

Integrating Technology in Online Learning Based on Computer-Mediated Communication Artificial Intelligence to Improve Students' Achievement

Atik Rokhayani
Universitas Negeri Semarang

Dwi Rukmini
Universitas Negeri Semarang

Rudi Hartono
Universitas Negeri Semarang

Januarius Mujiyanto
Universitas Negeri Semarang

The growing percentage of fully online classes has highlighted the necessity to explore Computer-Mediated Communication Artificial Intelligence (CMC AI) in English language class. This study aimed to investigate students' achievement and perceptions in English grammar class. It used a mix-method approach. The participants of the study were the undergraduate students of the English Education Department. The result of the pre-test mean score was 69.07, while the post-test mean score was 80.26. Asymp. Sig. (2-tailed) in Test Statistics of Wilcoxon Signed Ranks Test shows 0.000, which is lower than 0.05. Therefore, there was a significant improvement difference of the scores of the students before and after being taught by using CMC AI. The interview and questionnaire data showed students' overall positive perceptions toward the use of CMC AI within the English grammar class. The students mentioned their positive perceptions that CMC AI can improve autonomous and fun learning. It can also be used anytime and anywhere as a private tutor and partner, challenging and enhancing resources in learning English language.

Keywords: artificial intelligence, computer-mediated communication, online learning, students' achievement

INTRODUCTION

Technological education has been seen as a need in today's world. The advancement of technologies has a variety of effects on English teaching. A computer is used by teachers and students to assist learning in a classroom setting. Numerous computer facilities encourage educational activities. Therefore, studies and education have attempted to find creative ways to integrate technology tools that fulfill the requirements of both teachers and students in the teaching and learning process. Asif et al.(2022) stated that technology was found to have a positive effect on the English students' achievement. CMC is one strategy that can

help to learn. It is an online application that provides communication, online simulation, and game simulation. In terms of the fluency, adaptability, and originality aspects of creative thinking, computer-mediated communication outperformed face-to-face communication and had a higher sense of media richness (Chao et al., 2020). CMC can be done via human-to-human and Artificial Intelligence (AI).

CMC human-to-human requires interaction among people. As a millennial generation, students use the internet as their primary form of communication. CMC is in daily usage. It is often used in the learning context. It has been encouraged to improve communication and collaboration among students as an efficient method (Côté & Gaffney, 2021). The students communicate by texting. WhatsApp messenger may be utilized for educational purposes, and it was determined that WhatsApp technology can also be beneficial for students' active involvement in English as a Foreign Language settings (Fattah, 2015). Moreover, the students used social media as a kind of computer-based technology that enables the exchange of ideas and knowledge through virtual communities and networks. Noori et al. (2022) stated that social media had a significant part in improving learning and teaching since it was widely utilized for a variety of purposes. Students and lecturers used it to interact with one another, and lecturers possessed the required skills to integrate into their teaching.

Online teaching English based on CMC human-to-human and CMC AI is very different. In CMC human-to-human class, the students actively communicate with their lecturer and classmates. They intensively have a great interaction to discuss the topics in the class. They usually do face-to-face communication. Compared to CMC Human-to-Human, the students do not interact with their peers during the class, but they communicate with the robot as their assistance in AI. The students can apply chatbots as CMC AI. AI may be a partner in the classroom. It may help in the learning process by assisting with language. Using AI, students may work together with chatbots and machines to interact and accomplish their communication. The possible function of chatbots as tutors has aroused interest in the area of communicative competence (Wang & Petrina, 2013). Chatbots process language using artificial intelligence, enabling robots to comprehend human speech (Kim, 2018).

Several studies were conducted on CMC (AbuSeileek & Qatawneh, 2013; Eslami et al., 2015; Ko, 2012). The majority of the research were carried out in CMC human-to-human. CMC AI also becomes the focus of the research recently (El Shazly, 2021; Hancock et al., 2020). However, few studies have been published about CMC AI in English teaching, especially on grammar learning. Therefore, the novelty of this study is the use of CMC AI in teaching grammar.

CMC is often considered an alternate mode of communication for face to face and is chosen as an option because it provides an environment appropriate to the usage of English in a variety of communication settings. CMC's use in English lessons becomes significant for students' curriculum comprehension. The advantages of CMC demonstrate how it may improve the classroom environment. CMC is essential in the digital age. It enables communication and interaction between humans and human robots.

