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Are University Students Ready for Online Distance Learning After the Pandemic?

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Abstract

The Covid-19 pandemic has had a major impact on education, causing a shift away from traditional classroom learning and towards open and distant learning (ODL). Students' perspectives on education have been altered by this abrupt change in educational approaches. Thus, it is essential to observe their current classroom learning readiness. Hence, a study involving 120 students from a local public university was done to examine the readiness of mathematics students for online learning during the pandemic. Participants completed an online questionnaire as part of a quantitative approach. The data analysis with SPSS sought to fulfil three goals. Students' attitudes towards online learning were largely good, according to the findings. There was no statistically significant difference in preparation between male and female pupils. Furthermore, a significant positive link was discovered between self-learner control and online communication self-efficacy. The study's conclusions imply that monitoring student progress during ODL, encouraging active student interaction during synchronous online learning sessions, and including regular assessments to boost confidence and preparation are all important. Institutions should also examine and modify course assessments to better fit with online learning approaches, thereby boosting students' preparation for online learning. Overall, the report emphasizes the pandemic's impact on education and the need to assist students in transitioning to online learning environments.

Keywords: Online Learning Mathematics, Post Covid, Readiness, Odl,

Introduction

Engelbrecht's recent study (2023) delves into the question of whether we will ever revert to our pre-pandemic approach to teaching mathematics. While primary schools are mostly returning to face-to-face instruction, secondary and higher education levels continue to incorporate online elements due to the availability of essential internet resources. Many universities and colleges are now adopting a "hybrid" teaching model, combining in-person lectures with extensive online activities. However, the readiness of students, particularly in mathematics subjects like calculus, differential equations, and linear algebra, for online teaching remains a topic of debate.

The Covid-19 pandemic has driven the evolution of online-based distance learning (e-learning) with novel techniques and strategies, including in Malaysia. As the pandemic unfolds, traditional face-to-face learning has given way to technology-assisted distance learning, underscoring technology's role as both a tool and a substitute for in-person instruction (Murphy, 2020). The role of educators has undergone significant changes due to the pandemic (Luthra and Mackenzie, 2020). Tam (2020) identifies three major transformations in education caused by Covid-19: shifts in schooling due to the digital divide, a greater focus on future-oriented skills, and widespread integration of technology. Many countries have explored various strategies to mitigate the impact of the pandemic on education, with distance learning, especially online learning, emerging as the most widely studied approach (Doculan, 2016). However, student readiness for online learning is a significant challenge that requires further investigation (Wang and Shee, 2007). The popularity of the internet, the rise of distance education, and the obstacles posed by the pandemic have all contributed to a substantial increase in online education. Online learning, which leverages technology to enhance teaching and learning, aims to improve accessibility, reduce costs, and increase productivity in education (So.T, 2006). It involves delivering instructional resources via the internet using multimedia computers (Doculan, 2016).

Universities play a crucial role in addressing the challenges posed by the Covid-19 pandemic as they educate the future workforce and provide essential services. While not all university students use open distance learning (ODL) platforms, the pandemic has compelled both educators and students to reassess their willingness to adopt and embrace new online learning methods (Hassan et al., 2020). Many students have recognized the value of utilizing modern online information and communication technologies (ICTs) in this context (Wen and Xu, 2011). The rapid growth of online learning can be attributed to the widespread availability of internet-enabled ICT applications. However, the sudden implementation of these online programs during a pandemic may leave students disillusioned and demotivated due to their lack of preparedness (Kurilovas and Kubilinskiene, 2020).

Teaching mathematics through online learning presents challenges for both educators and students, given its abstract and computational nature. The readiness of educators and students to adapt to the abrupt transition from traditional to online learning is a significant concern. Active participation in distant learning mathematics courses, the development of interpersonal relationships among students, and the cultivation of independent learning skills are crucial for students to effectively utilize online learning tools (TT Wijaya, 2020). Therefore, further research is necessary to explore the readiness of remote mathematics education using e-learning applications, encompassing students' motivation and the learning process, to enhance the learning experience and students' mathematical abilities. Despite the ongoing exploration of open and distance learning (ODL) by instructors and students, they have shown resilience in addressing the new educational challenges posed by the Covid-19 pandemic. Students' readiness is influenced by factors such as internet availability, knowledge, talents, and attitudes (Maarof et al., 2020).

