Online Learning Readiness and Science Engagement of College Students

Resa Mae V. Monday, LPT

resamae.monday@hcdc.edu.ph
Holy Cross of Davao College, Inc., Graduate School Department, Davao City, 8000, Philippines

Abstract

Online learning readiness is vital to raise students' science engagement. The research aimed to investigate whether there exists an indicator of online learning readiness that influences the science engagement of college students. Moreover, the research employed a non-experimental quantitative design, utilizing the descriptive-correlational technique with a hundred college students in Davao Oriental selected through simple random sampling, using adapted instruments to measure online learning readiness and science engagement. This study found that the overall mean score for all indicators combined of online learning readiness is high, and college students' science engagement level is also high. Notably, there is a significant relationship between online learning readiness and science engagement. The regression model further revealed that study skills and motivation significantly influence student engagement in science lessons. This may have important implications to educational practitioners that academic interventions and strategies targeting the enhancement of study skills and motivation could positively impact and improve overall student engagement in science education. Recommendations that were put forward include online learning accessibility initiatives and techniques to boost students' science engagement that could serve as a valuable proactive strategy to navigate the difficulties encountered by the teachers and students effectively.

Keywords: Science engagement; online learning readiness; college students

1. Introduction

In the past two years, virtual learning was used as an alternative for the continuity of education. Although online learning removes the need to travel to school, some students might struggle with technology skills and internet access, which leads to a higher rate of disengagement toward science class. Even before the pandemic, there was widespread worry over students' engagement in Science, and numerous significant reports by the OECD (2019) linked science involvement with interest in Science. This result is consistent with online learning monitoring where 30% only of students actively participate online (Prastuti & Nur, 2021). Many students reported feeling unmotivated (Wong, 2020), uninterested, bored, and socially alienated (Ranganathan et al., 2021) which raises concerns about a perceived decline in science engagement (Aker & Ellis, 2019). The student engagement became an emerging concern among teachers (Baloran et al., 2021) because actively involving students is a fundamental prerequisite for comprehension (Hadzigeorgiou & Schulz, 2019). The PISA (2018) further revealed that Filipino students performed poorly in Science, with the Philippines ranking 78th out of 79 participating countries which underscores that fostering deep learning seemed challenging, primarily due to students' comprehensive grasp of the fundamental concepts in Science (Farillon et al., 2022). Numerous studies have been conducted on how online learning readiness affects learning, attitudes, and academic performance. However, none of these studies emphasize the relationship between online learning readiness and the science engagement of college students. Furthermore, the findings of this study will be highly beneficial to concerned departments such as the Commission on Higher Education, the Department of Education, school administrators, teachers, students, and future researchers.

1.1. Statement of the Problem

The problem deals with the readiness for online learning and the science engagement of college students in Davao Oriental. More specifically, it seeks answers to the following questions:

1. What is the level of readiness for online learning of students in terms of technology access, technology skills, study skills, time management, and motivation?
2. What is the level of science engagement of college students in terms of engagement with science lessons and tasks, science learning involvement, and science effort and preparation?
3. Is there a significant relationship between readiness for online learning and science engagement of college students?
4. Is there an indicator of online learning readiness that significantly influences the science engagement of college students?

1.2. Hypotheses

H O_1: There is no significant relationship between readiness for online learning and science engagement of college students.
HO_2: No indicator of online learning readiness significantly influences the science engagement of college students

1.3. Theoretical/Conceptual Framework

Some factors affect online learning readiness: technological skills, technological access, study skills, motivation, and time management skills. The study is mainly guided by the Transactional Distance theory proposed by Michael Moore. Transactional Distance focuses on the dynamics between teacher and student in distance learning. According to the component of Moore's theory, it involves the student's autonomy, as the distance between him and his teacher requires the student to take responsibility for his learning (Abuhassna & Yahaya, 2018). Transactional distance has been shown to play an excellent role in online learning especially for learners' learning engagement (Chen, 2023).

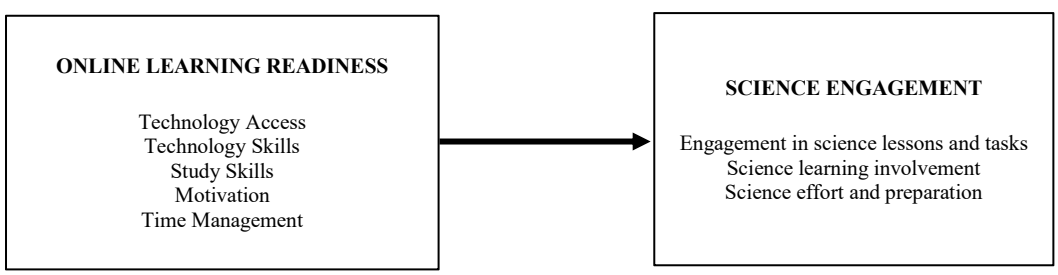

Figure 1. Conceptual Framework of the Study

The conceptual framework of the study is shown in Figure 1. The researcher, in particular, considers the extent to which online learning readiness correlates with science engagement of college students. The diagram depicts the direct impact of online learning readiness on college students' science engagement.

