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Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Dinamos digitales: preparación tecnológica y autoeficacia en el aprendizaje en línea de los estudiantes de fitness y deportes de una universidad estatal de Filipinas

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Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

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Abstract

There has been a plethora of research on technological readiness and online learning self-efficacy across several fields in recent years. While some research has shown a correlation between the two, the vast majority of investigations have shown the inverse. Additionally, research on fitness and sports in higher education is lacking, particularly in the Philippines. In this study, 256 exercise and sports science students from a selected state university are surveyed to better understand the nature of the connection between TR and OLSE. Furthermore, this study has used correlational analysis such as Pearson's r and multiple regression to find out how the four constructs of TR and OLSE were related to each other. The results showed that TR and OLSE are significantly related to one another. Optimism, insecurity, inventiveness, and discomfort—the four TR dimensions—are also positively associated to OLSE. Results suggest that students' OLSE might be substantially enhanced if they are more likely to make advantage of state-of-the-art resources made available through online learning platforms. Herein are proposed recommendations and initiatives for further study.

Keywords: fitness; sport, self-efficacy; online learning, technology

Resumen

En los últimos años, se han realizado numerosas investigaciones sobre la preparación tecnológica y la autoeficacia en el aprendizaje en línea en varios campos. Si bien algunas investigaciones han demostrado una correlación entre ambas, la gran mayoría de las investigaciones han demostrado lo contrario. Además, faltan investigaciones sobre la aptitud física y el deporte en la educación superior, en particular en Filipinas. En este estudio, se encuestó a 256 estudiantes de ciencias del deporte y el ejercicio de una universidad estatal seleccionada para comprender mejor la naturaleza de la conexión entre TR y OLSE. Además, este estudio ha utilizado análisis correlacionales como la r de Pearson y la regresión múltiple para averiguar cómo se relacionaban entre sí los cuatro constructos de TR y OLSE. Los resultados mostraron que TR y OLSE están significativamente relacionados entre sí. El optimismo, la inseguridad, la inventiva y la incomodidad (las cuatro dimensiones de TR) también se asocian positivamente con OLSE. Los resultados sugieren que el OLSE de los estudiantes podría mejorar sustancialmente si es más probable que aprovechen los recursos de última generación disponibles a través de las plataformas de aprendizaje en línea. En este artículo se proponen recomendaciones e iniciativas para estudios posteriores.

Palabras clave: fitness; deporte, autoeficacia; aprendizaje en línea, tecnología.

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Introduction

Technological Readiness is the willingness of students to embrace new technology to accomplish educational goals (Blut & Wang, 2020; Geng et al., 2019; Wagiran et al., 2022). Current studies have demonstrated that technologically proficient students perform better in the classroom and that this effect is amplified in an online setting (Kampa, 2023; Wang et al., 2022). Initially, there is uncertainty over the conceptualization of TR concepts. Initially, it was believed to consist of four separate elements: innovation, optimism, insecurity, and discomfort. Several research conducted by scholars have overlooked the distinctions among the four components by utilizing a combined score to assess the variables (Parasuraman & Colby, 2015). Technological readiness in this study is divided into two components: motivators and inhibitors. The two-dimensional constructs can be subdivided into motivators (optimism and innovativeness) and inhibitors (insecurity and discomfort) (Blut & Wang, 2020). *Optimism* is the belief that technological progress can enhance people's autonomy, choices, and efficiency in their everyday activities. Optimists tend to believe they have a strong understanding of a technical tool and that it will help them do jobs efficiently (Li et al., 2023). *Innovativeness* is the inclination to be a pioneer in technology and a leading thinker (Uren & Edwards, 2023). Innovative persons are attracted to online educational platforms and are keen to explore its features and advantages (Alhammadi et al., 2023). *Insecurity* is characterized by a lack of trust in technology, stemming from doubts about its effectiveness and concerns about potential negative consequences (Bondanini et al., 2020). Fears regarding the dependability of the internet or the system can lead to a sense of anxiety, thus diminishing the perceived value of utilizing online learning platforms (Ramírez-Correa et al., 2023). *Discomfort* is defined as a feeling of impotence in response to technological progress and the significant burden it brings, as stated by (Durst et al., 2023). Users of online educational platforms who perceive a lack of control over the platform are more prone to experiencing anxiety when using such technologies. Feeling overwhelmed and unfamiliar with online learning systems can lead to skepticism and uncertainty about their effectiveness (Williamson McDiarmid & Zhao, 2023). Various scholars have offered their own definitions of online learning self-efficacy (OLSE). Alamri (2023) highlighted the importance of having confidence in