The research objectives of this study are to determine the readiness of mathematics students in online learning post COVID-19 pandemic.

a) To identify students' perspectives in learning mathematics through online platforms.
b) To investigate student's readiness in online learning post Covid-19 pandemic.
c) To identify the relationship between students' self-learner control and online communication self-efficacy.

Literature Review

The COVID-19 epidemic has rapidly changed education worldwide. School closures have affected 421 million pupils in 39 countries, according to the OECD (Tam & El-Azar, 2020). Many analysts say this has created the largest "online movement" ever, revealing the future of education and preparing the way for a new normal. University students are increasingly preparing for online learning (Chung et al., 2020). Hung et al (2010) established and validated five characteristics of online learning readiness: Self-directed learning, learner control, computer and internet efficacy, and online communication self-efficacy. Self-directed learning (SDL) lets students engage with others outside the classroom to attain their educational goals (Benson, 2011; Holec, 1996). Technology for SDL outside the classroom is associated with long-term goal orientation, collectivism, and high-power orientations (Hofstede, 2001) across three nations (Lai, Wang, & Hu, 2016). The study assessed students' preparation for online learning based on SDL's three key components: the desire to learn and control one's own activities, computer technology use, and personal aspects including age and language learning anxiety. SDL components correlated positively with computer use and individual learning and negatively with language learning anxiety. Older pupils were more motivated to learn but also more afraid of failure while using computers for SDL. The Journal of Educational Computing Research found that computer technology skills and attitudes, learning styles, and peer and teacher support influence Hong Kong students' usage of computers for learning (Lee & Yeung, 2016). Search, communication, organisation, differentiation, and reactive or generative self-efficacy predict internet usage in integrated learning environments. Hsiao (2017) found that internet anxiety and identity are more complex in students with high digital self-efficacy. Students with low internet self-efficacy had a favourable correlation. Understanding and learning require asking questions. Online questioning has similar benefits. Learning management systems, class forums, and course chat groups allow students to ask and answer questions. Chung et al. (2020) discovered that university students are hesitant to ask questions in face-to-face sessions, even when they fail to understand the lecture, and they lack confidence in online communication. They're unprepared for online learning. Intrinsic and extrinsic motivation motivate kids to learn. Intrinsic motivation comes from within, and extrinsic motivation comes from outside (Ryan & Deci, 2000). Online learning improves retention, understanding, recall, and application with motivation. According to Paul's (2018) on motivational variables as precursors for online discussions in mixed-class settings, lecturers can improve their online teaching and student satisfaction by understanding university students' online readiness and how demographic factors affect it.

Students' Readiness in Online Learning

Research investigating the preparation of students and lecturers for online learning focuses on developing an appropriate digital education environment (Eden 2020, Blayone 2018). To realise the benefits of online learning, students need to be appropriately prepared (Engin, 2017). Student preparation has been proven to positively affect online learning achievement (Rynearson & Kerr, 2006), contentment with the learning experience (Gunawardena & Duphorne, 2001), self-confidence (Forgesone, 2005), and lifelong learning (Davis, 2006). When students are prepared to engage with digital learning environments, they become more participatory. Factors such as gender, ethnicity, socio-economic background, and financial help can influence this readiness.

Internet education and the usage of internet media are acquiring growing importance in research and academic programs. Student preparation for online learning involves three components: preferences for delivery, trust in using electronic communication for learning, and competence to engage in self-directed learning. Borotis and Poulymenakou (2004) define a student's preparedness for online learning as both cognitive and physical readiness. Current definitions of success for students and lecturers incorporate abilities, attitudes, learning settings, and outcomes (Engin, 2017).