Additionally, CMC provides updates on the development of communication technologies. CMC has a variety of societal implications and settings. It is both a tool and a mode of communication. It is seen through the lens of technological advances as tools that have evolved into a mode of communication. Otherwise, when CMC is regarded as a mode of communication that encompasses the text, the sender, and the receiver, other features become prominent. Humans have a significant part in the encounter through the setting. By looking into its characteristics and applications, comprehensive knowledge of CMC may be developed. CMC evolves into the class's integration of media and interaction processes that may be utilized to convey information and ideas. Communication technology enabled real-time communication between classrooms and formational teachers (Genlott & Grönlund, 2016).

Another study examined the implications of computer-mediated communication for pedagogy and language learning (Hosseini, 2015). The researcher illustrated the beneficial effect of previous research on Computer-Mediated Communication (CMC). He provides a detailed description of CMC. The findings indicated that CMC has a beneficial effect on language abilities. CMC also benefits language learning in a variety of ways. The researcher utilized computers to facilitate pedagogical comprehension and communication.

CMC gave the effect of task performance on how students learn (Hedayati & Foomani, 2015). This study enrolled 40 students. For three weeks, the students received treatment via online communication. The study mainly focused on two aspects of language: vocabulary and grammar. Additionally, it assessed group effectiveness. According to the study's findings, the complexity of grammatical and lexical sentences produced by the Reflective and Visual Learners groups was better than that of the other groups. Thereby, there is a significant effect of learning styles and task performance on synchronous CMC.

The integration of CMC into language learning was also examined (Mahdi, 2014). The objective of the study was to enhance students' competence. For the research, the researcher analyzed 40 articles. He concentrated on CMC in the context of learning. Several articles discussed and analyzed CMC's strengths, which play a significant role in its application to the environment in teaching applications. The analysis revealed that teachers should maximize their use of CMC in assessment in future research. Additionally, the essential factors of CMC must be explored during the learning process.

Due to the capabilities of this technology, a significant shift has occurred in educational methods within the area of SLA. Ibrahim et al. (2019) stated that lecturers must possess good communication skills, particularly interpersonal interactions with students, in order to ensure that the teaching process runs well. In the early 2000s, academics were fascinated by the CMC era had begun to influence our everyday lives. CMC communication often happens rather than face-to-face interaction. Lecturer and students used CMC during learning process. By incorporating CMC materials into L2 classes, new modes of language learning are being introduced. Alqarni (2021) argued that the interactive communication between lecturers and students in online classes is facilitated by the use of technological equipment. In addition, Blake (2016) stated that with sophisticated technology widely accessible, academics started to wonder if the theoretical benefits of CMC interactions instead of face-to-face conversations might also be applied.

Particular research examining encounters between people with CMC focuses on conversational analysis methods similar to those used in the study of classroom interactions (Sauro, 2011). Students may engage in both synchronous and asynchronous CMC (Abrams, 2003). The synchronous and asynchronous CMC modes are connected and distinct in many dimensions. They provide similar opportunities for collaborative learning, enhanced speaking time for each student, better outcomes, and enhanced writing abilities. CMC can be done via human to human. However, CMC can be done via chatbot as Artificial Intelligence (AI) in this digital era.

Education will be influenced by changes in the newest information technology. Artificial Intelligence has always been a part of the education system at the college and university level. The definition of AI-mediated communication refers to an entirely new way of communicating in which intelligent systems augment or create the content of the conversation (Hohenstein & Jung, 2018). AI can do more than enable interaction; it also simplifies communication (Reeves, 2016). It may be characterized as computers that simulate human thought and cognition and are intended to teach and solve problems (Baker et al., 2019).

In education, AI substantially contributes to the success of learning. Statt (2018) stated that Artificial intelligence technology will be capable of completely generating information on behalf of a sender—including constructing online profiles and even developing messages in synchronous communication. With recent advances in natural language encoding, basic and networked learning, and computing resources for large data storage, contemporary IT has significant implications for language communication in education and teaching a foreign language.

