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Research article

Self-directed Learning, Self-efficacy, and Technology Readiness in E-learning Among University Students

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Abstract.

Research on e-learning shows that there are moderating factors determining the successful use of e-learning. Learner's internal factors such as attitudes, self-efficacy, digital literacy, self-directed learning, and technology readiness are factors that influence the use of e-learning and e-learning satisfaction. External factors such as technical support, infrastructure support, and leadership have also been found to affect e-learning satisfaction. The objectives of this quantitative study are twofold. First, it intends to explore how students used e-learning during the COVID-19 pandemic. Second, it examines the interplay between self-directed learning, self-efficacy, and technology readiness among university students. For this quantitative study, a questionnaire was administered to 4,953 university students. Using descriptive statistics and multiple regression analysis, this study looks at the relationships between self-efficacy, technology readiness, and self-directed learning. The implications of this study on higher education policy on e-learning will also be discussed.

Keywords: self-directed learning, self-efficacy, technology readiness, e-learning

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1. Introduction

E-learning has recently played an ever increasingly important role in the educational institutions around the world. Due to the outbreak of the pandemic, there has been a shift from traditional classrooms to virtual classrooms. Teachers are required to adopt e-learning in their classrooms. Compared to the traditional classroom learning environment, e-learning has given different experiences for learners [1-5]. One of those experiences is how teachers and students deal with the borderless classroom. In extraordinary circumstances such as this pandemic, e-learning can overcome the problem of limited space and time in the real world [6].

Previous research shows that satisfaction in the use of e-learning is determined by internal and external factors. The internal factors include attitudes [7], self-efficacy [8], independent learning [9,10], personality [11], social environment [12], and technological

readiness [13] while the external factors cover institutional support, technical support [14,15], and course design [16]. E-learning is also often associated with a shift in teaching paradigm from teacher-centred learning to student-centred learning (SCL). In the SCL method, students are required to be able to manage learning activities independently. Literature review on independent learning found that independent learning can increase learners' knowledge and skills. Initiative and responsibility [16] and self-efficacy [8] are some of the most important characteristics for independent learning. Students will be able to increase their knowledge if they have the capability to accomplish tasks for their learning and manage their own learning pace [16].

The relationship between the use of technology and learning achievement is often debatable due to some moderating variables. Technology has some effects on learning, but it is still difficult to directly measure the effect due to various moderating factors and indirect benefits. Many internal and external factors influence the use of technology such as attitudes, motivation, self-efficacy, digital literacy, and many other variables. This research focused on three variables, namely the self-directed learning, computer self-efficacy, and technology readiness.

Self-directed learning historically was defined as a personal attribute. A self-directed learner is a learner who can take charge of their own independent learning and who has the capability to manage his/her learning strategy. However, the more updated definition of self-directed learning covers the notions that SDL is a learning process in which learners take responsibility for planning, implementing, and evaluating the learning process [17].

In its broadest sense, self-directed learning describes the process by which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning objectives, identifying human and material resources for learning, selecting and implementing appropriate learning strategies and evaluate learning outcomes [18]

Self-efficacy refers to the beliefs and expectations of a person in his or her ability to accomplish a task [19]. Self-efficacy determines how a person overcomes the problems they face and how they overcome obstacles. A person who has high self-efficacy will show maximum effort to solve all the challenges he faces, while people with low self-efficacy will give up more quickly if they experience obstacles. In the world of education, self-efficacy is an important factor that can determine learning success [20].

Technology readiness is an important factor in the implementation of e-learning. Learning with high technology readiness has a positive attitude towards learning technology media and innovative learning platforms. Students who are not comfortable with

technology and feel anxious about using technology will need longer time to learn to use technology for their personal needs [21].

The objectives of this quantitative study are twofold. First, it intends to explore how students used e-learning during the pandemic. Second, this study aims to examine the interplay between self-directed learning, self-efficacy, and technology readiness among university students.