Research has studied students' preparation for online learning through various techniques and measurement instruments. While there is currently a lack of clarity surrounding the components of preparedness, it is recognized as a complicated entity. Academics are always exploring the most relevant and extensively used qualities in preparation studies. Relevant and significant characteristics of preparation include students' attitudes/attributes (Alem, Bernard & Chitu, 2014), time management (Martin, Stamper & Flower, 2020), communication skills (Martin, Stamper & Flower, 2020), and technical competency (Demir & Yardage, 2015).

Self- directed Learning

Self-directed learning plays a vital part in ensuring students are suited for online training. Students who display high levels of self-directed learning are often more involved in learning tasks, such as independently reading resources online, planning their own study time, and completing projects. Self-directed learning refers to a method that empowers students to take control of their learning pace, enabling them the freedom to connect with others while working towards their learning goals (Benson, 2011; Holec, 1996).

In a university environment, Lee, Yeung, and Ip (2016) evaluated the components of self-directed learning, including students' self-management, passion for studying, and ability to limit distractions during self-learning. The researchers hypothesised that interactive technology may play a role in facilitating self-directed learning among students (Lee et al., 2016). Additionally, the study evaluated students' demographic and background aspects as elements of self-directed learning, such as age, gender, language learning anxiety, and preferred learning styles. The findings demonstrated a substantial correlation between interactive technology and students' excitement for self-directed learning, indicating the influence of online learning on students' self-directed learning.

Self-learner Control

Traditional face-to-face learning differs significantly from internet learning. Without face-to-face encounters with professors, online learning forces students to direct their own learning. Despite the fact that learner control has been studied for over a half-century, no clear definition or theory has developed due to its multidimensionality (DeRouin, Fritzsche, & Salas, 2005). Learner control refers to the extent to which students can choose what they want to learn, when they want to study it, and how they want to learn it (Kraiger & Jerden, 2007). Although DeRouin et al (2005) defined learner control as "sequence, pacing, content, context, method of presentation, optional content, task difficulty, and incentives" (p. 185), the concept of learner control in this study includes the ability to direct one's own learning progress, the ability to maintain learning without being distracted by other online activities, and the ability to repeat online material based on one's learning needs.

Motivation for Learning

Several research have shown the importance of student emotion and the link between academic performance and active learning, such as higher motivation (Jdaitawi, 2020). Students' attitudes and incentives affect learning.

Motivation drives behaviour. If they can see how class activities will benefit them, students are more likely to participate (Pintrich and Schunk, 1996 quoted in Tuan, Chin, and Shieh, 2005). Tuan, Chin, and Shieh's (2005a) questionnaire measured student scientific education interest. This study classified motivation using six factors: self-efficacy, active learning approaches, the importance of science learning (including its worth), performance targets, accomplishment goals, and learning environment stimulation. Several reasons drive students to learn science. Self-efficacy was defined as pupils' confidence in their abilities.

Online Communication Self-efficacy

Lee, Yeung, and Ip (2016) found that students learned best using technology. The researcher elaborates on pupils who used technology to study using their chosen method. Online communication self-efficacy was similarly affected by student-instructor interactions and support (Lee et al., 2016). Hsiao et al (2017) found that students reported low technological fear and strong online communication self-efficacy. Learning requires questioning. To learn more, students are encouraged to ask questions (McVay, 2000). Online enquiries may have the same impact. Online communication self-efficacy includes asking questions in class or chat groups. Chung et al. (2020) found that university students rarely ask questions in face-to-face classes due to social shame, even when they don't understand a lecture, and that they lack online communication self-efficacy. This affected their online learning readiness.

Controlling educational online platforms can boost enjoyment, excitement, and competence (Luskin & Hirsen, 2010). Learner self-efficacy in user-controlled online situations has mixed results. The results shows no difference in student self-efficacy between interactive and non-interactive multimedia classes. According to Maag (2004), students were delighted and thrilled to learn using technology because of its interactive learning technique, but they rarely learned any information or self-efficacy.