According to Broussard (2018), the term "artificial intelligence" is a broad term that covers efforts to comprehend human intelligence via the reconstruction of intellect in the computer and the invention of technologies capable of performing activities associated with a particular level of human intelligence. Social robots are an example of AI. Chatting robots are a part of computer systems that simulate the scholarly communication of spoken speech. A person and a machine (robot) exchange language processing messages (in written or spoken form). Students will comprehend via direct dialogue with a robot.

Additionally, chatbots will deliver individualized replies to students' communications, measure their achievement, and make recommendations to improve their education. Kannan et al. (2016) stated that users get smart replies, advised answers based on algorithms, and conversation histories parse when using the app. Moreover, Pavlick & Tetreault (2016) argued that optimizing communications for interpersonal goals

such as expressing a high status can be done even further in forthcoming AI-MC systems. In this study, chatbots play as students' partners in learning grammar .

Until now, the implementation of CMC AI in English classes has rarely been studied. This became the consideration for implementing CMC AI in English lesson in the current study. The purpose of this study was to determine whether students could benefit from it and assess students' perceptions in implementing CMC AI. There are two main objectives of this study. They are exploring the effectiveness of CMC AI in helping students improve their English achievement and investigating students' perceptions about CMC AI. The main implications of the study offer a theoretical, pedagogical, and practical contribution. Theoretically, the study will provide both the teacher and the students with the theory of CMC through AI. Pedagogically, the findings of the study can be applied to improve students' achievement. In terms of practically, the study will provide an overview of the students while they learn English language.

Due to the limitation of the field study and its ability of CMC AI as a new technique to learning, this study aimed to implement CMC AI in teaching English grammar. This study focuses on the students' grammar learning achievement and perceptions. The research questions of the study are as follows:

1. How does the implementation of CMC AI improve the students' English grammar achievement?
2. How is the students' perception of implementing CMC AI in English grammar class?

METHOD

Research Design

This study applied mix-method approach. It is a case study research. For the quantitative approach, the writers used an experimental design. It used one group pretest-posttest design. The writers also used qualitative approach to gain the students' perception towards the implementation of CMC AI in English grammar class.

In this study, the writers conducted grammar class by integrating technology. It was done via synchronous and asynchronous learning mode. The lecturer applied a chatbot as CMC AI. The chatbot is an AI friend for the students in learning grammar. During the learning process, the students communicated with chatbot.

Population and Sample/ Study Group/Participants

Regarding the research participants, the writers used 1 class as the sample of the study. The sample of this study was the students of the English Education Department in a private university in Indonesia. There were 43 students. They joined English Grammar in Written Discourse class. This course was given to the second-semester students for four credits.

Data Collection Tools

AI was used to provide instructional materials. The students communicated with their assistants through chatbots. As a result, they applied CMC AI. They communicated using the chatbot. The chatbot was employed throughout the English Grammar in Written Discourse teaching and learning activities. Due to the pandemic situation, all teaching and learning activities must be conducted online to prevent the spread of the corona virus. Each student interacted with the chatbot as a learning partner.

This class used to be fully face to face before implementing the newly introduced strategy CMC AI in which students learned from the lecturer. The lecturer and students didn't apply CMC AI. In addition, they discussed the learning materials via offline mode. This study provides a new teaching strategy to students by introducing the online learning approach CMC AI.

Data Collection

The writers used English grammar test as the instrument in this study. They also used qualitative approach by applying questionnaire and interview to gain the students' perception towards the implementation of CMC AI in English grammar class. The students were required to do a pre-test and post-

test. The pre-test and post-test consisted of 50 questions. There were four part in the pre-test and post-test. They were part A, B, C, and D. Part A consisted of 7 questions. Part B consisted of 15 questions. Part C consisted of 18 questions. Part D consisted of 10 questions. Before the pre-test was applied, the writers calculated the validity and reliability of the test.

The validity of the test is analyzed using Corrected Item-Total Correlation. The test item is claimed to be valid if the correlation value is higher than 0.2. The result shows that from the questions of Part A, B, C, and D, had higher correlation value than 0.2. Therefore, all of the questions are valid. In addition, the reliability of the test is determined through a tryout. A test is said to be reliable if the reliability coefficient is higher than 0.6. It was found out that the Cronbach's Alpha was 0.821. This means that the test belongs to be reliable. So, the test can be categorized as valid and reliable. The present study had 43 participants for the research questions who were enrolled in the class and completed the pre-test and post-test. Due to time management, the writers were only able to interview a few students.

