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Research Article

THE IMPACT OF E-LEARNING ON METACOGNITION SKILLS IN HIGH SCHOOL STUDENTS

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Abstract

This study aims to determine the effect of using e-learning on the metacognitive skills of high school students in learning English. A quantitative approach was used in this study and this research was designed using a quasi-experimental design approach. The method used in this study is quasi-experimental. Research subjects were students of class X high school, totaling 136 students. The subjects of this study were divided into two groups, experimental and control. The data analysis technique used in this study is to compare the two groups. The results of data analysis show that students who are taught by e-learning acquire better metacognitive skills than students who are taught conventionally. The use of e-learning in learning English which is a foreign language learning in high school has an effect on students' metacognitive skills

Keywords: The use of e-learning, Metacognition Skills, High school students.

INTRODUCTION

The rapid development of technology is unavoidable. Society as consumers must be able to adapt to the speed of technological development. If not, what is certain is that the incoming information lags behind the complexity of the information. Not only information is lost, but the way of thinking is also affected by technological sophistication. The world of education is one of the important sectors affected by technological developments. This can be seen in the shift in the use of learning media from classical models to online learning media. For this reason, schools continue to strive to improve the quality of learning by using online media. The development of technology in the world of education is very useful for educators. The utilization of learning technology is intended to increase student motivation and achievement, as educators, and lesson planners must be able to design learning with different types of learners. appropriate means of communication and learning resources to make the learning process effective and efficient. The explanation above emphasizes the need for e-learning-based learning. The results of E-Learning learning in high school English subjects aim to formulate a product, namely learning media, especially for material related to basic skills in understanding text or speech written in English. There is evidence that e-learning-based learning has improved the quality of good learning for both teachers and students. This is supported by research conducted by Rapi (2016) which states that student achievement using interactive media is higher than students using conventional learning methods. The development of the use of the internet and web technology is followed by technological innovation and data communication. Many applications and information systems are based on internet technology. This condition makes things easier to do such as distance learning or e-learning. E-learning is a new way of learning process as a consequence of the development of technology, information, and communication. E-learning is a web-based electronic media that can be applied to computers connected to local and global networks such as computer laboratories.

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The use of e-learning in learning processes developed as improvements in technology and information. Purbo (2002) explains that e-learning is a form of information technology that is applied in the education system in cyber schools. E-learning is used in all educational activities that use computers and the internet. This is in line with Purbo's view that e-learning is a new learning paradigm that uses the internet. E-learning is not limited by space and time as stated by Min-Lin (2014). Plus, it also offers a variety of interactions so you can host a traditional class. This concept is also supported by the argument put forward by Rohendi (2012) which states that e-learning is a transformation from conventional to digital both in terms of content and system. Today, computer technology is not only used for computer science and word processing, but also as a medium used for multimedia that allows students to create projects and other concepts in engineering and science. Multimedia computing means technology that optimizes the role of the computer as an infrastructure for displaying and manipulating text, graphics, and audio in one integrated display. By displaying and combining many elements that convey information and messages, computers are designed to be used as an effective technology medium to be used as a learning tool and delivery of relevant learning materials such as graphic design and animation. Conceptual visualization is very useful for making abstract and theoretical concepts concrete. Many studies show the benefits of visualization in the form of images, animations, simulations, and videos in the learning process (Kirna, 2014), computer media can visualize learning materials to be more concrete. In the last decade, web-based learning environments have been widely used at various levels and in various forms of education to improve the teaching-learning process (Kazu and Demirkol, 2014). The use of digital environments inspires great hope in the academic community as they can support students' autonomy and motivation to learn while respecting their differences (Chen and Tseng, 2012). However, several studies have shown that not all students achieve the same benefits in terms of learning outcomes when studying in a computing environment (Archer, 2003; Hsu and Dwyer, 2004), which have been explored using three approaches: The first relates to pupils' cognitive styles. ; second, metacognitive skills; and third, for the perception of

