



A Comparative Study on the Effects of Digitally Self-regulated and Guided Discovery Learning Instructions on EFL Learners' Vocabulary Acquisition

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Abstract: The present research was an endeavor to examine and compare the effects of digitally self-regulated and guided discovery learning instructions on Iranian EFL learners' vocabulary acquisition. To this end, by conducting the Oxford Placement Test, 60 out of 140 Iranian EFL male and female learners from three language institutes in Isfahan, Iran, were randomly selected, and divided into three equal groups (i.e. two experimental groups and one control group). Prior to the instructions, a vocabulary pretest, designed and validated by the researchers, was conducted. Then, the experimental groups received two types of instruction, separately. The first experimental group was taught via digitally self-regulated learning (SRL) instruction based on Santangelo, Harris, and Graham's (2008) six-stage model. The second experimental group was instructed via guided discovery learning instruction based on Brown and Campione's (2011) stages. In contrast, the control group received the traditional method of teaching vocabulary such as word lists, dictionary use, and word translation. After conducting eight-session instructions, a posttest was administered. The data were analyzed via ANOVAs and post hoc analysis using the Tukey test. The findings of the study revealed that both digitally self-regulated and guided discovery promoted Iranian EFL learners' vocabulary acquisition. Additionally, the findings indicated that digitally self-regulated instruction was more effective than guided discovery instruction regarding vocabulary acquisition. Eventually, the theoretical and pedagogical implications regarding language learners, teachers, and curriculum designs are also provided.

Keywords: Digitally Self-regulated Learning, EFL Learner, Guided Discovery Learning, Vocabulary Acquisition.

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Introduction

Due to significant shifts in the field of English Language Teaching (ELT), the role of language learners has been immensely highlighted. In fact, the emergence of the learner-centered approaches in education considered language learning as a mutual process between teachers and learners (An, Gan, & Wang, 2020). In order to implement such approaches appropriately, various classroom activities are demanded, which can result in learners' participation, self-autonomy, and motivation (Guthrie & Wigfield, 2018). The prominent type of learning approach in this area is Self-Regulated Learning (SRL), put forward by Zimmerman (2000). According to Zimmerman (2000), SRL refers to the extent to which learners become motivated, utilize more meta-cognitive strategies, and behave actively in their learning context to reach their goals. In the same vein, Dembo, Junge, and Lynch (2006) argued that SRL addresses the learners' potential to control and monitor the affective elements in their own learning. Koksai and Dundar (2018) pointed out that, to behave autonomously in language learning contexts, self-regulated language learners may be responsible for their own learning. Owens et al. (2020) maintained that self-regulated language learners intentionally make attempts to guide and manage complex learning tasks and practices.

According to Taj et al. (2017), the field of education is passing through a stage of incredible change. Prior to the development of information technology, there was no term for defining digital learning. However, the revolutionary development assisted learners to get the required educational materials and knowledge from outside the class (Seifert & Har-Paz, 2020). Along with e-learning, the emerging concept of digital learning is also used in the educational field. The growing use of technology has provided more individuals with access to knowledge (Zohrabi & Farshbafan Bimesl, 2022). In the same vein, Seifert and Har-Paz (2020) believed that the use of digital learning has been also enhanced especially in developing countries due to their affordable prices so that such nations prefer to utilize them for distance learning.

Salvo, Welch, and Shelton (2019) mentioned that the appropriate utilization of digital learning tools in promoting self-regulation among learners may contribute to their academic success. In fact, enhancing the amount of the learners' self-regulation in digital environments leads to some fundamental changes in traditional and face-to-face learning contexts, especially after the COVID-19 spread. Accordingly, digitally self-regulated learning can be considered a proper instructional approach in promoting the learners' achievement. According to Wang et

al. (2013), digitally self-regulated learning has a noticeable role in enhancing the learners' development. In addition, Fredricks et al. (2004) argued that digitally self-regulated learning affects language learners' achievement in language education. Similarly, to Uka and Uka (2020), digitally self-regulated learning is beneficial to promote academic achievement.

As far as the definition of self-regulation (SR) is concerned, Pintrich (2000) pointed out that it is an active process through which learners set up goals for their learning, and then attempt to monitor and regulate their cognition, motivation, and behavior. Therefore, SR refers to a system of personal management in which individuals guide their thoughts, behaviors, and feelings to reach their goals. In the same vein, according to Maranges and Baumeister (2016), self-regulation theory is defined as "the standards of desirable behavior, motivation to meet standards, monitoring situations and thoughts that precede breaking standards, and willpower, or the internal strength to control urges" (p. 65).