Data Analysis

The writers used quantitative and qualitative data in this study. For quantitative data, the students were asked to do a pre-test and a post-test. To compare students' pre-test and post-test results, the writers used a paired samples t-test. In this study, the writers also used qualitative data. They used questionnaire and interview. They asked the students to fill the questionnaire and interviewed by choosing some students. A thematic analysis was used to analyze the qualitative data. Then, the questionnaire and interview results were analyzed.

FINDINGS

Students' Grammar Achievement

The students' achievement becomes the first finding of the study, followed by a discussion of students' perception of CMC AI. The writers compared the result of pre-test and post-test scores after taking the class. The students seemed to do higher in post-test than pre-test as shown in the improvement of mean scores as shown in the table follows. The result of the pre-test mean score was 69.07, while the post-test mean score was 80.26. Students seemed to have better results in their post-test based on the following table.

TABLE 1
THE RESULT OF PRE-TEST AND POST-TEST BEFORE AND AFTER BEING TAUGHT BY USING CMC AI

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test CMC-AI	43	46	88	69.07	11.835
Post-Test CMC-AI	43	66	98	80.26	7.061
Valid N (listwise)	43				

The writers calculated the paired-sample t-test to measure the score of the pre-test and post-test.

TABLE 2
THE TABLE OF WILCOXON SIGNED RANKS TEST

		N	Mean Rank	Sum of Ranks
Post-Test CMC-AI - Pre-Test CMC-AI	Negative Ranks	4 ^a	11.00	44.00
	Positive Ranks	36 ^b	21.56	776.00
	Ties	3 ^c		
	Total	43		

- a. Post-Test CMC-AI < Pre-Test CMC-AI
b. Post-Test CMC-AI > Pre-Test CMC-AI
c. Post-Test CMC-AI = Pre-Test CMC-AI

TABLE 3
THE RESULT OF TEST STATISTICS

Test Statistics^a

	Post-Test CMCAI and Pre-Test CMCAI
Z	-4.924 ^b
Asymp. Sig. (2-tailed)	.000

- a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

From the tables above, the results revealed that there is a significant difference of the scores of the students before and after being taught by using CMC AI. Asymp. Sig. (2-tailed) in Test Statistics of Wilcoxon Signed Ranks Test shows 0.000, which is lower than 0.05. The students' post-test scores were considerably higher than their pre-test scores. We can consider that students increased their grammar scores after utilizing CMC-AI to learn grammar.

Students' Perception of CMC Artificial Intelligence

The writers discovered some thoughts in the students' responses that could be recommendations for implementing effective CMC Artificial Intelligence in the grammar class. The students indicated positive perceptions that CMC AI can improve autonomous learning. In other words, the students can enhance their self-study by using CMC AI. The students showed a positive attitude and were challenged when communicating with a chatbot as AI. They didn't worry about the conversation, and they had different feelings between chatting with chatbot and people.

The finding showed that the students could improve learning resources when having a conversation with a chatbot as Artificial Intelligence. They got a new source to study English, especially grammar. Learning grammar can be more effective due to the digital source of chatbot. The students are interested in learning grammar through CMC AI. They consider that CMC AI has many benefits in learning. They are fun and happy learning grammar by communicating with a chatbot as AI.

This study explored the impact of CMC-AI to the Grammar class. Theoretically, CMC-AI gives students opportunity to explore learning grammar independently. It might be autonomous learning because the students can learn anytime and anywhere. CMC-AI covers teaching strategy that might students enhance learning resources. Pedagogically, CMC-AI strengthens lecturers to apply creative teaching to create fun learning. Practically, the outcome of this study contributes to the learning grammar to implement CMC-AI strategy.

DISCUSSION

Students' Grammar Achievement

The finding indicated that the students' post-test scores were significantly higher than their pre-test scores. The result of the pre-test mean score was 69.07, while the post-test mean score was 80.26. Asymp. Sig. (2-tailed) in Test Statistics of Wilcoxon Signed Ranks Test shows 0.000, which is lower than 0.05. We can consider that the students' grammar scores improved due to the chatbot implementation as CMC AI. The students can improve the quality of learning through autonomous learning so as to improve student achievement. They also do not need to find friends to communicate with because by using CMC AI, the students can take advantage of smart AI technology to learn and communicate English. CMC-AI is also useful in learning English, especially grammar.