self-efficacy. Regarding the first approach, namely cognitive style, some authors suggest that students' performance in interacting with the web environment may be related to individual differences. In the Addiction field dimension - ADI, for example, studies that address these findings (Alomyan, 2004; Chen and Macredie, 2002; Handal and Herrington, 2004; López-Vargas, Hederich-Martinez, and Camargo-Uribe, 2011) show addicted beginners have some difficulty interacting successfully with the web environment; whereas their non-specialist classmates were most effective when interacting with the computing environment (Archer, 2003; Hsu and Dwyer, 2004; Palmquist and Kim, 2000). In this sense, activities such as exploring freely, directing the self-study process, and analyzing the information presented in computational scenarios are activities that can present a certain complexity to beginners, depending on the subject (Alomyan, 2004; Chen and Macredie, 2002). Regarding the second approach and metacognitive capacity, it can be concluded from the study that a deficit of metacognitive capacity is related to poor learning performance when a student interacts with a digital environment because this type of scenario interferes with the definition of required learning objectives. concrete; planning activities to achieve goals, and self-monitoring and self-regulating the learning process to change and/or adjust learning strategies and objectives and invest more efforts to achieve what is desired.

On the other hand, research in the field of information technology applied to education shows that the use of scaffolding can support the performance of subjects when they engage in independent learning tasks in an e-learning environment (Greene, Moos, Azevedo, and Inverni, 2008); Kim and Hannafin, 2011; Lehmann, Haenlein and Ifenthaler, 2014; Zhang and Quintana, 2012). In this research area, the use of metacognitive scaffolding in web-based scenarios provides support for students to control and regulate cognitive processes during their learning process. In this sense, the subject can set his own goals, plan learning activities objectively to achieve his goals, monitor what is planned, and self-evaluate the results obtained, to modify his planning following the proposed goals and/or adjust. (Molenaar, Boxtel, and Sleegers, 2010; Quintana, Zhang, and Krajcik, 2005; Zhang and Quintana, 2012). In this line of thinking, students' metacognitive abilities can be positively influenced by the use of scaffolding that supports decision-making regarding the organization, planning, monitoring, and self-regulation of the learning process. Regarding metacognitive skills and cognitive style, several papers now show evidence of a possible relationship between subject-independent students and the use of metacognitive skills, a hypothesis that arises from the intrinsically oriented characteristics of FI students' styles. and interested in achieving goals (López-Vargas *et al.,* 2011; Huertas, López and Sanabria, 2017). Although the studies are inconclusive and there is no consensus among researchers, there is a need to further explore this possible association for understanding and understanding the behavior of learners with different cognitive styles interacting in a web-based learning environment, and therefore propose alternative solutions. to support learning. to respond more fairly and flexibly to their differences. Much work has been done to validate this framework (Arbaugh *et al.,* 2008; Ice *et al.,* 2007) and to provide operationalized cognitive models with the potential to contextualize and understand metacognition in online learning environments. Theoretical frameworks and cognitive models are the best options for developing and validating metacognitive constructs in the context of online research communities. Metacognition skills must be possessed by students because if they master these skills well, students will be able to reflect on the learning patterns carried out by these students. Metacognition refers to students' activities of thinking about something, applying appropriate learning strategies, integrating learning, and reflecting on what has been done in their learning. Metacognition is students' knowledge and awareness of cognitive processes, or knowledge of their thoughts. Therefore, metacognition becomes very important because it involves the process of cognition of something and can be used as a guide to further regulate cognition in the future (Desmita, 2009). In addition, Saraswati *et al.* (2011) stated that metacognition is important because knowledge of cognitive processes can guide students in the assembly and selection of models used to develop positive achievement. The results of the development of appropriate science and technology to support the subjects taught. Purchasing educational facilities and infrastructure is seen as very conducive to the teaching and learning process and easy-to-achieve educational goals. The purpose of this study was to identify and analyze the effect of using e-learning on the metacognitive skills of high school students. In addition, the purpose of this study is to provide guidelines and basic learning using e-learning and metacognition skills in research and can be used as a reference to guide the learning process.