2. Methodology

This study employed a non-experimental quantitative research design, specifically utilizing the descriptive-correlational approach, to investigate the online learning readiness and science engagement of first-year college students in a coastal municipality in Davao Oriental. The study focused on 100 selected students using simple random sampling. The survey questionnaire, adapted and modified for online learning readiness (Tuntirojanawong, 2013) and science engagement (Baraquia, 2019), underwent rigorous validation and reliability checks. The readiness for online learning measure, adapted from a case study at Sukhothai Thammathirat Open University, included demographic information and technology experience. The Students' Science Engagement Scale (SSES), built upon an established scale, measured three constructs with 22 indicators. The research followed ethical protocols, obtaining necessary approvals and endorsements. Data collection occurred via Google Forms, and analysis involved means, standard deviations, Pearson correlation, and linear regression. This comprehensive approach aimed to understand the relationships between online learning readiness and science engagement among college students. The instrument's validity and reliability were evaluated before the survey's actual administration. Specialists in the field assessed the instruments' validity. A demographic with the same characteristics as the survey's actual respondents was used for the survey's pilot testing. As a result, the reliability test result was Cronbach's Alpha: 0.948. This study follows ethical guidelines and has undergone a thorough ethics review.

3. Results and Discussion

Table 1. Level of Readiness for Online Learning

Indicators	SD	Mean	Verbal Description
Technology Access	.806	3.890	High
Technology skills	.743	3.996	High
Study skills	.722	4.214	Very High
Time management	.670	4.124	High
Motivation	.736	4.140	High
Overall	.643	4.073	High

The overall level of readiness for online learning is shown in Table 1. Based on the provided data, the mean scores for all indicators are above the threshold value of 3, indicating readiness for online learning. The overall mean score for all indicators combined is 4.073, which falls within the "High" category. This suggests that, on average, college students possess the necessary attributes and skills to engage in online learning successfully. It is important to note that the standard deviations are relatively low, indicating a relatively small degree of variability around the mean scores. This suggests that college students' responses are relatively consistent across the indicators, further supporting the interpretation of their readiness for online learning.

The table further revealed that study skills emerged as the highest-scoring attribute among the indicators. This result of the study is consistent with the literature of Leatemia et al. (2016), who stated that

the very nature of an online learning environment encourages self-directed learning; learners are expected to plan, implement, monitor, and assess their learning. Motivation, time management, and technology skills closely follow the highest indicators. Also, proper online learning success lies in fostering sustainable motivation and helping students adapt and navigate the system with enthusiasm intact (Torun, 2020)—moreover, their self-motivated discipline in sticking to a timetable leads to better learning outcomes during distance learning (Sari et al., 2021). Lastly, despite being in the "High" category, technology access received the lowest mean score. This finding aligns with the study of Fearnley et al. (2021), that college students experience neither discomfort nor apprehension about using the Internet in essential computer software. However, families from lower socioeconomic strata have limited access to quality Internet service and online learning resources. As a result, caution should be exercised when interpreting and extrapolating the findings of this study to other contexts, particularly those from higher socioeconomic strata (Barrot et al., 2021).

Table 2. Level of Engagement with Science Lessons

Indicators	SD	Mean	Verbal Description
Engagement with Science Lessons and Tasks	.740	4.250	Very High
Science Learning Involvement	.707	4.180	High
Science Effort and Preparation	.727	4.194	High
Overall	.661	4.208	High

The level of science engagement is presented in Table 2. The overall mean score for all indicators combined is 4.208, with a standard deviation of 0.681, falling within the "High" category. This suggests that, on average, college students demonstrate high engagement with science lessons. The standard deviations are relatively low, indicating a relatively small variability around the mean scores. This suggests that college students' responses are relatively consistent across the indicators, further supporting the interpretation of their high level of engagement with science lessons.

By inspecting closely, it can also be observed that Engagement with Science Lessons and Tasks obtained the highest mean score among other indicators, followed by Science Effort and Preparation. On the other hand, Science Learning Involvement obtained the lowest mean score. The results are in harmony with the existing literature where the author asserted that when students engage in genuine science practices, including question-asking and class discussions, their engagement levels increase (Maestrales et al., 2021). In addition, Baraquia (2019) stated that students will be profoundly engaged in learning if scientific teachings and performance objectives are realistic and contextualized. Furthermore, practical work fosters and expands students' interest in Science and promotes it as an exciting subject (Shana & Abulibdeh, 2020). It is more likely that students will have meaningful experiences when they are actively participating in science lessons and tasks. When students work hard and show up prepared for their lessons, they will put forth the time and effort necessary to learn.