This aligns with other studies showing that chatbots can be used to support language inputs and provide opportunities for language students to improve their communicative competence (Kim et al., 2019). This finding can then be considered to have supported that integration of CALL and chatbot will improve students' outcomes (Shawar, 2017). In addition, students can use chatbots at universities to help them learn more effectively (Malik et al., 2021).

Students' Perception of CMC Artificial Intelligence

The students were asked about their perception of the grammar class to get the data of the second objective of the study concerning student perceptions of CMC AI. The students were assigned to attend the interview and complete the questionnaire.

The findings indicated that all forty-three students, as determined by interview and questionnaire data, considered that grammar class was beneficial in academic achievement. The majority of students said that studying grammar using CMC AI was fascinating and simple. "I like chatting with chatbots since I am not required to find a partner to chat." one student said. Additionally, the chatbot teaches me new vocabulary. "It's simple and easy to communicate with Artificial Intelligence." another student said.

Several students commented on how logical and organized the teaching materials. The students stated that "the learning materials were presented in a structured manner and the use of Artificial Intelligence in grammar class was easy". The results indicated that students regarded the course as beneficial in assisting them in improving their grammar achievement. Additionally, they said that they considered the learning materials simple to comprehend. The syllabus for the class was suitable for students' needs which are categorized as digital generation. The positive responses recommended that students had positive views and perceptions of the implementation of CMC-AI in grammar class.

CMC Artificial Intelligence Can Improve Autonomous Learning

Note that students in the study have never used CMC AI in this online class. Thus, there was no face-to-face interaction between the students and the teacher. The authors coined CMC AI for this study. This research takes advantage of the use of CMC AI. It is the first experience for the students to chat with chatbot. The students were having a chat with the chatbot.

The implementation of the chatbot in grammar class became a new method in the online class. The students mentioned that they liked the chatbot to create autonomous learning. The other students also said that chatbot could motivate them. In addition, they could have interactive communication with the chatbot. They could have interactive communication with the chatbot related to topics in grammar class.

Regarding autonomous learning, one student said that "I like learning grammar via CMC AI because it can create autonomous learning". It supported the previous research that AI technology can encourage autonomous English learning for college students to increase their English proficiency (Han, 2019). Another student expressed that "CMC AI motivated me in learning grammar". Communication through AI is simple because we don't find friends as a partner to communicate", said one student.

Some students expressed that learning grammar through CMC AI can be done in the class and outside of the class. Others also mentioned that communicating through AI gives more chances to learn grammar. A student noted that "interaction through chatbot reduces anxiety because our partner is a robot". In

addition, one student mentioned that CMC AI is appropriate for the pandemic situation because the class is conducted online, and we don't need to have direct face to face interaction with friends.

CMC Artificial Intelligence Is Challenging

Some students expressed that CMC AI is challenging. They have a new learning experience to communicate with the chatbot. They need to grasp the idea from the chatbot. They also need to relate the conversation with the topics. A student said that "sometimes our communication with the chatbot is out of topic so, I need to follow chatbot to understand its meaning". Another student said that "learning grammar through CMC AI is appropriate for millennial generations". The students also stated that CMC AI could be used as a private tutor and partner.

Furthermore, the students believed that the chatbot understood the topics and students' needs. The chatbot can answer the students' questions. The students were also enthusiastic about having a conversation with the chatbot because they could get the answers privately. Other students added that "CMC AI involved them actively participated in learning grammar". They were pleased in learning grammar.

The students stated that they could enhance their interaction while communicating by using the chatbot as CMC AI. They mentioned that they interacted more in having a conversation with a chatbot because they didn't worry about making mistakes. It didn't happen if they were making a conversation with their friends. They needed time to chat because they were anxious about making some mistakes.

"CMC AI is not only challenging but also improving my grammar," the student said. The other students also supported this argument. In addition, the students said that they were more interested in learning grammar because of the support from the chatbot as Artificial Intelligence.