METHODS

The research that will be conducted is a quasi-experimental design with a non-equivalent control group, using the existing class as a group, with the selection of classes that evaluate the terms and conditions are the same (homogeneous). The research subjects were X high school students, totaling 136 students, which were divided into 2 (two) groups, namely the experimental class and the control class. The experimental class consists of 2 classes, each class has 34 students, and the control class consists of 2 classes, each class has 34 students, using the cluster random sampling technique (Fraenkel, 2006). The selection was considered because it was not possible to conduct this research using randomized or random techniques and have a class with homogeneous skills in carrying out learning (Cohen and Morrison, 2011). Two categories of independent variables were used in this study, namely the use of e-learning and metacognition skills as the dependent variable in this study. Analysis of the data used in this study using a t-test to determine the difference between the two samples.

RESULTS AND DISCUSSION

After the test group was treated with the use of e-learning and the control group with the conventional learning model, the measurements were carried out. The results of research data analysis for the average acquisition of metacognitive skills with e-learning learning obtained better results than conventional learning (Table 1). In the calculation with the independent Sample Test (Table 2), which shows a significant level on the t-test for Equality of Means, the results are 0.002 (<0.05) it can be concluded that there are differences in metacognitive skills between students who are taught by e-learning and students who are taught conventionally. .

Table 1. Group Statistics

	Metacognitif_Skill	
	Group	
	E-learning	Conventional
N	68	68
Mean	66.35	60.38
Std. Deviation	13.146	8.576
Std. Error Mean	1.594	1.040

Table 2. Independent Samples Test

Levene's test for equality of variances	F		13.178	
	Sig.		.000	
t-test for Equality of Means	t		3.137	3.137
	df		134	115.283
	Sig. (2-tailed)		.002	.002
	Mean Difference		5.971	5.971
	Std. Error Difference		1.903	1.903
	95% Confidence Interval of the Difference	Lower	2.206	2.200
		Upper	9.735	9.741

The results showed that the use of metacognitive scaffolds had a significant and positive effect on student performance, metacognitive abilities, and academic self-efficacy. Regarding the first research question, the research analysis showed that students who interacted with the metacognitive scaffold achieved better learning outcomes than their classmates who did not interact with the scaffold. It can be seen that each level of the metacognitive framework supports the monitoring and control process whereas the metacognitive supporting framework suggests that beginners set learning goals and plan a sequence of activities depending on those goals. In addition, the environment helps beginners fill out study plans, monitor their learning process using metacognitive activators, and provides an assessment module to assess their actual learning level, change their strategy if necessary, and provide a final assessment in each lesson when they feel ready. This activity is likely to help beginners identify as information processors and positively support their perceived self-efficacy in approaching learning in an e-learning environment.

Our results suggest that an e-learning environment can have a positive effect on learning outcomes, and this effect is particularly beneficial when structured to enhance metacognition. Second, they show that e-learning can promote better metacognition and learning outcomes even without metacognitive enhancement. To understand why this is so, we can rely on the results of further analysis. The research presented emphasizes that e-learning and metacognition tend to have a reciprocal relationship. Indeed, we have found research showing that e-learning can promote metacognition and therefore help explain why online activities affect learning outcomes (i.e. can stimulate metacognition). There are several explanations for why this could be. For example, they can promote greater motivation to learn, which in turn is linked to the importance of metacognitive strategies (Klein *et al.,* 2006). Please note that, in some cases, e-learning allows the recording of actions taken by individuals and the provision of feedback on the actions they have taken. This feedback is important for the person to become aware of their mental mechanisms and learn to control their learning strategies. Often, information and communication technologies explicitly require students to think about the choices they make, and therefore encourage them to ask themselves about the mental processes that are activated to find the most appropriate path. Sometimes the use of e-learning "forces" the learner to scan their mind in stages or sequentially, facilitating awareness of the mental operations used to complete the task. This represents the optimal use of e-learning, which can influence mental processes and thus have a broader positive effect in unrelated areas (although this has not been tested, we argue that it is an interesting avenue for future research). Metacognitive reflection also develops thanks to social interactions and these tools can encourage and support collaboration by supporting "shared" metacognition to the extent that online learning environments are interactive (Cacciamani *et al.,* 2012). The possibility of online collaboration using ICT has led to changes in the communication process itself. This modulation offers an interesting change in the metacognitive sense of the distance learning process (De Beni, Meneghetti and Pezzullo, 2010).