Challenges in Online Learning

The COVID-19 pandemic has made this phrase popular. ODL uses technology to allow students to learn without being in a classroom (Sadeghi, 2019). Students and educators can work anywhere with internet and resources. ODL lecturers and students must overcome obstacles. Technology can help teachers suit students' learning styles and preferences (Fauzi & Hussain, 2016). Lecturers, students, and course content assist learning in online education (Zhao, Zei, Lai & Tan, 2005).

According to Embi (2011), poor internet access, sluggish response times, and uninspiring material and instructional resources make online learning difficult for students. Internet access, technology, and software prevent online learning, according to Aboring (2016). Adam, Sumintono, and Mohamed (2018) noted that technology, computers, and the internet are advancing, yet there is room for development. Yukselturk & Bulut (2007) state that lecturers struggle with online learners. Online learning fails due to time management, desire, and effort. Online students must be self-disciplined and accountable (Yukselturk & Bulut, 2007). Due to lack of face-to-face connection, ODL makes collaborative learning difficult (Adam, Sumintono and Mohamed, 2018).

Hilton, Chaffee, Guilmett, and Hilton (2019) say pupils encounter management, learning, and technology concerns. According to Hilton, Chaffee, Guilmett, & Hilton (2019), time constraints prevent students from balancing work, school, family, and social life. Due to class challenges and apathy towards studying, they lack self-confidence. Finally, students struggle with Internet connectivity, computer skills, and unreliable resources (Hilton, Chaffee, Guilmett, & Hilton, 2019). Students also experience time restrictions, too much to study, insufficient resources from instructors, unpleasant learning systems or technology, and little feedback (Au, Li and Wong, 2018). Due to their obstacles, these pupils may learn in a stressful, unproductive atmosphere. This study examines university students' ODL readiness.

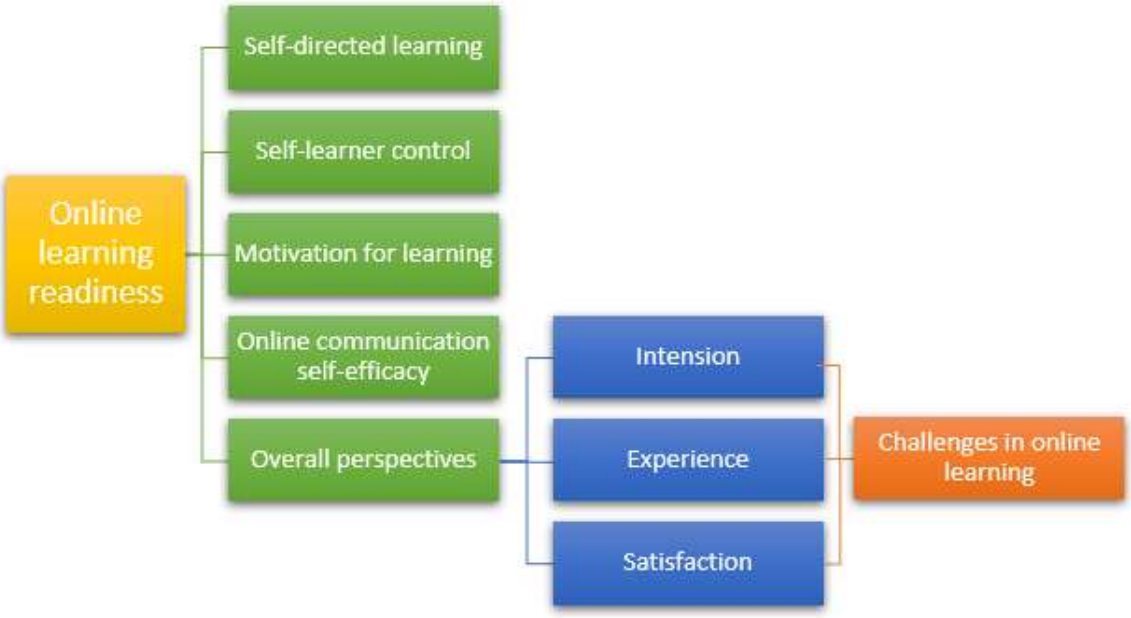

Figure 1.1 Conceptual Framework of Online Learning Readiness.