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

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one's capacity to use technology to improve educational outcomes. Additionally, Yildiz Durak (2018) underlined the importance of learners having confidence in their technological abilities to actively participate in an online course. This includes accessing course materials, utilizing virtual tools effectively, communicating with instructors and peers, and engaging in class discussions and problem-solving. Therefore, students' confidence in their capacity to excel in an online course significantly impacts their academic performance (Ahmadipour, 2022).

The significance of this research lies in its multifaceted contribution to social, professional, and theoretical domains. Socially, understanding technological readiness and online learning self-efficacy is critical in addressing the challenges faced by students in the Philippines, where disparities in access to technology and digital literacy can impede equitable learning outcomes (Blut & Wang, 2020). This study sheds light on how fitness and sports majors, a population underrepresented in educational technology research, navigate these barriers, offering insights that can inform inclusive educational policies and practices (Alamri, 2023). Professionally, the findings have practical implications for educators and institutions aiming to enhance student success in online learning environments, particularly within specialized disciplines like exercise and sports science. By identifying factors that influence OLSE, the study equips stakeholders with actionable strategies to foster technological preparedness, thereby improving students' employability and adaptability in an increasingly digital workforce (Durst et al., 2023). Theoretically, this research enriches the academic discourse on TR and OLSE by examining their interplay through a multidimensional lens, addressing gaps in the literature by focusing on previously unexplored constructs within a unique cultural and academic context (Okuonghae et al., 2022). Consequently, the study bridges existing knowledge gaps and paves the way for future inquiries into the dynamic interactions between technological and educational competencies (Rosar & Weidlich, 2022).

After an in-depth investigation on the connection between TR and OLSE, it was found that most of the literature suggested a reverse link between the two. The majority of the research publications focused on examining the influence of OLSE on TR. Research findings indicate different levels of connection between the two variables,

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

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with some suggesting a positive correlation (Burçin Hamutoğlu et al., 2021; Fitriawan et al., 2023), others a negative correlation (Qin et al., 2022), and some showing no correlation (Ogbodoakum et al., 2022). Several research were found that conducted a comprehensive analysis on how TR influences OLSE. An example of this can be seen in a study by Okuonghae et al. (2022), where 320 randomly selected participants were examined to determine the factors influencing the adoption of e-learning in Nigeria. It was found that there is a significant connection between technological readiness and computer self-efficacy, suggesting that both elements together affect the use of e-learning by LIS students in Nigeria. Investigations on the link between TR and OLSE in the field of Exercise and Sports Science in higher education are not thoroughly documented. Moreover, only a limited number of research have explored the connection between the four constructs of TR and OLSE. The current study aims to explore the association between TR and OLSE, focusing on college students in the Philippines, considering four TS features. The following hypotheses will be examined as part of this investigation:

H₁: TR has no significant relationship with OLSE;

H_{1a}: OPT has no significant relationship with OLSE;

H_{1b}: INS has no significant relationship with OLSE.

H_{1c}: INNO has no significant relationship with OLSE;

H_{1d}: DISC has no significant relationship with OLSE;

Methods

Participants and Sampling Technique

The selected respondents for the study are students currently taking the degree in Bachelor of Science in Exercise and Sports Sciences in a state university in the Philippines. *Purposive sampling technique* has been utilized on the selection of the respondents. Selection criterion has been formulated to obtain the most reliable and accurate data from the respondents:

1. Currently enrolled during the 2nd Semester of A.Y. 2023-2024;
2. Straight Male or female and/or member of the LGBTQIAP+; and,
3. 19 years old and above;

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

The study was executed in the second semester of the academic year to include first year college students in the study in which they have already experienced the said modality in learning to various Exercise and Sports Sciences courses. Table 1 represents the demographic profiles of the respondents. Most of the respondents are female, followed by male and LGBTQIAP+ [$N_{\text{FEMALE}} = 115(44.9\%)$, $N_{\text{MALE}} = 95(37.1\%)$, $N_{\text{LGBTQIAP+}} = 46(18.0\%)$] respondents. Lastly, most of the respondents fall under the 19-21 years old age group, followed by 22-24 years old [$N_{19-21 \text{ YEARS OLD}} = 204(79.7\%)$, $N_{22-24 \text{ YEARS OLD}} = 52(20.3\%)$, $N_{25 \text{ YEARS OLD AND ABOVE}} = 0(0.00\%)$].