2. Research Method

This study aims to look at the ways students did their online learning and to find predictors of self-directed learning among college students. To answer this question, the researcher will use the quantitative method. In this study, 4,953 students were recruited. To obtain data, an online questionnaire was distributed. The questionnaire contained three parts. The first part was intended to obtain information on participants' study program and where they were from. The second part of the questionnaire asked about the self-directed learning, computer self-efficacy, and technology readiness. For this part, participants were given options Strongly Agree, Agree, Disagree, and Strongly Disagree. These options were then converted into scales of 4 for the most favourable answer to 1 for the least favourable answer. Questions related to self-directed learning were designed to find out students' eagerness and willingness to regulate their own learning. This construct was modified from previous study of Fisher & King [22] that include motivation, self-management, and self-monitoring. Computer self-efficacy included statements related to students' perceived ability to perform various tasks related to e-learning. Technology readiness construct was designed to capture students' perceived preparedness when dealing with technology. The data from the second part of the questionnaire were analyzed using Multi Linear Regression to find the predictors of self-directed learning. The third part of the questionnaire was intended to obtain information how students did their online learning. In this part, some of question items allows students to choose more than one options. The data from this part were analyzed using descriptive statistics.

3. Findings and Discussions

In this study, a descriptive quantitative research design was used to address the first research questions namely students' use of e-learning. An online questionnaire of two parts was distributed to all active students and 4,953 students filled out the

questionnaire. The first part of the questionnaire was intended to elicit information about the demographics of the participants, their current practice when studying online and how they used the internet during their study. The second part of the questionnaire was aimed to find the predictors of self-directed learning.

3.1. Students' Use of E-learning

3.1.1. Residence

The participants in this study were mostly live in cities and big cities. Out of the 4,953 students, almost 40% live in big cities (*kota*), 46% live in cities (*kecamatan*), the rest 14% live in *kabupaten* or districts.

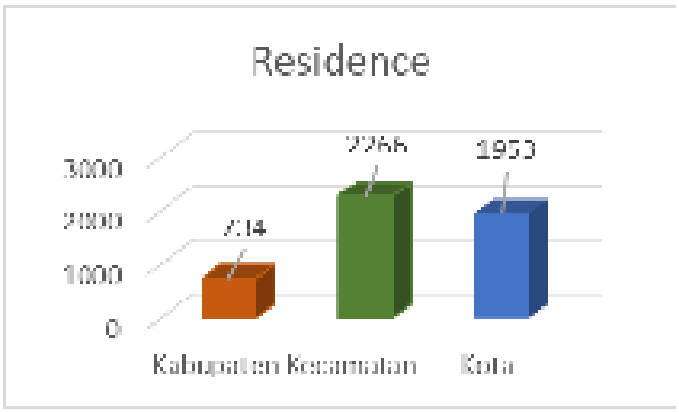


Figure 1: Students' residence.

3.1.2. The most preferred method for online learning

When asked about the most preferred method for online learning, students opted for video conference tools such as Zoom and Gmeet. 90% of the participants opted to attend classes through video conference applications. The least preferred method for online classes was the emails. 80% of the participants did not want to use email for classes. This imply that students preferred to have face-to-face meetings with their lecturers through video conference applications such as Zoom and Gmeet. Video conference allows students and teachers to communicate and engage directly, albeit virtually [23]. Through videoconferencing, teachers and students will be able to engage in conversations, giving feedback, and pay attention to non-verbal cues [24].

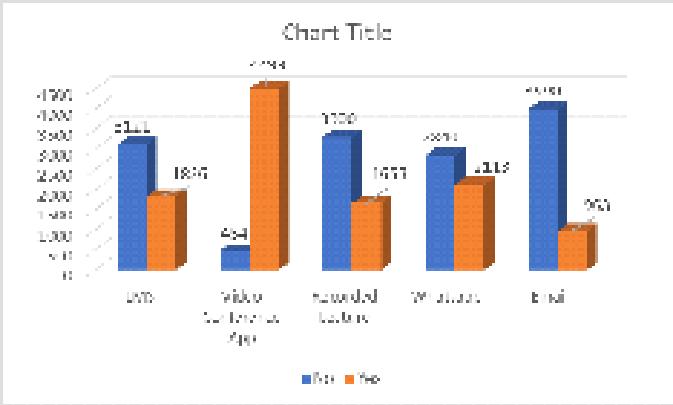


Figure 2: The most preferred method for online learning.