Figure 1.1 depicts a conceptual framework that divides online learning preparedness into five characteristics. For Overall opinions on online learning are built on three components: intention, experience, and satisfaction. Challenges in online learning can be related from the students' general viewpoints and will be examined in the last chapter of this study.

Research Methodology

Research Design

This study employed survey research to collect quantitative data to assess students' goals, experiences, and satisfaction using online math platforms descriptively. Next, gender differences in online learning readiness and their interactions were examined using inferential statistics.

Sampling: Random Sampling

The researcher adopted selective sampling since online distance learning (ODL) was difficult and many students were unfamiliar with receiving questions via internet messengers. A total of 120 students were randomly selected from semesters 5, 6, and 7 from a public university campus. These students have the most experience with both traditional and online learning techniques, making them excellent for online math readiness assessments.

Instrument

The study assessed online learning preparedness using Hung et al. (2010) Online Learning Preparedness Scale (OLRS). This scale measures self-directed learning, learner control, motivation, online communication self-efficacy, and general attitudes towards online learning. The questionnaire covered the five dimensions and were assessed on a 10-point Likert scale.

Findings

A descriptive analysis was performed on the ratings provided by students regarding their overall perspectives towards online learning.

Table 1

Mean and standard deviation of respondents' overall perspectives towards mathematics online learning.

Overall perspectives (Intention, Experience and Satisfaction)

	N	Mean	Std. Deviation
If given a choice, I will continue to learn mathematics through online for the next semester	120	5.72	2.701
My overall mathematics online learning experience so far.	120	7.65*	1.846
My overall mathematics online learning satisfaction so far.	120	7.48	1.749
Overall		**6.95**	**2.099**

Table 1 shows that students generally agreed to totally agreed that online mathematics learning was good (mean = 7.65, SD 1.846). Students were happy with their online mathematics study throughout the semester (mean = 7.48, SD 1.749). The lowest rating students provided to the first item in this section slightly disagreed to slightly agreed to continue the next semester online if given a choice (mean = 5.72, SD 2.701). Respondents were mostly positive about online mathematics learning. The construct mean was 6.95 and the standard deviation was 2.099 for students' perceptions on learning mathematics online.

To determine the difference in student preparation by gender, compute the mean and standard deviation for each factor (dimension). Table 2 shows the mean and standard deviations for the five factors (B) Self-directed learning, (C) Self-learner control, (D) Motivation for learning, (E) Online Communication Self-efficacy, and (F) Overall views (Intention, Experience, and Satisfaction).

Table 2
Mean and standard deviation of all factors (dimensions) of readiness in online learning between male and female.

	Gender	N	Mean	Std. Deviation
Mean B: Self-directed learning	Male	29	8.26	1.1490
	Female	91	7.87	1.4768
Mean C: Self-learner control	Male	29	7.54	1.5024
	Female	91	7.23	1.7196
Mean D: Motivation for learning	Male	29	7.73	1.5824
	Female	91	7.71	1.5111
Mean E: Online Communication Self-efficacy	Male	29	7.36	1.8545
	Female	91	7.32	1.9654
Mean F: Overall perspectives (Intention, Experience and Satisfaction)	Male	29	6.87	1.5695
	Female	91	6.97	1.8699
Overall	**Male**		**7.55**	**1.5316**
	Female		**7.42**	**1.7086**

Table 2 shows that male students' means for various dimensions range from 6.87 to 8.26 on a 10-point Likert-type rating scale, whereas female students' means range from 6.97 to 7.87. From the table, male students have an overall mean of 7.55 with a standard deviation of 1.5316, whereas female students have 7.42 with 1.7086. This shows that both genders were ready to learn mathematics online because they typically agreed to all items in all dimensions.