Zohrabi and Farshbafan Bimesl (2022) maintained that learning is a process that leads to relatively fixed changes in the learners' behaviors after experiencing specific instructions. For ELT researchers, employing proper learning instruction, which contributes to learners' discovery and recognition of their own progress and development is of paramount importance. Yerizon and Subhan (2018) defined Guided Discovery Learning (GDL) as a type of learning strategy, which includes presenting the instruction in line with a systematic model, which assists the learners to overcome the challenges and solve the problems by identifying the problems, obtaining the required information, inspiring, inferencing, and interpreting. They also added that GDL provides the learners with the opportunity to explore, utilize their full competence, and collect information to discover a solution to a problem. As stated by Akanmu and Fajemidagba (2013), GDL instigates a sense of discovery and inquisitiveness among the learners, contributes to their enthusiasm to discover the solutions, and provides an answer to proposed questions during the learning. Through GDL, Akanmu and Fajemidagba (2013) assumed, learners are supposed to learn deeply since GDL promotes them to be autonomous, providing them optimal freedom and self-determination to discover a number of different learning outcomes under the guidance of their instructors. In line with the purpose of the study, the following research question is proposed:

RQ. Do digitally self-regulated and guided discovery learning instructions have any significant effect on Iranian EFL learners' vocabulary acquisition?

Literature Review

The theoretical framework of the current study was based on three main theories, namely Vygotsky's Sociocultural Theory, Marsick and Watkins's (2008) Informal and Incidental Learning Theory, and Bruner's (1961) constructivist approach. First, in his Sociocultural Theory (SCT), Vygotsky (1978) indicates that increasing individuals' awareness is mostly social, not cognitive, and social interactions essentially enhance the psychological amendment of humans. This theory lends support to the current study by highlighting the significance of social collaborations in online contexts, which can facilitate learning. Second, according to Marsick and Watkins's (2008) definition, informal-incidental-based learning is gained as a result of other learning activities, and cannot per se be considered a classroom-based learning activity. In their study, the informal and incidental learning theory paves the ground for using digital learning in English and learning of language indirectly. Marsick and Watkins (2008) argued that learning begins with some sort of internal and external stimuli. Such trigger can be made by online learning, which reveals the dissatisfaction with formal instruction and present experience of thinking or being. Third, the assumption underlying guided discovery learning emerges from Bruner's (1961) constructivist approach, stating that any field of study may be instructed effectively in some intellectual manner to any human at any stage of development. According to Bruner's (1961) constructivism theory, individuals create their own knowledge rather than knowledge being transferred into their minds. This construction of knowledge depends on past experience, existing knowledge, and the individuals' ability to understand the connections. Individuals can change existing knowledge and develop new knowledge.

A number of scholars mentioned the utilization of GDL in education (Brown & Campione, 2011; Gage, 2009; Lijnsev & Klaassen, 2004, to name a few). The popular dimension in various GDL practices is that teaching begins with offering a learning challenge, and learners themselves are supposed to contribute to the knowledge development required to come up with the challenge. When learners get sufficient feedback in enhancing the needed knowledge, GDL may assist them to be more engaged, enhance flexible knowledge, and learn how knowledge is developed in a specific context (Lijnsev & Klaassen, 2004). Although the benefits of GDL have been widely recognized around the globe, as Gage (2009) states, most instructors scarcely take advantage of GDL. Gage (2009) believes that the instructors still ask learners common questions, which do not instigate the learners' curiosity and do not provide the learners with the opportunity to discover new knowledge. Concerning the empirical studies

conducted on self-regulated learning, guided discovery, and digital learning, the following empirical studies discuss some of these studies related to various language skills.

In a correlational study, Soleimani, Aghayani, and Ashari (2018) explored the correlation among EFL students' self-regulation, locus of control, and preference for vocabulary acquisition. They selected 116 EFL university students and collected the data through two questionnaires and one vocabulary levels test. The findings showed that there was a positively significant nexus between EFL students' locus of control and preference for vocabulary acquisition. Moreover, the locus of control and self-regulation had a positive significant relationship with the vocabulary acquisition preference. However, no tangible difference was found between students' self-regulation and locus of control.