3.1.3. Students' preferred method of teaching during the pandemic

During the pandemic, universities worldwide have to adjust their delivery method to online teaching. The participants in this study, surprisingly, opted for online learning or hybrid learning, where they could stay at home and attend classes. From Figure 3 below, we can see that for the last choice, fully offline mode, the majority of the students (86%) chose No. This imply that students might be aware of the advantages of having online classes. The first year of the pandemic might change students' learning habits and approaches. When they were asked to choose between fully online or hybrid, the findings showed a balanced responses between the two methods with hybrid learning receiving more Yes responses from the participants.

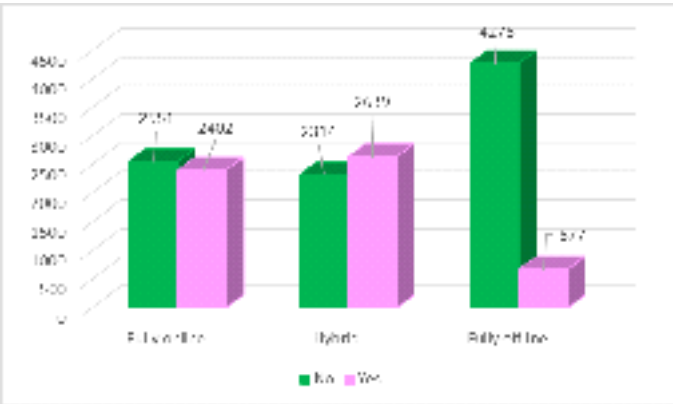


Figure 3: Delivery modes.

3.1.4. Students' facilities at home

Students' access to the Internet and available facilities have been cited as some of the important factors for students' online learning experience. When asked about whether

they have their own study room or share their study room with other people, most participants in this study reported that they studied from the bedroom. Only a few students had their own study room (Figure 4).

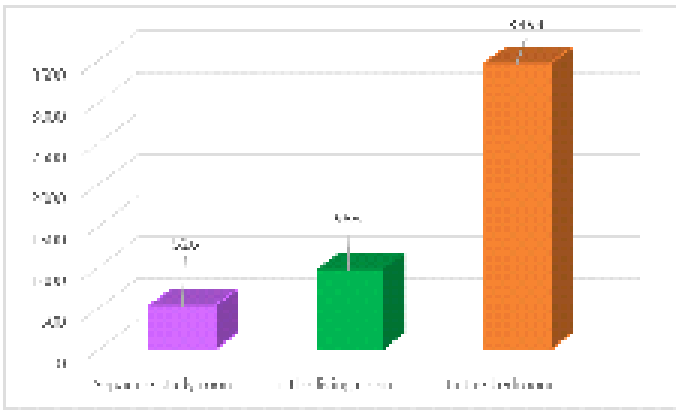


Figure 4: Students' facilities at home.

3.1.5. The Internet access

The participants were also asked how they accessed the Internet to attend classes. From Figure 5 below, it is evident that students used either Wi-Fi in their homes or used their Internet data. Very few students (11%) reported that they also made use of free public Wi-Fi. This might refer to Wi-Fi provided in many coffee shops or public places where students could go to work on their assignments and projects.

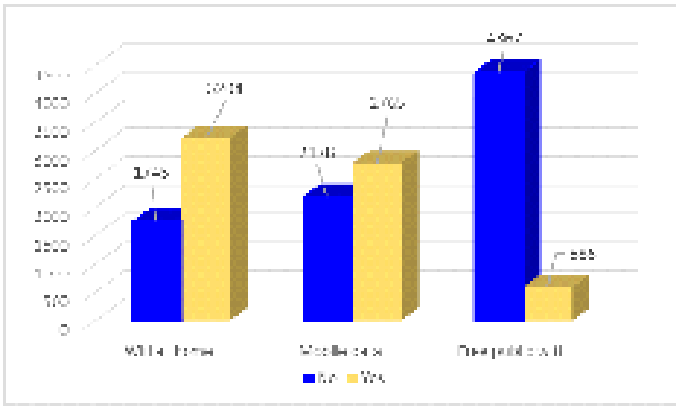


Figure 5: The Internet Access.