Table 1. Respondents' Demographics

<i>Demographic characteristics</i>	<i>Item</i>	<i>N(%)</i>
Gender	Straight male	95(37.1%)
	Straight female	115(44.9%)
	LGBTQIAP+	46(18.0%)
Age group	19-21 years old	204(79.7%)
	22-24 years old	52(20.3%)
	25 years old and above	0(0.00%)
	N=256	

Instruments

Two distinct questionnaires were utilized in this study. First, the Technological Readiness Index developed by Colby and Parasuraman (2002), is a 10-item questionnaire that measures students' technological readiness based on two dimensions subdivided into four distinct constructs: Positive feelings toward adopting technology [Optimism (e.g., "You find technologies to be mentally stimulating.") and Innovativeness (e.g., "You can usually figure out new high-tech products and services without help from others."), and Inhibitors of Technology Readiness [Discomfort (e.g., "It is embarrassing when you have trouble with a high-tech gadget while people are watching."), and Insecurity (e.g., "Other people come to you for advice on new technologies.")]. Responses are recorded on a 5-point Likert Scale from 1- "Strongly disagree" to 5- "Strongly agree." Lastly, the Online Learning Self-Efficacy in Students by Zimmerman and Kulikowich (2016), is a 22-item which measures online learning self-efficacy encompassing a wide variety of tasks required for successful online

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

students. An example of a statement, “.” The responses are encoded on a 7-point Likert Scale from 1- “Strongly disagree” to 7- “Strongly agree.”

Statistical Analysis

To describe the demographic characteristics of the respondents, descriptive statistics such as Frequency and Percentage were used. Additionally, First, a *normality test* was performed. Most constructs were able to obtain the threshold value [-2, 2], hence it can be postulated that all data are normally distributed. Moreover, to determine the relationship between the two variables, *Pearson r* has been performed. Lastly, to test the direct relation and influence of TR and its four distinct constructs to OLSE, *Multiple Regression* analysis has been utilized.

Ethical Statement

The ethical considerations for this study adhered to strict standards and were reported to the Research Management Office of Bulacan State University under document number CSER-CRDU-2024-015. Data was collected via an online survey using Google Forms, disseminated by physical education professors through educational platforms like Google Classroom. The survey outlined the study's purpose, inclusion criteria, instruments, and variables, ensuring complete transparency for participants. Participation was voluntary, with respondents informed of their right to withdraw without consequences. Potential minor discomfort from sensitive survey questions was acknowledged, and no monetary compensation was provided. Data were securely stored in password-protected Excel files, accessible only to the researchers, and retained on a USB drive for three months before being permanently deleted. Respondents were assured that their data would not be reused for future research. To ensure confidentiality and anonymity, no identifying information was collected or reported. The study complied with the Data Privacy Act 2012 (Republic Act 10173). Respondents could withdraw or request debriefing at any stage, and safeguards were in place to protect their rights and privacy throughout the research process.

Results

Table 2 illustrates the findings on the correlational analysis that was performed. First, it was observed that overall technological readiness is positively associated with

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

OLSE ($r(256) = .941, p < .05$). It can be postulated that the level of students' readiness in utilizing technology in learning various concepts in Exercise and Sports Sciences may significantly increase their OLSE. The next following results are specifically the constructs of TR that were tested in relation to OLSE. It was observed that OPT is statistically related to OLSE ($r(254) = .610, p < .05$). It can be construed that the level of optimism that students shown in using various technologies in absorbing various concepts and skill-related topics in Exercise and Sports Sciences may significantly bolster OLSE. Additionally, it was observed that INS is significantly interrelated to OLSE ($r(254) = .470, p < .05$). Focusing on the questionnaire that was utilized for the study, the finding suggests that the level of attentiveness of students show pertaining to the data or information they share with technologies in learning Exercise and Sports Sciences may positively boosts OLSE. Furthermore, it was also observed that INNO is positively correlated with OLSE ($r(254) = .589, p < .05$). In connection with this, it can be assumed that as the students' innovativeness in using technologies in learning Exercise and Sports Sciences may significantly leverage their OLSE. Lastly, it was found that DISC is positively interconnected with OLSE ($r(254) = .716, p < .05$). Based on this finding, it can be hypothesized that as students' felt highly discomfort in operating various technologies may increase their OLSE. This particular finding is somehow peculiar, but on a positive note, the more they feel that they are being taken advantage by those people who knows more than them, or having trouble with these technological innovations, the more their efficiency in online learning may be bolstered.