In terms of the self-regulation process, Nakata (2019) probed into how low-level learners could become better self-regulated learners. The data were gathered through closed and open-ended questionnaires and review sheets. The findings revealed that the process of self-regulated learning was individually specific, and each learner utilized a unique process to enhance his or her own self-regulation.

In a recent study, Erfanrad, Fazilatfar, and Maftoon (2020) examined the impact of Systemic-Theoretical Instruction (STI) and discovery learning on learning the English tense-aspect system. To this end, they selected 60 Iranian low-intermediate EFL students and divided them into three groups through STI and discovery learning (experimental) and traditional method (comparison). The findings showed that two types of instruction had a positively significant effect compared to the traditional method. Examining the nexus between self-regulatory strategies and writing skills of Iranian EFL learners, Mallahi (2020) selected 125 B.A. level EFL students. He used an argumentative essay prompt and a self-regulatory strategy questionnaire in writing. The findings revealed that there was a slight relationship between self-regulatory strategies and writing skills.

Reviewing the related literature revealed that the number of studies conducted on digitally self-regulated and guided discovery is scarce. To broaden the scope of the literature, the current study was an endeavor to fill such a gap in the literature.

Method

Participants

The participants of the study consisted of 60 out of 140 Iranian EFL male and female learners from three language institutes in Isfahan, Iran, who were randomly selected based on their

obtained scores on the Oxford Placement Test. The participants ranged in age 18 to 21 years old. All of the participants were Persian native speakers. The demographic information of the participants is presented in the following table.

Table 1. *Demographic Information of the Participants*

Setting of Experiment	Isfahan, Iran
Length of Experiment	One semester, 8 sessions (60 minutes each session)
Frequency of Sessions	two sessions a week
Number of Participants	60 participants, including: 20 participants in the first experimental group 20 participants in the second experimental group 20 participants in the control group
Age Range	18-21 years old
Gender	Both male and female
Native Language of Participants	Persian

Instruments and Materials

Oxford Placement Test (OPT)

In order to select a homogenous sample of the participants at the beginning of the study, an Oxford Placement Test (OPT, 2019) was utilized. The test consisted of 100 items with three sections including listening, reading, and speaking. As a standard and reliable test, OPT was selected since it was fast and easy to handle for placement assessment purposes. The test takes approximately 90 minutes to administer, and all the questions in the test are in the multiple-choice format. Answers are recorded directly on the answer sheet, and the answer sheets can be quickly marked using the overlays provided.

Vocabulary Pretest and Posttest

In addition to OPT, a researcher-made vocabulary pretest was utilized. The aim was to determine whether participants were homogeneous in their knowledge of English language vocabulary prior to the study. Initially, the vocabulary pretest consisted of 64 multiple-choice test items. The vocabulary items were selected from the English Vocabulary in Use (intermediate level) textbook. The items of the vocabulary test were reviewed by three expert judges in the field to ensure validity. In order to calculate the reliability, inter-rater reliability

was run and reported (.79). The vocabulary pretest was used as a pilot test to select the 50 target words. To this end, the participants were asked to examine whether they were familiar with the words and provided a definition or a synonym. The participants were familiar with 14 words, which were then excluded from the final draft. Eventually, 50 words, new and unfamiliar to all the participants, were selected as the baseline lexis for the study.

Materials

The textbook for teaching English vocabulary was a course book named *Solutions* (Krantz, Falla & Davies, 2012). The textbook was selected since it is a five-level English course book from elementary to advanced levels with a clear supported approach to speaking, writing, and exam preparation at its heart. For the purpose of the current study, the units including the same 50 targeted words in the posttest were selected and presented during the instructions. In fact, each unit consisted of seven lessons designed in order from A to G.

Data Collection Procedure

One of the most essential parts of the research is “piloting” since it is possible to detect the unforeseeable minute points and problems with the research instruments of the main study, and in this way, it may prevent the possible deviations of the instruments. Regarding this point, the researcher designed a pilot study. The purpose was to allocate the time limit and find out the weaknesses of the research instruments to be eradicated for their final versions. To this end, 20 participants from the target population of the study (i.e. Iranian EFL learners from three language institutes) with similar characteristics were selected to take part in the pilot study.