Table 3
Independent t-test for five dimensions.

		Levene's Test for Equality of Variances				
		F	Sig.	t	df	Sig. (2-tailed)
Mean B: Self-directed learning	Equal variances assumed	1.218	.272	1.292	118	.199
	Equal variances not assumed			1.469	60.062	.147
Mean C: Self-learner control	Equal variances assumed	.047	.828	.869	118	.387
	Equal variances not assumed			.932	53.367	.356
Mean D: Motivation for learning	Equal variances assumed	1.100	.296	.048	118	.962
	Equal variances not assumed			.047	45.445	.963
	Equal variances assumed	.152	.697	.092	118	.927

Mean E: Online Communication efficacy	Equal variances Self-assumed	not		.095	49.653	.925
Mean F: Overall perspectives (Intention, Experience and Satisfaction)	Equal variances assumed		.935	.336	-.262	118	.794
	Equal variances assumed	not			-.287	55.526	.775

An Independent Samples t-test was used to see if there were any significant differences in the readiness of male and female students to learn mathematics through online platforms (Table 3).

The results for the first dimension investigated, self-directed learning (B), revealed no significant gender difference, as shown by a t-value of 1.292 (118 degrees of freedom) and a p-value of 0.119. Similarly, with a t-value of 0.869 and a p-value of 0.387, the second dimension, self-learner control (C), revealed no significant difference between male and female students. Similarly, there was no significant gender difference in the third dimension, motivation in learning (D), with a t-value of 0.048 and a p-value of 0.962. The next dimension examined, online communication self (E), indicated no statistically significant difference between male and female students, as evidenced by a t-value of 0.092 and a p-value of 0.927. Finally, with a t-value of -0.262 and a p-value of 0.794, the dimension of overall viewpoints (Intention, experience, and satisfaction) (F) revealed no significant difference between genders.

According to these data, there were no significant difference between male and female pupils across any parameters. When using the "Equal Variances Assumed" row for t-value calculations, the p-values obtained from Levene's test were larger than 0.05, suggesting that the assumption of equal variances was satisfied. In other words, male and female students displayed a comparable level of preparedness to learn mathematics using online platforms. As a result, the null hypothesis fail to be rejected.

To address the last research question, we must determine whether there is a significant relationship between students' (C) self-learner control and students' (E) self-efficacy in online communication. The Pearson correlation test was used to examine the link between these two aspects of preparation in online learning.

Table 4

The results of Pearson correlation that shows the relationship between Self-learner control and Online communication self-efficacy.

Correlations

		Mean C: Self-learner control	Mean E: Online Communication Self-efficacy
Mean C: Self-learner control	Pearson Correlation	1	.700**
	Sig. (2-tailed)		.000
	N	120	120

**. Correlation is significant at the 0.01 level (2-tailed).

According to Table 4, the result indicated that r = 0.700 with a p-value of 0.000, which is less than 0.05. This demonstrates a substantial positive link between the factors self-learner control and online communication self-efficacy. As a result, there was a statistically significant association between self-learner control and self-efficacy in online communication. Since the value of r^2= 0.49, self-learner control can explain 49% of online communication self-efficacy. In other words, as students' self-learner control grows, so does their online communication self-efficacy. As a result, the null hypothesis is rejected and there is a significant strong positive relationship between Self-learner control and Online communication self-efficacy.

Discussion and Conclusion

The study examined students' intentions, experiences, and satisfaction with ODL mathematics. Students reported varied feelings about online learning, primarily positive but not entirely positive.

Most students had a great experience learning mathematics via ODL, however 25% had a negative experience. Their negative experience was shared by previous studies too, since Malaysian university students struggled with online learning due to internet availability and data shortages (Chung et al., 2020). Government and commercial telecom subsidies and free data to address these issues.