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines
 Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

Table 2. Technology readiness vis-à-vis Online learning self-efficacy

		Online Learning Self-Efficacy	
Pearson- <i>r</i>	Technology Readiness	Correlation Coefficient	.945**
		Sig. (2-tailed)	<.05
		N	305
	Optimism	Correlation Coefficient	.628**
		Sig. (2-tailed)	<.05
		N	305
	Insecure	Correlation Coefficient	.494**
		Sig. (2-tailed)	<.05
		N	305
	Innovativeness	Correlation Coefficient	.628**
		Sig. (2-tailed)	<.05
		N	305
	Discomfort	Correlation Coefficient	.703**
		Sig. (2-tailed)	<.05
		N	305

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

Table 3 demonstrates the results on the regression analysis executed. It was found that TR predicts OLSE, indicating that TR is directly correlated and affects OLSE [$F(4, 251) = 587.136, p < .001$]. The R^2 model = .903 indicates that the model accounts for 90.3% of the variance in OLSE. This could be interpreted as evidence that students' technological preparedness greatly improves and boosts OLSE. In this regard, H_1 has been rejected. Furthermore, the coefficients were further analyzed to determine each factor's influence to the dependent variable. First, it was observed that OPT predicts OLSE, indicating that OPT has a direct significant influence to OLSE ($\beta = .210, t = 14.975, p = <.001$). This suggests that a student's level of optimism regarding technology may have a direct and substantial impact on their overall OLSE. Ergo, H_2 has been rejected. Also, it was detected that INS predicts OLSE, signifying that INS directly affects OLSE ($\beta = .220, t = 14.972, p = <.001$). Higher levels of online safety awareness and caution when disclosing personal information to learning platforms are

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

associated with significantly higher levels of OLSE. Thus, H_3 has been supported. In addition, it was found that INNO predicts OLSE, suggesting that INNO exerts a direct influence on OLSE ($\beta = .192, t = 15.478, p = <.001$). Students' OLSE appears to be increasing in tandem with their demonstrated creativity in applying a variety of technological tools to the educational process. Therefore, H_4 has been rejected. Finally, DISC was found to be a predictor of OLSE, which suggests that DISC has a beneficial effect on OLSE ($\beta = .218, t = 23.721, p = <.001$). When it may seem counterintuitive, it is possible that OLSE is considerably boosted by the experience of being exploited by others when using technological platforms and the associated feelings of shame. Consequently, H_5 has been rejected.

Table 3. Direct influence of TR to OLSE

Hypothesis	Regression weights	Beta Coefficient	R^2	F	t -value	p -value	Decision
H_1	TR $\rightarrow$ OLSE	.701	.903	587.136	-	<.001	Rejected
H_{1a}	OPT $\rightarrow$ OLSE	.210	-	-	14.975	<.001	Rejected
H_{1b}	INS $\rightarrow$ OLSE	.220	-	-	14.972	<.001	Rejected
H_{1c}	INNO $\rightarrow$ OLSE	.192	-	-	15.478	<.001	Rejected
H_{1d}	DISC $\rightarrow$ OLSE	.218	-	-	23.721	<.001	Rejected

Note: * $p <.05$

Legend: TR- Technological Readiness OPT- Optimism, INS- Insecure, INNO- Innovativeness, and DISC- Discomfort, OLSE- Online Learning Self-Efficacy

Discussion

Although previous scholarly research has demonstrated that the belief that variables must be related for multiple regression analysis is incorrect, this study is based on this assumption for its correlational analysis. The results of this study show that TR is a strong predictor of OLSE and has a direct relationship with it. Based from previously conducted studies, utilizing advanced technology via online educational platforms is likely to significantly enhance students' OLSE (Butt et al., 2021; Han & Geng, 2023; Rahman et al., 2023). The study's approach differs significantly from the findings of Okuonghae et al. (2022), but the conclusion is supported by their study that examined the relationship between the two variables. According to Zamiri and Esmaeili (2024) and Alenezi (2023), students' inclination to adopt new technology, can enhance their proficiency in utilizing such tools to excel and succeed in online classes, especially

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

in the higher education setting. Furthermore, the level of technological preparedness could improve the learner's confidence in completing the necessary online academic assignments.