The study included pretest, posttest, control, and two types of instruction, namely, digitally SRL and guided discovery learning. After participant selection, all of the participants took a placement test and vocabulary pretest to ensure their homogeneity in terms of language proficiency and vocabulary acquisition, respectively. The experimental groups received two types of instruction, separately. The first experimental group was taught via digitally SRL, and the second experimental group was instructed via guided discovery learning. In contrast, the control group received the traditional method of teaching vocabulary in EFL contexts. The instructions lasted for eight sessions. After administering the pretest, the implementation of digitally SRL was facilitated by using Santangelo et al.'s (2008) six-stage SRSD model. It consists of six phases, namely, Developing Background Knowledge, Discussing Strategy, Modeling, Memorizing, Supporting, and Performing independently. This model allowed the

learners to foster their self-regulated learning. The efficacy of such a model has been verified by some previous studies (Graham & Harris, 2003; Harris & Graham, 2003; Harris et al., 2006). Such studies revealed that stages of the SRSD model can be adapted to meet the learners' needs.

In the first stage, it was expected to develop learners' background knowledge. To this end, the instructions were focused on lexical knowledge such as word units, word components, form, function, meanings, the relationships among words, etc. During the second stage of the SRSD model, the learners were required to discuss what they learned from the previous stage. To this end, the learners were assessed to find out whether they remembered the first stage. The instructor of the digitally self-regulated learning group, who was an experienced M.A. language teacher, was supposed to utilize some types of graphic organizers, and introduced the learners the self-monitoring and the idea of goal setting. The third stage included modeling. In this stage, the learners were presented with self-instructions (i.e. self-talk) and reminded of the previous stages to make self-modeling. During the fourth stage of SRSD, the learners memorized each step taken and their self-monitoring. The fifth stage began with a collaborative experience between the instructor and learners. To this end, the instructor and learners set a goal to cover all steps and started planning and performing the previous stages. This stage was provided with the instructor's support when the learner needed help. Thus, the type of collaboration in this stage consisted of both the instructor and peer support. Finally, during the sixth stage, the learners became more independent and autonomous so that they performed vocabulary tasks without getting any prompt or receiving assistance from the instructor or their peers.

Digital learning instruction was conducted via www.lessonwriter.com. It is a website designed for setting up pedagogical lessons. Thus, English language instructors create a text that they wanted to teach in class. This website automatically made vocabulary, pronunciation, word etymology, and structure support to guide the learners. The learners in the experimental group were supposed to do the follow-up exercises and answer the vocabulary questions related to the given text. Moreover, the learners were able to record, monitor, and regulate their previous activities. The website also enabled the learners to compare and evaluate their performance with other learners. The learners also utilized either available programs on the website such as WordPerfect to do editing, or programs dictionaries, thesauri, and encyclopedias. The instructor controlled generating the lessons from scratch. More importantly, this website provided a lesson plan to the instructors, as well. Through

implementing the digital learning, the instructor made an attempt to utilize the six-stage SRSD model so that the learners became self-paced, and self-regulated before and after each lesson.

In contrast, in the experimental group taught via GDL, the implementation stages proposed by Brown and Campione (2011) on GDL were precisely followed. To this end, another M.A. experienced teacher was requested to cooperate in conducting the instruction. In the first stage, the instructor proposed initial questions to warm up the learners for the lesson. He then assisted learners to recall information from their own experiences to integrate their former information learned with the new one. For the second stage, the teacher took the learners' attention to the lesson topic and made challenging questions, and the learners were asked to work individually. During the third stage, the main words of general topics were presented and discussed. The learners were supposed to look for practice on the gist of the matter. In the fourth stage, the learners exercised the specific information based on the instructor's leading questions. The instructor posed a problem after the learners' responses and gave an answer to each question raised to discover the links between the concepts. In the fifth stage, the instructor summarized the general and the supporting ideas of each lesson. The learners received the teacher's feedback on their performance. During the sixth stage, the learners worked in pairs and practiced specific information obtained through discovering new knowledge. In fact, they cooperated to answer the leading questions until they discovered new knowledge to be included in their previous materials learned. The seventh stage included the instructor's emphasis on the principles of discovery learning, and the learners made attempt to relate the new incoming information they discovered to their own experience. Finally, in the eighth stage, while the learners worked on the tasks in pairs, the instructor gave feedback and assessed the whole performance of the learners. New themes emerged, and the learning began again.