3.1.6. The Internet connection

Connectivity and access to the Internet are paramount during online learning since it determines how well students participated in the class activities. When asked about

the Internet connection, almost half of the participants reported that their Internet connection was smooth (45%). Approximately a fourth of them reported that their Internet connection was sometimes disconnected, while the rest (18%) said that their Internet was frequently disconnected.

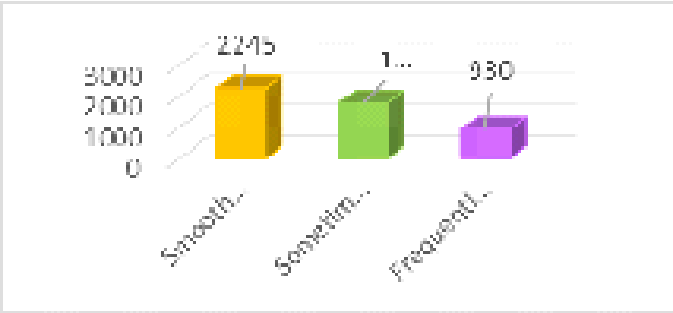


Figure 6: The Internet connection.

3.1.7. Gadgets availability

Online learning will not be possible without the availability of gadgets to obtain access to the Internet and to online classes. The participants in this study mostly had their own gadgets (75%), while the rest (25%) shared their gadgets with their family members.

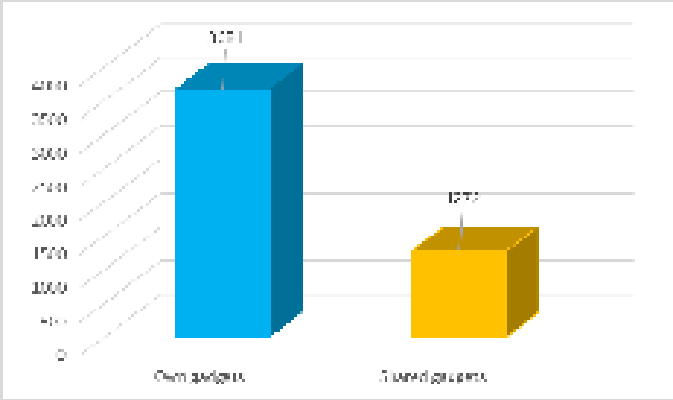


Figure 7: Gadgets availability.

3.2. Predictors of Self-directed Learning

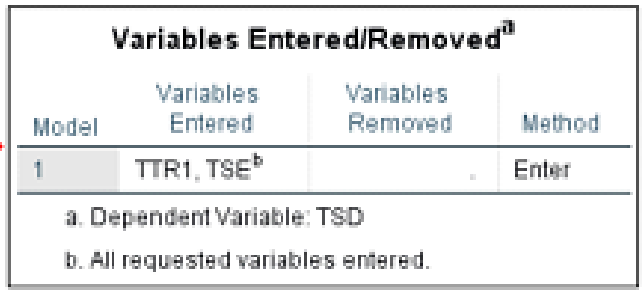
The second research question of this study is to look at the predictors of self-directed learning. The dependent variable in this study is self-directed learning and the independent variables are computer self-efficacy and technology readiness. The second part of the questionnaire was used to address the second research question. The second part consisted of eight question items on self-directed learning, five question items for

self-efficacy, and four question items for technology readiness. To test the validity and the reliability of each construct.

Table 1: The Result of Cronbach's Alpha Analysis.

Reliability Statistics		
Variables	Cronbach's Alpha	N of Items
Self-directed Learning	0.849	8
Self-Efficacy	0.798	5
Technology Readiness	0.758	4

The table above shows that the question items for each construct were reliable as they score more than 0.7. Next, the variables were tested using Multiple Linear Regression.



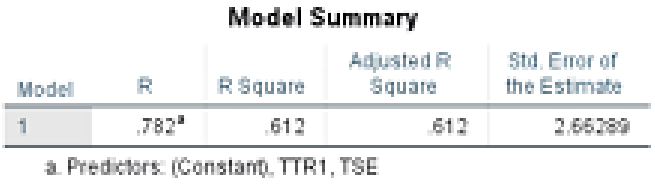
Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	TTR1, TSE[b]	.	Enter

a. Dependent Variable: TSD

b. All requested variables entered.