Additionally, it was discovered that OPT has a strong positive correlation with and exerts a beneficial influence on OLSE. As defined by scholars, OPT refers to the concept that individuals can exert greater control over their lives (Carver et al., 2010; Carver & Scheier, 2014), through the utilization of existing technologies. Optimists are inclined to feel that they possess a strong grasp of a technological tool and that it would enable them to complete their work efficiently and effectively (Li et al., 2023). Students' proficiency with technical resources can enhance their performance in completing educational assignments online, as supported by previously conducted studies in the Philippines (Elcullada Encarnacion et al., 2021; Panoy et al., 2022). Scholars have acknowledged the benefits of optimism in influencing psychological regulation, self-control, and self-efficacy (Lei & Lei, 2022; Zhang, 2022), particularly in online settings.

Interestingly, INS has been found to have a beneficial influence on OLSE. The distrust of technology arises from skepticism over its effectiveness and concerns about its possible adverse consequences (Bondanini et al., 2020). Moreover, the advantages of using online learning platforms might not be fully appreciated due to concerns about the internet's reliability or the system, which can lead to anxiety (Ramírez-Correa et al., 2023). The findings indicate that students' OLSE could improve if they pay more attention to the data and information, they share with technologies throughout their classes (Getenet et al., 2024). If students are careful about providing personal information, coursework details, and project information, they can enhance their online study experience and boost their academic achievement as supported by the study of Reyes-Millán et al. (2023). Furthermore, by focusing on the construct's definition in the literature, it is suggested that students can leverage their feelings of helplessness and overwhelm as motivation to enhance their OLSE. Research indicates that low self-efficacy in technology usage can be improved, by Exercise and Sports Sciences instructors, through teaching students effective coping strategies to manage feelings of helplessness and overwhelm during online learning (Tłuściak-Deliowska, 2022; Wu & Tu, 2019).

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

Furthermore, INNO has been found to have a substantial and favorable association with TR. According to Verbivskyi (2023) and Imanov (2021), innovativeness is associated with being at the forefront of new advancements in technology and ideas. Additionally, Rosar and Weidlich (2022) and Sarker et al. (2019) have mentioned that, creative students are inherently attracted to online learning platforms and are consistently eager to enhance their understanding of the digital resources at their disposal. The findings suggest that students' ingenuity and interest in utilizing technology, including online educational platforms, can enhance their self-efficacy in online learning. Alenezi et al. (2023) and Okoye et al. (2023) have cited, it is widely agreed upon that the integration of digital technology in educational settings, especially in the higher education, is becoming unavoidable. This is due to the rising presence of Information and Communication Technologies (ICTs) in various aspects of human life, especially for sustainability purposes (Alam et al., 2023). In this regard, students' self-efficacy in academic success can increase when they exhibit creativity and inquisitiveness in utilizing technology across different educational platforms (Abu Hanifah et al., 2022; Landrum, 2020; Vidergor, 2023).

Finally, it was noted that DISC positively and significantly improves TR. Discomfort is the sensation of powerlessness resulting from being inundated by the requirements of contemporary technology (Blut & Wang, 2020; Nafia et al., 2023). Online learning platform users are prone to experiencing anxiety if they perceive a lack of control over the platform's features (Dimo et al., 2024; Roetzel, 2019). In the context of higher education, Verdú et al. (2023) and Liu et al. (2020) unraveled that doubt and skepticism about online learning platforms may stem from feeling overwhelmed in the past and being inexperienced with using these tools. According to the findings, students' self-efficacy in online learning may be enhanced by their discomfort with technology on online educational platforms. The unique discovery motivated researchers of the current study to use an integrative approach. As Wang (2024) and Saleem et al. (2024) have recommended, offering detailed guidance on utilizing online educational platforms could reduce the anxiety, experienced by students in Exercise and Sports Sciences courses. Collaboration between teachers and students can alleviate the fear experienced by some students when using digital learning platforms (Özbek et al., 2023). Evidence

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines
Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

indicates that teachers' favorable attitudes toward technology can greatly influence their students' readiness to embrace similar tools for education (Galaraga & Alpuerto, 2022; Nassr et al., 2021). This can alleviate potential anxiety that students might face in online learning settings.

