaching as well as output-based application. They stated that using the conventional method of teaching writing causes an incomprehensible and dull atmosphere. Utilizing cooperative error detection assist students to work in group and signify each other's errors. Therefore, it makes ESP students more competent. Finally, they believed that using methods such as cooperative error detection assists them in having better writing skills and getting better scores. To quote, one of the ESP students interviewees stated:

I think this class was effective since before that I did not know anything about cooperative error detection. It was an interesting experience and I will recommend this method to my English teacher in the language institute. Besides, we wished never had writing tests, but now by using this technique, we are not scared of testing. S7

One of the other ESP students noted:

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> *In my opinion, language teachers should focus on the use of new techniques such as cooperative error detection. Furthermore, ESP teachers at university should try to make use of interesting and fun techniques for enhancing the motivation of students and guiding them toward having effective outcomes. S9*

D) Making a fun atmosphere

The other main theme that appeared from the interview was that utilizing cooperative error detection through Skype made the atmosphere of the class exciting. ESP students believed that in conventional classes, teachers come to class and provide the regular content. Most of the time, the atmosphere of the class is boring and students want to finish the class soon. They believed that using attractive methods of teaching as well as presenting the content in a virtual environment leads to effective learning. Furthermore, the ESP textbook should provide some more sections for productive skills such as writing.

One of the ESP students said:

> *I think using attractive techniques such as cooperative error detection in an online environment can assist ESP students in experiencing writing instruction through a fun technique. Besides, they learn to make use of each other's ideas to make their writing better. S10*

Likewise, another one pointed out:

> *In my opinion, using online cooperative error detection can change the atmosphere of class from boring to fun and attractive. Before that, I did not like writing skills and I never paid attention to it. But now, I like it and I always want to write. S7*

DISCUSSION

As for the theoretical background, in foreign language pedagogical settings, cooperative-based learning is distinguished as an effective way to assist L2 learners (Becirovic, et al. 2022). The results indicated that the participants of the experimental group performed significantly better in comparison to participants of the control group. Besides, the participants of the experimental group who received the treatment had positive attitudes concerning cooperative error detection and they regarded it as something positive and fun. Cooperative error detection provides EFL learners with an interactive and engaging approach to boost their writing accuracy. When students work cooperatively to identify and rectify writing errors, they are actively immersed in mastering writing. This hands-on engagement fosters a deeper understanding of English grammar, syntax, and style, promoting EFL learners' writing skills in a meaningful context. Moreover, cooperative error detection allows EFL learners to benefit from the diverse perspectives of their peers or instructors. Different reviewers may spot grammatical errors that the writer might overlook, thus enhancing the quality of feedback. This diverse critique contributes to the development of targeted error recognition skills, which are essential for EFL learners as they navigate the complexities of the English language.

Since the study was conducted to examine the effect of online cooperative error detection on psychology ESP students' writing accuracy, and found the effectiveness of online cooperative error detection, it confirms the results of several related studies. Some studies (e.g. Houari & Abdellah, 2023, Li, 2023 and Davari, 2022) in general confirmed that cooperative-based activities such as cooperative error detection have a significant positive impact on the writing accuracy of EFL learners. The findings of the current study were aligned with Houari and Abdellah's (2023) study. In their study, they proved the effectiveness of cooperative written error correction in developing EFL learners' writing. In the same line with the findings of this study, in his study, Li (2023) indicated the effectiveness of online collaborative writing instruction in reinforcing the writing skills of Chinese EFL students. Similarly, in her study, Davari (2022) investigated online reformulation and collaborative feedback on EFL learners' writing performance. She proved online reformulation and collaborative feedback had a significantly positive effect on EFL learners' writing performance.

The results of the current study could be in line with Meletiadou's (2021) study that examined the effect of peer assessment on EFL learners' writing. In line with the findings of the current study, learners who received peer assessment had better writing scores and it proved the effectiveness of peer assessment. In the same line with the outcomes of this study, Fazilatfar, et al. (2018) investigated the possible effect of the asynchronous online discussion forum on the Iranian EFL students' writing ability and attitudes. Their findings showed the effectiveness of asynchronous online discussion forums. Moreover, similar to the findings of the current study, Servetti (2010) examined cooperative learning groups in a written correction task. Like the results of this study, she proved the effectiveness of cooperative error detection was proved. In the same line with the outcomes of this study, Nagata and Nakatani (2010) proved the effectiveness of error detection in developing the grammatical knowledge of EFL learners. Furthermore, in contrast to the outcomes of this study, Abedi, et al. (2010) investigated the effect of error correction versus error detection on Iranian pre-intermediate EFL learners' writing achievement. In this respect, they concluded that the error correction had a more significant effect on EFL learners' writing achievement. While in our study, it was proved that cooperative error detection had significantly positive effects on L2 learners' writing.