On the other hand, while e-learning can promote more metacognitive individuals, our analysis also shows the opposite pattern, namely that using online education requires basic skills for self-regulation (Ramirez-Arellano *et al.,* 2019). Furthermore, metacognition seems to moderate the relationship between e-learning and learning outcomes, i.e. it produces better learning outcomes only for students with better metacognition or metacognitive training (eg Lee and Wu, 2013). This conclusion implies that individuals must possess metacognitive skills, otherwise, they cannot benefit from the e-learning revolution. Since many individuals may not have adequate metacognitive skills, we recommend measuring metacognitive skills also concerning online learning to obtain information about tasks to be performed. For example, it may be possible to structure web-based activities to promote the acquisition of skills that can be improved, develop new strategies to promote concept acquisition during the learning process, increase student confidence, and plan to learn more effectively. to achieve certain learning objectives (Sanchez-Alonso and Vovides, 2007).

These results allow several conclusions to be drawn. First, the lack of research examining the relationship between e-learning and metacognition requires research. Second, we want to avoid the trivial conclusion that, simply put, e-learning has a positive effect on metacognition and learning. As the relationship between these two constructs may be more complex than previously thought, it is important to understand the circumstances behind the different results. In other words, it is unrealistic and simple to claim that e-learning supports learning. In contrast, e-learning requires a set of cognitive (meta) skills that must be taken into account when designing online courses. Unfortunately, the benefits offered by online learning and e-learning often go hand in hand with a lack of critical theory in technology education (Whitworth, 2007) and are not always matched by the ability of researchers to better define and structure the use of e-learning in different settings. . Near here. These differences tend to hurt the level of learning and individual psychological processes (Thomas *et al.,* 2016). In addition to technical and individual characteristics, the design of a web-based environment must consider the learning process, metacognition (Kramarski and Gutman 2006) as well as cognitive aspects (Klein *et al.,* 2006), and motivation (Ramirez-Arellano *et al.,* 2018). According to Siemens and Baker at the international conference, Learning and Knowledge Analysis In 2012, learning analysis includes measuring, collecting, analyzing, and reporting data about students and the context in which they learn to optimize learning. In this article, we attempt to extend the concept of learner metacognition, and in future publications, we will introduce further improvements to the model. We argue that the learner's experience can be enhanced by engaging in

metacognitive activities before, during, and after each learning activity. Tutors and learning technology professionals who define an online learning environment can include relevant metacognitive activities and supportive resources while taking into account learner differences in skills, knowledge, abilities, and preferences for metacognition. This is especially important for individual learners who may engage in self-study activities without social interaction with other learners.

Conclusion

Our analysis shows that the association between metacognition and e-learning use is (at least) threefold. On the other hand, working in a technology-mediated context supports the development of metacognitive skills, which in turn leads to better learning outcomes. On the other hand, using web-based education requires metacognitive skills. In general, the relationship between these two variables appears close and partially circular: while better metacognition enables learners to use e-learning effectively, technology tools and online learning can promote processes of self-monitoring and self-regulation. But there are "third parties" that support the combined use of e-learning and metacognition to achieve the best learning outcomes. In particular, it seems important that learners use e-learning in a metacognitive way that they are not passive recipients of information, but that the functions of these tools (synchronous communication, monitoring functions) facilitate them. metacognitive. Question. The use of e-learning can contribute to the creation of a strong learning environment (Smeets, 2015), but its use requires critical reflection that must take into account various aspects related to students, teachers, and their attitudes towards e-learning and e-learning arrangements. mediated learning. so that metacognition and self-regulation become more effective and together encourage learning. Our results provide an opportunity to take this definition further, as the context of learners is not only physical but is determined by their knowledge, skills, and individual differences, which may express themselves differently depending on the particular object of learning and attitudes. Where it happened. In particular, by highlighting the deep interactions between metacognition and e-learning, our analysis shows that motivational and metacognitive factors must be taken into account when interpreting learning outcomes, and therefore these factors are important for the usefulness of e-learning. Although determined in part at the individual level, they are also highly contextual, as individual skills and motivations can be contextually activated and define general psychological processes that enable learners to analyze and use data productively to derive maximum benefit from new knowledge. A future challenge for e-learning is our understanding of how psychological processes can be contextually activated and influence different stages of learning.

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