Results

After calculating descriptive analysis of all groups, to ensure the normality of distribution Kolmogorov-Smirnov Test was run. In addition, to answer the research question, which compared the effect of two types of instruction on vocabulary acquisition ANOVAs, and Tukey HSD analysis were conducted. The results of the Kolmogorov-Smirnov Test are presented in Table 2.

Table 2. One-Sample Kolmogorov-Smirnov Test

		Digitally Self-regulated pre	Guided Discovery pre	Control pre	Digitally Self-regulated post	Guided Discovery post	Control post
N		20	20	20	20	20	20
Normal Parameters ^{a,b}	Mean	11.35	11.6500	12.100	16.3	12.2500	12.300
	SD	3.67	4.74924	5.3793	3.5	5.37905	4.7362
Most Extreme Differences	Absolute	.170	.140	.138	.279	.228	.139
	Positive	.160	.096	.127	.228	.111	.125
	Negative	-.170	-.140	-.138	-.279	-.228	-.139
Test Statistic		.170	.140	.138	.279	.228	.139
Asymp. Sig. (2-tailed)		.131 ^c	.200 ^{c,d}	.200 ^{c,d}	.000 ^c	.008 ^c	.200 ^{c,d}

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

According to Table 2, since the significant values are higher than .05. ($p > .05$), it is concluded that the difference between the groups' variances is not significant and roughly equal for the pretest, and therefore the assumption of homogeneity of variances is met. Since the main assumptions of the parametric tests were met, utilizing parametric tests is safe. Table 3 shows the descriptive statistics of the pretest and posttest of the experimental and control groups.

Table 3. Descriptive Statistics

	N	Min.	Max.	M	SD
Digitally Self-regulated pretest	20	23.00	41.00	32.00	3.674
Guided Discovery pretest	20	25.00	40.00	32.50	4.749
Control pretest	20	24.00	42.00	33.00	3.379
Digitally Self-regulated posttest	20	25.00	46.00	35.50	3.558
Guided Discovery posttest	20	27.00	48.00	37.50	3.379
Control posttest	20	23.00	44.00	31.50	4.736
Valid N (list wise)	20				

As illustrated in Table 3, in the pretest, the mean and standard deviation for the Digitally Self-regulated (DSR) group are (M=32.00) and (SD=3.67), for the Guided Discovery (GD) group is found to be (M=32.50) and (SD=4.74), and for the control group (M=33.00) and (SD=3.37), respectively. In contrast, in the posttest, the mean and standard deviation for the DSL group are (M=35.50) and (SD=3.55), for the GD group is found to be (M=37.50) and (SD=3.37), and for the control group (M=31.50) and (SD=3.73), respectively. After calculating descriptive statistics, the results of three groups in the pretest were analyzed and compared via ANOVA.

Table 4. ANOVA Pretest of Three Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.700	2	2.850	.132	.877
Within Groups	1234.900	57	21.665		
Total	1240.600	59			

Based on the results of ANOVA, since $p > 0.05$, $F(2, 57) = .132$, it is concluded that no significant difference is found in the three groups' pretest performance prior to the treatments. In addition, the results of comparing the three groups in the posttest were also calculated with another ANOVA.

Table 5. ANOVA Posttest of Three Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	221.433	2	110.717	5.188	.009
Within Groups	1216.500	57	21.342		
Total	1437.933	59			

As presented in Table 5, there is a significant difference among the three groups for the fact that ANOVA, $F(2, 57) = 5.188$, $p < .05$, indicating at least one significant difference among the means. The main shortcoming of ANOVA lies in the fact that it provides no

information as to the location or the source of variance. Therefore, in order to determine the location of the difference, when the F value was significant, the post hoc analysis by Tukey HSD test was conducted. Table 6 illustrates the results.

Table 6. Tukey HSD Analysis

Multiple Comparisons						
Dependent Variable: Vocabulary						
Tukey HSD						
(I) SRL	(J) GDL	Mean			95% Confidence Interval	
		Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
1.00	2.00	4.10000*	1.4608	.018	.5845	7.6155
	3.00	4.05000*	1.4608	.020	.5345	7.5655
2.00	1.00	-4.10000*	1.4608	.018	-7.6155	-.5845
	3.00	-.05000	1.4608	.999	-3.5655	3.4655
3.00	1.00	-4.05000*	1.4608	.020	-7.5655	-.5345
	2.00	.05000	1.4608	.999	-3.4655	3.5655

* The mean difference is significant at the 0.05 level.