Table 3. Pearson Correlation Table

	Level of Science Engagement Pearson r	P value	Correlation Strength
Level of Readiness for Online Learning	0.834*	<0.001	Very Strong

* Significant at 0.001 level of significance (2-tailed)

In correlation analysis, The p-value is 0.001 which is less than 0.05 alpha level. This means that the null hypothesis is rejected. Therefore, there is a significant relationship between online learning readiness and the science engagement of college students. The correlation coefficient was found to be equivalent to 0.834, which means that the degree of correlation is strong. This result implies that the readiness of students to engage in e-learning is linked to their level of engagement (Prihastiwi et al., 2021).

Table 4. Multiple Regression coefficient with online learning readiness variables as significant predictor of science engagement.

Variables in the model	B	SE	β	t	P	R Square
Constant	.608	.204		2.975	.004	.781
Technology Access	-.094	.061	-.114	-1.536	.128	
Technology Skills	.115	.071	.129	1.629	.107	
Study skills	.428	.080	.467	5.342	.000	
Time Management	.038	.087	.039	.437	.663	
Motivation	.373	.088	.416	4.238	.000	

R = 0.890; DW = 1.616; F = 71.514; Sig. = <0.001

The result revealed that study skills and motivation significantly influence student engagement in science lessons. The indicators of study skills and motivation showed statistical significance at less than 0.01 level of significance, as presented in the table. The F-value of 71.514 is statistically significant at $p < 0.001$, indicating that the overall model is a good fit. The combined influence of the indicators as predictors of students' science engagement is equal to 0.781. This indicates that approximately 78.1% of the variance in science engagement can be explained by the readiness for online learning variables included in the analysis. Moreover, the p-value is less than 0.05, leading to the rejection of null hypothesis two (2). These findings suggest that students with strong study skills and high motivation levels are likelier to engage in science lessons. Lastly, the model for predicting student engagement in science is as follows: LSE = 0.608 + 0.428 (SS) + 0.373 (M), where LSE= level of science engagement, SS= level of study skills, and M= level of motivation. This implied that the online learning readiness of students in general significantly impacts the students' science engagement. These results are consistent with the foundational ideas of Michael Moore's transactional distance theory, learner autonomy, which refers to study skills essential in online learning because they help students organize, plan, and manage their learning efficiently. In addition, motivation enables students to overcome their psychological and physical distance from peers and instructors. Motivated individuals are more likely to participate actively in learning and continue their studies.

4. Conclusion

This study assessed online learning readiness in a local higher education setting and found that participants felt prepared for online learning, impacting their engagement in science lessons. Study skills play a crucial role in supporting the self-directed nature of online learning, indicating students' ability to organize, execute, and evaluate their education. Motivation is key in sustaining learning engagement, with disciplined time management leading to improved outcomes. Higher student engagement is associated with realistic, contextualized teaching strategies, while hands-on learning fosters increased interest in Science. The correlation between online learning readiness and science engagement underscores the importance of well-prepared students actively participating in science lessons. Study skills and motivation significantly influence

students' science engagement, emphasizing the need to develop these aspects to enhance overall participation in science education.

5. Recommendation

Educational institutions can further empower students for successful online learning experiences and increased science engagement by addressing technology access, improving technology skills, promoting self-directed learning, and fostering intrinsic motivation. Although students demonstrated readiness regarding technology skills, ongoing efforts to improve their digital literacy should be made. Educational institutions may provide workshops, training sessions, and online tutorials to equip students with the technical skills required for effective online learning. Second, educators may build encouraging and supporting self-directed learning approaches, allowing students to take ownership of their learning journey. Also, educators may create a motivating learning environment, design interactive and relevant activities, and provide positive feedback to foster students' intrinsic motivation for learning. However, it is essential to acknowledge that educational institutions and policymakers may look into ways to provide students from lower socioeconomic backgrounds, with affordable and reliable internet connectivity and necessary devices to address potential disparities in technology access to ensure equal opportunities for all students. Third, educators may continue to develop materials for science education that strongly emphasize the relevance and real-world applications of scientific principles. Hence, students' interest can be aroused, and the usefulness of Science can be illustrated by showing them how Science affects daily life and deals with current issues. Lastly, while this study sheds light on students' readiness for online learning and science engagement, future research can explore specific interventions and strategies promoting these characteristics. Longitudinal studies can shed light on these factors' long-term viability and impact on students' academic success and career paths. While this study provides valuable insights, its small sample size and reliance on a single method limit its generalizability. Moving forward, extensive surveys in the future are crucial to deepen our understanding of student challenges across different levels.