Figure 8: Variables.

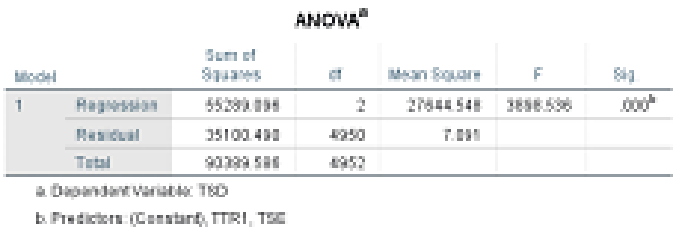


Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.782[a]	.612	.612	2.66289

a. Predictors: (Constant), TTR1, TSE

Figure 9: Model Summary.



ANOVA[a]

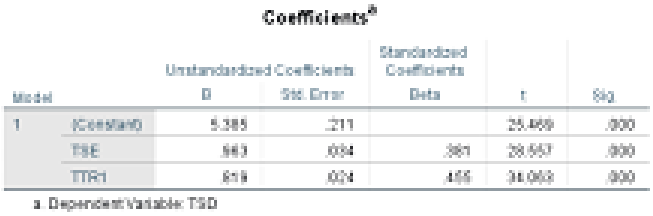
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55289.898	2	27644.948	3898.536	.000[b]
	Residual	35100.488	4950	7.091		
	Total	90389.586	4952			

a. Dependent Variable: TSD

b. Predictors: (Constant), TTR1, TSE

Figure 10: Analysis of ANOVA.

A multiple linear regression was used to test if computer self-efficacy and technology readiness significantly predicted self-directed learning. From the figures above, it is evident that a significant regression equation was found ($F(2,4950) = 3898.536$, $p <$



Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	5.385	.211		25.469	.000
	TSE	.663	.034	.381	28.557	.000
	TTR1	.619	.024	.455	34.063	.000

a. Dependent Variable: TSD

Figure 11: Analysis of Multiple Linear Regression.

.000), with an R2 of 0.612. This study also found that computer self-efficacy significantly predicted self-directed (β= ,381, p<.000), as did technology readiness (β= .455, p<.000).

This present study examined how students did online learning and whether computer self-efficacy and technology readiness were the predictors of self-directed learning. From the first research questions, it is implied that students could adjust to the changes from the offline mode to the online one. More students opted for online learning or hybrid learning instead of offline mode. Online learning has forced parents and students alike to make some adjustments in their household. For instance, parents were willing to provide Wi-Fi and gadgets so that students could attend their classes. One of the most persistent challenges that students encountered was the technical problems related to the Internet connection. Some studies have highlighted the Internet connection [25]. This suggests that students viewed online learning as beneficial for their own learning and achievement. Many universities are located in remote areas with limited Internet facilities and thus, online learning using video conference application was not preferable. In this study, the participants, however, mostly reside in big cities with good Internet connection. They opted to have their classes using Gmeet or Zoom as shown in Figure 2. Since the onset of the pandemic in 2020, students and parents have acknowledged the barriers to online learning by providing necessary facilities and access to gadgets and Internet connection. Students' technology readiness should open more opportunities for teachers to create more innovative teaching methods that accommodate diverse students needs and learning styles. University administrators also need to give full support to teachers who are willing to put more effort in engaging students virtually.

Next, this study also found that computer self-efficacy and technology readiness were significant predictors of self-directed learning. These findings are consistent with previous studies [21,26]. Students who perceive the ability to complete a task and who are more prepared to face challenges during online classes are more likely to be able to manage their own work and tasks. On the macro level, the findings of this study corroborate those of other studies and highlight the importance of computer self-efficacy and technology readiness in motivating students to manage their own learning.

Therefore, university's technical support needs to play a greater role in making sure that students and teachers received trainings related to digital literacy and information literacy.

4. Conclusions

This study aims to look at how students did their online learning and the interplay between self-directed learning, self-efficacy, and technology readiness. Students have adjusted well to online learning, which is evident from their preference of online learning and hybrid learning, better access to the Internet and gadgets. The present results also indicate the salient role of self-efficacy and technology readiness in encouraging students to regulate their own learning process.

Acknowledgments

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