As it is presented in Table 6, the results of Tukey HSD analysis revealed that digitally self-regulated learning was more significantly effective than guided discovery instruction in promoting Iranian EFL learners' vocabulary acquisition (Mean Difference=-4.0000*, Std. Error=1.460, Sig=.000). That is, both types of instruction (i.e. digitally self-regulated and guided discovery), enhanced Iranian EFL learners' vocabulary acquisition. However, comparing the efficacy of such instructions, the results showed that there was no significant difference between digitally self-regulated instruction and guided discovery instruction in terms of vocabulary acquisition. It is concluded that both experimental groups had a better performance compared to their counterparts in the control group.

Discussion

One justification for the improvement of vocabulary acquisition among learners in the digitally self-regulated group can be due to enhancing their strategic behavior, planning, knowledge, and maintenance through digitally self-regulated instruction. This is in line with the findings of Zimmerman, Bonner, and Kovach (1996), who argued that planning is considered one of

the essential abilities in language learning, resulting in setting goals and strategies to meet their aims. Another rationale for the obtained findings is attributed to increasing learners' engagement during the digitally self-regulated activities. According to G'anem-Gutiérrez and Harun (2011), engagement and interaction with physical and psychological objects assist humans to develop their thinking, also easily provided by utilizing digital-based materials. They also maintained that in EFL/ESL contexts, languaging or so-called verbalization of crystalized thought and language gives learners an opportunity to analyze. It is also justified that learners in the digitally self-regulated group had the opportunity to self-monitor with the help of website worksheets and receive support from their peers to enhance their vocabulary acquisition. As stated by Zainuddin et al. (2019), e-learning modules lead to learner-learner interaction and learner-content integration since digitally based learning contributes to language knowledge co-construction.

The finding is consistent with the results of Guthrie and Wigfield (2018), who confirmed that in a rich instructional context where learners are goal-oriented, they seemed to be highly engaged in classroom activities. In the same vein, fostering the learners' autonomy by digitally self-regulated activities can be regarded as another justification for the results. This is supported by Paris and Paris's (2001) idea that there is a close nexus between learners' self-regulation and autonomy. Furthermore, in addition to autonomy, according to Garcia and Pintrich (1996), self-regulation may lead to learners' motivation. Notably, the association between self-regulation and motivation was previously endorsed by a number of scholars (e.g. Glaser & Brunstein, 2007; Pintrich, 2000; Pintrich & Schunk, 2002; Zimmerman, et al., 1996; Zimmerman & Kitsantas, 2005). In the same line, Chuang et al. (2018) concluded that using digital materials in language courses successfully escalated learners' learning motivation and self-paced learning skills.

It should be noted here that the results on the efficacy of digitally self-regulated instruction in the present investigation verify the findings of a number of research studies, which revealed a significantly positive impact of self-regulated instruction on learners' achievement in different disciplines and educational contexts (e.g. Glaser & Brunstein, 2007; Perels, et al., 2009; Winters, et al., 2008). The findings are also in line with the results obtained by Zhonggen and Guifang (2016), confirming that digitally based educational contexts provide interactive learning opportunities for learners to assist them to take their own learning responsibilities. However, the tangibly positive effect of guided discovery learning can be explained in terms of Heywood's (1992) assumption. He argued that although discovery

techniques did not significantly enhance the learners' achievement scores as opposed to other methods, such techniques made a better learning context in which the learners were more engaged and motivated. Accordingly, learners might experience a better and more effective educational setting, resulting in their engagement, creativity, and motivation. This finding is supported by the results of previous studies (e.g. Fotos & Ellis, 1991; Nassaji, 2017; Salihu, 2015, to name a few). According to Nassaji (2017), pedagogical practices based on problem-solving in which learners need to reflect on language forms and get them involved in classroom activities were found to be effective in enhancing the learning process. In the same vein, Ellis (2002) maintained that discovery-based techniques result in learners' motivation, memorability of rules, engagement, problem-solving, and critical thinking.

Furthermore, the results of the current study lend support to the research studies of Akanmu and Fajemidagba (2013), Kirschner et al. (2006), Omiorrhieren (2002), and Salihu (2015). In these studies, the authors also concluded that the guided discovery approach was highly fruitful in enhancing learners' achievement. Moreover, Alfieri et al. (2011) found that the learners were more satisfied with guided discovery techniques in EFL/ESL classrooms. However, a word of notice is worth mentioning here. As expressed by Shulman and Keisler (1966), some language learners do not learn the rule with mere discovery techniques. Thus, discovery techniques can be utilized as complementary to other teaching methods and make learners cognitively prepared during the learning process.