Acknowledgments

My profound gratitude goes out to all of the students who enthusiastically participated in this study and provided invaluable information and insights that helped me build the framework for my research paper. Also, the research experts whose passion, commitment, and careful participation in the study have greatly improved the caliber of my work. Their willingness to dedicate time and energy to this research paper has improved my understanding and highlighted the value of teamwork in academic endeavors. Above all, I thank the Almighty Father and the people who believed in me because their support gave me strength to complete this work.

References

Abuhassna, H., & Yahaya, N. (2018). Students' Utilization of Distance Learning through an Interventional Online Module Based on Moore Transactional Distance Theory. Eurasia Journal of Mathematics, Science and Technology Education, 14(7). https://doi.org/10.29333/ejmste/91606

Aker & Ellis: A Meta-Analysis of Middle School Students' Science Engagement International Dialogues on Education, 2019, Volume 6, Number 1, pp. 9-24ISSN 2198-5944

Baraquia, L. (2019). Students' Science Engagement Scale (SSES): Developing the Constructs to Measure Science Engagement. *PANAGDAIT Multidisciplinary Research Journal, Volume 1, No. 1, pp*. 99-110.

Barrot, J., Llenares, I. & del Rosario, L. (2021). Students' online learning challenges during the pandemic and how they cope with them: *The case of the Philippines. Education and Information Technologies (2021) 26:7321–7338. ttps://doi.org/10.1007/s10639-021-10589-x*

Chen, L. (2023). Transactional distance and college students' learning engagement in online learning: the chain mediating role of social presence and autonomous motivation. Psychology Research and Behavior Management, Volume 16, 2085–2101. https://doi.org/10.2147/prbm.s409294

Farillon, L. M. F., Farillon, K. S. F., & Farillon, E. F. (2022). Computer games addiction and class performance of selected Philippine senior high school students. Utamax, 4(3), 186–201. https://doi.org/10.31849/utamax.v4i3.1029

Fearnley, M. & Malay, C. (2021). Assessing Students' Online Learning Readiness: Are College Freshmen Ready? Asia-Pacific Social Science Review. Vol. 21 No. 3.

Leatemia & et al. (2016). Self-directed learning readiness of Asian students: Students perspective on a hybrid. International Journal of Medical Education. 2016;7:385-392 problem based learning curriculum

Maestrales, S., Dezendorf, R.M., Tang, X., Salmela-Aro, K., Bartz, K., Juuti, K., Lavonen, J., Krajcik, J., & Schneider, B. (2021). U.S. and Finnish high school science engagement during the COVID-19 pandemic. *International Journal of Psychology*, DOI: 10.1002/ijop.12784.

OECD (2019), PISA 2018 Assessment and Analytical Framework, PISA, OECD Publishing, Paris, https://doi.org/10.1787/b25efab8-en.

Prastuti, E. (2021). Student Optimism Regarding Online Learning During the Covid-19 Pandemic. KnE Social Sciences, 4(15), 187–194. https://doi.org/10.18502/kss.v4i15.8204

Prihastiwi, W. J., Prastuti, E., & Eva, N. (2021). E-Learning Readiness and Learning Engagement during the Covid-19 Pandemic. KnE Social Sciences. https://doi.org/10.18502/kss.v4i15.8212

Ranganathan et al. BMC Medical Education (2021) 21:376 https://doi.org/10.1186/s12909-021-02803-8

Sari, M. T., Ilhamdaniah, & Megayanti, T. (2021). Time Management During Covid-19 Pandemic. Springer Nature. https://doi.org/10.2991/assehr.k.210203.082

Shana, Z.J., & Abulibdeh, E.S. (2020). Science practical work and its impact on students' science achievement. Journal of Technology and Science Education, 10(2), 199-215.

Torun, E. (2020). Online Distance Learning in Higher Education: E-learning Readiness as Predictor of Academic Engagement. Open Praxis, vol. 12 issue 2, April–June 2020, pp. 191–208 (ISSN 2304-070X)

Tuntirojanawong, S. (2013). Students' Readiness for E-learning: A case study of Sukhothai Thammathirat Open University, Thailand. *Journal of Learning Higher Education Volume 9 issue 1,* pages 59-66.

Wong, R. (2020). When no one can go to school. Does online learning meet students' basic learning needs? Interact. Learn. Environ. 72, 1–17. DOI: 10.1080/10494820.2020.1789672