Most ODL mathematics students were satisfied, while some were not. Like previous studies, online learning satisfaction was predicted by technical proficiency, time management, effort, and self-learning management (Küsel, Martin, & Markic, 2020; Li, 2019). The study stressed self-directed learning, time management, and motivation for online learning pleasure.

While students generally liked online learning, their purpose to continue learning mathematics online differed. Some students preferred face-to-face instruction, while more than half chose online learning. ODL may limit collaborative learning and student interaction (Adam, Sumintono, & Mohamed, 2018).

The study concluded that students had favorable experiences and satisfaction with online learning but varied intends to continue. Addressing obstacles and supporting effective online learning practices like collaborative learning can improve students' readiness and participation in mathematics instruction using online platforms.

The study also found no significant difference between male and female students' readiness for online learning. This shows that both genders displayed similar levels of readiness across the five characteristics of online learning readiness: self-directed learning, self-learner control, desire for learning, online communication self-efficacy, and overall viewpoint. These findings are comparable with study by Chung et al. (2020), Hung et al. (2010), and Bunz, Curry, and Voon (2007), which likewise revealed no significant gender differences in students' online learning readiness. It may be extrapolated that the students in this study, regardless of gender, acquired the essential abilities and confidence to effectively use technology for learning objectives, owing to their exposure to technology from an early age (Jones, 2012). Consequently, the study concludes that there is no substantial difference in students' preparation for online learning between genders.

Furthermore, the study demonstrated a high positive association between students' self-learner control and online communication self-efficacy. This means that students' capacity to control their learning processes in an online setting greatly affects their confidence in online communication. This finding resonates with research by Taipjutorus, Hansen, and Brown (2012), who similarly reported a substantial association between learner control and self-

efficacy in an online learning scenario. Although the link in this study was strong, previous research by Vondra, Armstrong, Tudor, and Hughes (2021) revealed a moderate positive correlation. Additionally, Vondra et al. (2021) discovered that the determinants of online learning preparedness considerably influenced each other, suggesting the interconnectedness of these aspects. Consequently, the study demonstrates a substantial association between students' self-learner control and online communication self-efficacy.
To further corroborate these findings, future research might explore additional factors impacting students' readiness for online learning and investigate potential techniques to promote self-learner control and online communication self-efficacy in online educational contexts.

Implication

Readiness is a crucial factor in learning, regardless of the method employed. While the overall findings indicate that students displayed moderate readiness for online learning, it is important to note that a quarter of the students expressed dissatisfaction with their online learning experience throughout the semester. To enhance students' readiness, it is imperative for instructors and universities to monitor student progress during online distance learning (ODL). Based on the responses related to online communication self-efficacy, students demonstrated moderate confidence in their online communication skills. Therefore, instructors should actively encourage student interaction during synchronous online learning sessions and inquire about their progress. Notably, students displayed less confidence in posting their answers or responses during live sessions. Therefore, instead of waiting for individual responses, instructors could engage every student by incorporating brief quizzes for each class. This approach would maintain student focus during online learning sessions and enhance their confidence and readiness in facing assessments.

Furthermore, students' perspectives on online learning revealed a moderate level of readiness. Despite acknowledging positive experiences and satisfaction with learning mathematics online, students demonstrated ambivalence when it came to their intention to continue learning through ODL if given a choice. As discussed earlier, students' experiences and satisfaction significantly influence their intention to continue learning online. However, it is important to consider the impact of online assessments during ODL. As mentioned earlier, collaborative learning is limited in an online setting, and assessing students during ODL can be more complex compared to traditional face-to-face classes. Recognizing these challenges, universities should review their course assessments to facilitate better adaptation to online learning, ultimately enhancing students' readiness for online education.

Recommendations

It is recommended that future research include students from all semesters, not just limited to semesters 5 to 7. Online learning perspectives—intention, experience, and satisfaction—need more investigation. In future investigations, pre- and post-tests can assess students' online assessment preparation. This method assesses and predicts students' online learning readiness. The findings of this study will help universities to implement online learning.. Universities can improve online teaching and learning by considering ODL student input.

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