Concerning the effect of learning styles of EFL learners, in the current study, the effectiveness of online cooperative error detection on psychology ESP students was proved. There was no significant difference between the effectiveness of cooperative error detection on reflective and impulsive ESP students. In contrast to the findings of the current study, Chen (2021) examined the relationship between reflective-impulsive cognitive styles and the oral proficiency of EFL learners. He concluded that learning style had a role in students' oral outcomes. Learners with different styles of learning have great differences in their performance. Reflective learners were better in speaking skills. Speaking like writing is considered a productive skill.

CONCLUSION AND IMPLICATIONS

Undoubtedly, writing is viewed as one of the most important productive skills playing a significant role in written communication. The history of written language refers back to 6000 years ago. In this respect, Boughey (1997) noted that writing is not regarded as a language skill to be acquired naturally, rather it is generally learned or it can be transmitted culturally as a set of practices in any pedagogical setting. He also stressed that writing can happen as a result of the relationship between the reader, the writer, the life, and the real text as well as that all of them are under constant modifications (Zarei & Rahnama, 2013). L2 writing skill involves multidimensional interactions among L2 writers and real-world authors. Hyland (2003) believes that L2 learners are supposed to "gain accuracy in the convection of writing in English to understand their disciplines, to establish their careers or to successfully navigate their learning" (p. 95).

The major aim of error detection is to be able to signify sentences that can be corrected or that need correction. Cooperative error detection refers to the way of distinguishing errors by the employment of the other members of a group opinion (Long, 1996). Cooperative error detection is a way of finding the errors through which learners are engaged in the process of identifying errors by working together and taking more chances to correct errors each other (Pawlak, 2004).

When learners try to signify their group members' errors in their writing, it helps them to focus on their errors and remove them (Mahmoud, 2014). Cooperative error detection helps learners devote their time to their errors along with signifying their friends' errors and eventually, they try to show the best of themselves. This method can assist learners to work cooperatively and create desirable writing. Besides, it also has positive effects on their social behavior (Pawlak, 2014).

With the outbreak of the COVID-19 pandemic and the consequent closure of schools and universities, online/distance education has been widely adopted around the world. The pandemic has not only killed around four million people (World Health Organization), but also resulted in serious damage to various sectors including the economy, government, entertainment, family, and education worldwide (ABS-CBN News, 2020).

Iran, like any other country, is currently being affected by the pandemic as one of the top 20 countries regarding the number of COVID-19 cases worldwide. To control the pandemic, Iran has imposed one of the longest lockdowns and quarantines in the world, including the closure of universities and educational institutions such as schools, language institutes, and extracurricular educational buildings. As such, to provide proper teaching and sustain learning during the closure of schools and universities, the education sector seems set to benefit from the diverse affordances of technology-enhanced education. In Iran, virtual/distance education in public schools is carried out through a wide range of online platforms including Students' Social Network (known as SHAAD), Adobe Connect, Zoom, and popular social networks such as Skype.

If the students attempt to distinguish their grammatical errors in their composition with the assistance of each other, it directs their attention toward their errors (Ellis, 2006). Distinguishing the errors in groups and with the help of each other may assist learners to work together and make them conscious to identify their errors and deliver an acceptable outcome. This approach encourages students to work in groups and it enhances their final achievement by shaping a good cooperative learning community. It also reinforces students' social behavior (Pawlak, 2009). Houari and Abdellah (2023) demonstrated that cooperative error detection is effective for EFL learners to improve their L2 learning, especially grammar performance.

Given the limitations and delimitations of the current study, the following suggestions are recommended. The current study delved into the effect of cooperative error detection on fostering psychology ESP students' writing accuracy in the context of Skype. Other studies are recommended to explore the following line of research to examine the generalizability of the findings and make a contribution to this domain. First and foremost, future studies are suggested to replicate this study with ESP students of different fields as well as ESP students with different language proficiency levels. Secondly, in this study, the researcher conducted the treatment for a limited number of sessions. Another study could be replicated with more treatment sessions to get more reliable results. Last, in this study only a limited number of participants had access to the researcher. For validating the outcomes of the study more longitudinal studies obtaining an account of more participants is required.

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