CMC Artificial Intelligence Can Improve Resources in Learning English Grammar

During the interview, the students expressed that communication through AI is effective. They also proved that "the learning process is more effective when the lecturer applied CMC AI in the class". The other students mentioned that "CMC AI gives many advantages to the students". "I got much a new knowledge and vocabulary in having a communication with chatbot", one student said. Many students also supported this statement that they got new information from chatbot as their partner.

CMC Artificial Intelligence Plays a Significant Role in Enhancing Students' Learning Experience

Some students also mentioned that CMC AI could improve vocabulary because they got new language when they were having a conversation with the chatbot. "I found new vocabulary from the chatbot," said the student. Another student said that "Chatbot gives me new vocabulary". Many students stated that they got new vocabulary from AI. They communicated with AI without any anxiety since interacting with the robot. They didn't think about the mistakes during the conversation. The students communicate with AI then make a written text based on their conversation as a new learning experience. It supported Kateryna et al. (2020) that the application of AI technique can enhance digital education quality.

CMC Artificial Intelligence Can Create a Fun Learning

Most of the students agree that CMC AI can make fun learning. "I am happy learning with the chatbot," the student said. Another student said that "Chatbot makes me fun". One student said that "Communicating with chatbot is simple". Furthermore, CMC AI can be used to acquire knowledge. So, the students were very interested in learning grammar. It supports that expert system knowledge in AI is creatively implemented to recall and achieve English knowledge points, in which knowledge points are represented as a multi-attribute variable (Li, 2017).

Regarding the benefits of CMC AI, the student said that "I can practice communicating anytime and anywhere". Another student also stated that "CMC AI can save my time". Most of the students agree that CMC AI has many benefits for learning English.

From the finding of the study, the students' grammar achievement of students improved after they participated in the class of CMC-AI. In other words, CMC-AI affects the improvement of the students' grammar achievement of students. Having a good grammar achievement is really needed for the English

Education Department students. By learning grammar well, the students are ready for mastering English which is used to be the basic skill after they graduate from university. When the students have the ability and mastery of grammar, they will be having a great competence in teaching.

CMC-AI improves the students' grammar achievement of students. In addition, CMC-AI gives chance for students to have communication with chatbot. They don't need to find friends as partners to learn. Furthermore, CMC-AI can be used everytime and anytime. By using CMC-AI, the students not only learn grammar but also learn other skills. The students can explore the conversation and learn the structure from CMC-AI. This study supports Hill et al. (2015) that there is a significant difference between human to human and human-chatbot conversations toward contents and quality of communication.

CONCLUSION

Based on the finding of the study, after implementing the chatbots as CMC AI, the learning outcomes could significantly improve. The result of students' grammar achievement showed that there was a significant difference of the scores of the students before and after being taught by using CMC AI. The result of the pre-test mean score was 69.07, while the post-test mean score was 80.26. Asymp. Sig. (2-tailed) in Test Statistics of Wilcoxon Signed Ranks Test shows 0.000, which is lower than 0.05. The students' grammar scores improved due to the chatbot implementation as CMC AI. In addition, the students' perspectives toward the use of CMC AI were positive. The study supports CMC AI, which demands further research. Further research could be conducted to compare students' English skills such as speaking and writing. Regarding student perceptions, the authors identified some important points that may provide knowledge for lecturers considering implementing the CMC AI. CMC AI can improve autonomous learning. It also can be used as a private tutor and partner. It is challenging in using CMC AI for learning. The implication of the study showed that CMC-AI can enhance resources in learning English grammar. It can also create a fun learning for college students. The students can communicate by using CMC AI anytime and anywhere.

SUGGESTION

The findings of the study are also expected to be used by lecturers to adapt teaching strategies and resources for CMC-AI in grammar learning to meet the effective requirements of both lecturers and students.

LIMITATION

This study limits on investigating the effectiveness of CMC AI in grammar mastery of students. The students had conversations with chatbot in Grammar Class. The writers took tenses as the main topic in this study. Tenses become an important topic for the students in Grammar Class because it is a basic English grammar skill.