Inconsistencies in TR's conception have persisted over the years, as previously noted (Blut & Wang, 2020; Kampa, 2023). Due to its complex nature, there is debate on whether TR should be seen through four dimensions (innovation, optimism, insecurity, discomfort), two dimensions (motivators, inhibitors), or as a single composite dimension. Several studies have examined TR as a four-dimensional concept and studied the impacts of each dimension (Lam et al., 2008; Son & Han, 2011). This approach has the potential to more precisely depict the TR construct and its effects, although it is not susceptible to criticism. Furthermore, it has been shown that the motivator and inhibitor dimensions frequently exhibit comparable effects in empirical studies (Blut & Wang, 2020). However, whether it is useful to see them as separate dimensions becomes an important question. Previous studies have used a one-dimensional approach by using a single dimension to express total TR (Tuasikal et al., 2023). This practical method may restrict research on the distinct impacts of each of the four TR components and obfuscate their interactions. On a positive note, the study's strength is its use of the four-dimensional approach to determine the influence of each variable on students' perceptions of their ability to succeed in online learning through different online educational platforms in Exercise and Sports Sciences classes. One limitation is the absence of prior research that has achieved a more comprehensive understanding of the correlation between the two variables. There were no investigations have been located about Exercise and Sports Sciences in higher education, particularly in the setting of the Philippines. Therefore, doing a comparable study to enhance the understanding of the connection between TR and OLSE is strongly advised. The outcomes of this investigation are inconclusive. Testing the association of these variables in different populations can either confirm or contradict the results of this study.

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

Conclusion

This study explored the relationship between TR and OLSE among Exercise and Sports Science majors in a state university in the Philippines, highlighting TR as a significant predictor of OLSE. TR explained 90.3% of the variance in OLSE, with all dimensions—optimism, insecurity, innovativeness, and discomfort—exerting significant influence. Optimism and innovativeness bolstered students' confidence and engagement with online learning, while insecurity and discomfort, though typically viewed as barriers, contributed positively by fostering cautious and adaptive behavior. These findings underscore the nuanced and multidimensional nature of TR and its vital role in shaping students' readiness for digital education.

The results emphasize the need for institutions to enhance technological readiness through targeted interventions, such as workshops, mentorship programs, and integrating TR training into the curriculum. User-friendly and adaptive online platforms, coupled with clear guidance and support, can mitigate insecurity and discomfort, empowering students to thrive in online learning environments. These strategies are essential for underrepresented groups, such as Exercise and Sports Science majors, who face unique challenges in navigating digital education. By addressing both motivators and inhibitors of TR, institutions can better equip students for success in increasingly digital academic landscapes.

Future research should expand on these findings by exploring the interplay between TR and OLSE in diverse academic disciplines, cultural contexts, and institutional settings. A gender-based comparative analysis can be considered to explore potential variations in TR and OLSE across demographic groups. Such an analysis could provide deeper insights into how gender influences students' adaptability and confidence in digital learning environments. Additionally, longitudinal studies could provide deeper insights into how TR and OLSE evolve. Also, a mixed-methods approach, incorporating qualitative techniques such as interviews and focus groups, could capture richer, context-specific insights into students' experiences with technology. Lastly, experimental designs could also test the efficacy of interventions to improve TR and OLSE. By broadening the scope and applying varied methodologies, future research can build on this study's foundation to develop more comprehensive

Original article. Digital dynamos: Technological readiness and online learning self-efficacy of fitness and sports majors in a State University in the Philippines

Vol. 11, n.º 2; p. 1-22, Abril 2025. <https://doi.org/10.17979/sportis.2025.11.2.11365>

models of technological readiness and self-efficacy in higher education. On another note, exploring the potential for localized validation of the instruments used in this study is highly recommended. While the Technological Readiness Index and the Online Learning Self-Efficacy scale were applied as originally developed, examining their cultural relevance and applicability to the Filipino higher education context could provide richer insights and further strengthen the validity of the findings.

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