To recapitulate, comparing two types of instruction revealed some striking differences. First, as confirmed by Zimmerman (2000), the environment plays a crucial role in fostering learners' self-regulation. The environment may mediate between learners' personal and behavioral features with real-world interactions. As far as the digital environment is concerned, most learners take advantage of the environmental features in interaction so that the cyclical development and adaptation of their self-regulation are obtained. Such interaction is supported by Vygotsky (1978), believing in mediation of speaking for communication and social intercourse. It is argued that, over time, the mediation of the environment through speaking leads to individuals' self-regulation in daily activities. In the same vein, An et al. (2020) noted that learners are able to transform their contexts based on their own preferences by utilizing theoretical concepts which assist to regulate the self. Accordingly, it can be concluded that digitally self-regulated contexts might pave the ground to correct socially particularized meanings, and regulate the actions, compared to guided discovery contexts, where, in most cases, self-regulation needs sufficient feedback (Lijnsev & Klaassen, 2004), and construction

of knowledge (Brown & Campione, 2011). That is, guided discovery contexts suffer from two limitations of being feedback, and knowledge construction-dependent.

Conclusion

Based on the findings, it is concluded that utilizing digitally self-regulated learning instructions leads to enhancing EFL learners' vocabulary acquisition. In this sense, the characteristics of the digital environments used in EFL/ESL contexts become more conspicuous. When self-regulated learning techniques are integrated into digitally supported environments, the learners will be provided with flexible access to learning materials and interactivity, and be able to monitor and manage their own learning. Providing scaffolding by digital environments may assist learners to become more self-directed. This is also claimed by Xu and Jaggars (2014). They reported that digitally self-regulated learning benefits college online learners. Moreover, the advantages of digitally self-regulated learning underscored the dire need for instructions based on self-regulation in online learning contexts. It can be also concluded that digital learning instruction provides students with more language learning strategies (i.e. vocabulary learning strategies in the present study) so that the students become technology strategic users to regulate their learning and acquisition. Furthermore, as opposed to conventional learning contexts such as teacher-centered and face-to-face environments, in digital and online contexts, due to accurate, meaningful, and accessible information, teachers may take advantage of the instructional technologies by promoting the cyclical phases of SRL in learners.

Concerning the guided discovery learning in the present investigation, one can draw the following conclusions. First, although the efficacy of guided discovery learning was not highly tangible on vocabulary acquisition, compared to the results of digitally self-regulated learning, the guidance provided during the guided discovery learning may assist learners cognitively create their preferred learning outcome. This conclusion is also supported by Mayer's (2004) assumption. According to Mayer (2004), learners should be mentally active for guided practice during learning. Second, GDL was found to guide the learners construct their own knowledge. This is consolidated and verified by the supporters of Bruner's (1961) constructivist approach, maintaining that by guided discovery learners gain precious experiences and make their own interpretations and inferences to discover and solve their learning problems.

Consequently, the pedagogical implications of this study, first, address EFL learners and teachers since implementing digital facilities as well as guided discovery learning in EFL courses can be taken into consideration by teachers and practitioners in order to teach and

evaluate language skills and sub-skills. Second, the educators in the instructional and technological designs and teaching side of EFL courses may benefit from the implications of the present investigation. The third implication refers to integrating digitally self-regulated techniques and guided discovery practices into EFL/ESL materials and textbooks to promote learners' opportunities to monitor, evaluate, and self-regulate. According to Schunk and Zimmerman (1997), utilizing self-regulated and discovery-based tasks and activities in the course materials would enhance the learners' engagement and autonomy. Fourth, the implications of the current research may contribute to ELT policymakers and language assessment organizations and centers.

Due to the limitations imposed on conducting the current study, further research is required to be conducted on the effect of digitally self-regulated and guided discovery learnings on EFL learners' language skills. Moreover, future longitudinal studies are needed to examine the long-lasting effects of digitally self-regulated and guided discovery learnings since it was not possible to have a longitudinal treatment. Last but not the least, future studies can be performed by more participants from various proficiency levels and gender.

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