REFERENCES

- Abrams, Z.I. (2003). The effect of synchronous and asynchronous CMC on oral performance in German. *The Modern Language Journal*, 87(2), 157–167. [https://doi.org/https://doi.org/10.1111/1540-4781.00184](https://doi.org/10.1111/1540-4781.00184)
- AbuSeileek, A.F., & Qataweh, K. (2013). Effects of synchronous and asynchronous computer-mediated communication (CMC) oral conversations on English language learners' discourse functions. *Computers & Education*, 62, 181–190. [https://doi.org/https://doi.org/10.1016/j.compedu.2012.10.013](https://doi.org/10.1016/j.compedu.2012.10.013)

- Alqarni, N. (2021). Language learners' willingness to communicate and speaking anxiety in online versus face-to-face learning contexts. *International Journal of Learning, Teaching and Educational Research*, 20(11), 57–77. <https://doi.org/https://doi.org/10.26803/ijlter.20.11.4>
- Asif, M., Sheeraz, M., & Sacco, S.J. (2022). Evaluating the impact of technological tools on the academic performance of English language learners at tertiary level: A pilot investigation. *Pegem Journal of Education and Instruction*, 12(1), 272–282. <https://doi.org/10.47750/pegegog.12.01.28>
- Baker, T., Smith, L., & Anissa, N. (2019). *Educ-AI-tion Rebooted? Exploring the future of artificial intelligence in schools and colleges*. Nesta Foundation.
- Blake, R. (2016). My first CMC article revisited: A window on Spanish L2 interlanguage. *Language Learning & Technology*, 20(2), 162–165. Retrieved from <http://llt.msu.edu/issues/june2016/blake2.pdf>
- Broussard, M. (2018). *Artificial unintelligence: How computers misunderstand the world*. MIT Press.
- Chao, S.H., Jiang, J., Hsu, C.H., Chiang, Y.T., Ng, E., & Fang, W.T. (2020). Technology-enhanced learning for graduate students: Exploring the correlation of media richness and creativity of computer-mediated communication and face-to-face communication. *Applied Sciences*, 10(5), 1–18. <https://doi.org/10.3390/app10051602>
- Côté, S., & Gaffney, C. (2021). The effect of synchronous computer-mediated communication on beginner L2 learners' foreign language anxiety and participation. *The Language Learning Journal*, 49(1), 105–116. <https://doi.org/https://doi.org/10.1080/09571736.2018.1484935>
- El Shazly, R. (2021). Effects of artificial intelligence on English speaking anxiety and speaking performance: A case study. *Expert Systems*, 38(3), e12667. <https://doi.org/https://doi.org/10.1111/exsy.12667>
- Eslami, Z.R., Mirzaei, A., & Dini, S. (2015). The role of asynchronous computer mediated communication in the instruction and development of EFL learners' pragmatic competence. *System*, 48, 99–111. <https://doi.org/https://doi.org/10.1016/j.system.2014.09.008>
- Fattah, S.F.E.S.A. (2015). The effectiveness of using WhatsApp Messenger as one of mobile learning techniques to develop students' writing skills. *Journal of Education and Practice*, 6(32), 115–127. <https://doi.org/http://dx.doi.org/10.13140/RG.2.2.11492.83846>
- Genlott, A.A., & Grönlund, Å. (2016). Closing the gaps—Improving literacy and mathematics by ICT-enhanced collaboration. *Computers & Education*, 99, 68–80. <https://doi.org/https://doi.org/10.1016/j.compedu.2016.04.004>
- Han, B. (2019). Application of artificial intelligence in autonomous English learning among college students. *IJET*, 14(6), 63–74. <https://doi.org/https://doi.org/10.3991/ijet.v14i06.10157>
- Hancock, J.T., Naaman, M., & Levy, K. (2020). AI-mediated communication: Definition, research agenda, and ethical considerations. *Journal of Computer-Mediated Communication*, 25(1), 89–100. <https://doi.org/10.1093/jcmc/zmz022>
- Hedayati, M., & Foomani, E.M. (2015). Learning style and task performance in synchronous computer-mediated communication: A case study of Iranian EFL learners. *Educational Technology and Society*, 18(4), 344–356. Retrieved from <https://www.jstor.org/stable/jeductechsoci.18.4.344>
- Hill, J., Randolph Ford, W., & Farreras, I.G. (2015). Real conversations with artificial intelligence: A comparison between human-human online conversations and human-chatbot conversations. *Computers in Human Behavior*, 49, 245–250. <https://doi.org/10.1016/j.chb.2015.02.026>
- Hohenstein, J., & Jung, M. (2018). AI-supported messaging: An investigation of human-human text conversation with AI support. *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, pp. 1–6. <https://doi.org/https://doi.org/10.1145/3170427.3188487>
- Hosseini, S.B. (2015). Computer-mediated communication: Pedagogical and language learning implications. *International Journal on New Trends in Education and Their Implications*, 6(1), 163–176.
- Ibrahim, M.Y., Yusof, M.R., Yaakob, M.F.M., & Othman, Z. (2019). Communication skills: Top priority of teaching competency. *International Journal of Learning, Teaching and Educational Research*, 18(8), 17–30. <https://doi.org/https://doi.org/10.26803/ijlter.18.8.2>

- Kannan, A., Kurach, K., Ravi, S., Kaufmann, T., Tomkins, A., Miklos, B., . . . Young, P. (2016). Smart reply: Automated response suggestion for email. *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, pp. 955–964.
- Kateryna, A., Oleksandr, R., Mariia, T., Iryna, S., Evgen, K., & Anastasiia, L. (2020). Digital literacy development trends in the professional environment. *International Journal of Learning, Teaching and Educational Research*, 19(7), 55–79. <https://doi.org/https://doi.org/10.26803/ijlter.19.7.4>
- Kim, N.-Y. (2018). Chatbots and Korean EFL students' English vocabulary learning. *Journal of Digital Convergence*, 16(2), 1–7. <https://doi.org/https://doi.org/10.14400/JDC.2018.16.2.001>
- Kim, N.-Y., Cha, Y., & Kim, H.-S. (2019). Future English learning: Chatbots and artificial intelligence. *Multimedia-Assisted Language Learning*, 22(3), 32–53.
- Ko, C.-J. (2012). Can synchronous computer-mediated communication (CMC) help beginning-level foreign language learners speak? *Computer Assisted Language Learning*, 25(3), 217–236. <https://doi.org/10.1080/09588221.2011.649483>
- Li, X. (2017). The construction of intelligent English teaching model based on artificial intelligence. *International Journal of Emerging Technologies in Learning (IJET)*, 12(12), 35–44. <https://doi.org/https://doi.org/10.3991/ijet.v12.i12.7963>
- Mahdi, H.S. (2014). The impact of computer-mediated communication environments on foreign language learning: A review of the literature. *Teaching English with Technology*, 14(2), 68–87. <https://doi.org/10.5430/wjel.v4n1p9>
- Malik, R., Shrama, A., Trivedi, S., & Mishra, R. (2021). Adoption of chatbots for learning among university students: Role of perceived convenience and enhanced performance. *International Journal of Emerging Technologies in Learning (IJET)*, 16(18), 200–212. <https://doi.org/https://doi.org/10.3991/ijet.v16i18.24315>
- Noori, A.Q., Orfan, S.N., Akramy, S.A., & Hashemi, A. (2022). The use of social media in EFL learning and teaching in higher education of Afghanistan. *Cogent Social Sciences*, 8(1), 2027613. <https://doi.org/10.1080/23311886.2022.2027613>
- Pavlick, E., & Tetreault, J. (2016). An empirical analysis of formality in online communication. *Transactions of the Association for Computational Linguistics*, 4, 61–74. http://dx.doi.org/10.1162/tacl_a_00083
- Reeves, J. (2016). Automatic for the people: The automation of communicative labor. *Communication and Critical/Cultural Studies*, 13(2), 150–165. <https://doi.org/10.1080/14791420.2015.1108450>
- Sauro, S. (2011). SCMC for SLA: A research synthesis. *Calico Journal*, 28(2), 369–391. <https://doi.org/http://dx.doi.org/10.11139/cj.28.2.369-391>
- Shawar, B.A. (2017). Integrating CALL systems with chatbots as conversational partners. *Computación y Sistemas*, 21(4), 615–626. <https://doi.org/http://dx.doi.org/10.13053/cys-21-4-2868>
- Statt, N. (2018). Google now says controversial AI voice calling system will identify itself to humans. *The Verge*, 10.
- Wang, Y.F., & Petrina, S. (2013). Using learning analytics to understand the design of an intelligent language tutor–Chatbot Lucy. *International Journal of Advanced Computer Science and Applications*, 4(11), 124–131. <https://doi.org/https://dx.doi.org/10.14569/IJACSA.2013.041117>