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Barriers to science learning and science academic performance: A case of online learners residing far from school

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Abstract

This study made use of a correlational mixed-method design. It aimed to determine the level of barriers to science learning experienced by learners and its relationship to their science academic performance. The learners under study are those residing abroad or outside the city where the school is located and chose to remain in the online learning modality despite the implementation of limited-onsite and full-onsite learning modalities. A quantitative and a qualitative phase make up the study. The quantitative phase utilized data from 16 respondents that met the criteria set by the researcher. It reports that the level of barriers to learning science experienced by the learners ranges from a mean score of 1.50 (very low) to 2.88 (moderate) with an average of 2.08 (low). It is also apparent that the most significant barrier the learners experience is linked to time and support for studies (TSS) and academic skills (AS). Additionally, based on the results, the Pearson correlation coefficient is $-.517$, and the p-value is $.040$ with alpha 0.05 . This data shows there is a significant relationship between the barriers to science learning experienced by learners online and their science academic performance. Hence, as the barriers to science learning experienced by learners online increase, their science academic performance decreases and vice versa. The qualitative phase utilized FGD and revealed the same results, supporting the quantitative results.

Keywords: Online learning; Science education; Barriers; Education; Distance learning

1. Introduction

The first quarter of 2020 has been very devastating to many sectors. Numerous businesses, including educational institutions, have closed as a result of the severe acute respiratory syndrome coronavirus 2, or SARS-Cov-2, which causes the coronavirus illness 19, or COVID-19 [1]. This affected many people and billions of students' education worldwide [2]; this further threat the declining science education in the Philippines [3].

Online learning has provided a great opportunity for learners and teachers to continue education wherever they are as long as there is an internet and a gadget. Such flexibility is the main selling point of this type of learning modality. However, Online learning is also confronted with challenges; learners have a hard time understanding what they read and retaining information; learners also have a hard time concentrating in class as a result of low motivation, less interaction, and less support to them [4]. Additionally, these challenges were exacerbated by the learners' socioeconomic status making learning hard, uncertain, and ineffective [5]. The ineffectiveness of online learning was seen in the early stage of the pandemic when teachers and learners were not utterly ready for the change in modality. Nevertheless, many institutions have opted for online learning. After all, online learning has provided more flexibility in learning, especially at a time when mobility and physical interaction is highly restricted to keep human lives safe. [6] found that learners perceive online learning during the pandemic as good and helpful. Online learning is filled with several barriers this then affects the learning of the learners. The qualitative study of [7] reveals that learners still prefer traditional learning to the online modality.

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To ensure that the education of many students will continue while we are battling the pandemic, many educational institutions, along with the Department of Education, have utilized distant learning modalities. Modular learning was the first modality used; however, problems arose as there was a lack of materials, teachers lacked training, the modules lacked validity, less supervision, and students had problems studying independently [8]. These severe issues were signs of the need to conduct a different modality to keep our students and teachers safe during the pandemic. The answer was Online Learning Modality.

Online Modality is an instructional modality delivered through online platforms and can be a combination of synchronous and asynchronous activities [9]. Just as cities evolve into smarter places using new technologies for monitoring, analyzing, and planning to increase efficiency and quality of life [10], learners navigate their educational journey with similar principles. They attend online during synchronous sessions and interact using virtual calls with the teacher and their other classmates. Meanwhile, activities that learners should accomplish independently are performed during asynchronous sessions. Coordination, much like that needed between government and stakeholders to foster smart cities, is necessary to foster effective online learning environments, and robust economies and educational systems alike can drive the adoption of safer, smarter methods of operation. Online learning is also confronted with challenges like poor connectivity; learners have a hard time understanding what they read and retaining information; learners also have a hard time concentrating in class as a result of low motivation, less interaction, and less support to them [4] [11]. [5] argues that problems during online learning affect learning and are worsened by the socioeconomic status of the learners. Barriers to learning are also seen to affect science education since this requires more interactions and laboratory work.

Nevertheless, online learning has provided more flexibility to education and is rather more effective than modular learning. Learners residing far away from schools can now study in institutions even if they are millions of kilometers away from the actual school. This calls for a need to study and ascertain the barriers that affect learners' learning to enhance further the type of education provided to them. Hence, the gap that the researcher intends to fill with this study is to ascertain the level of barriers to learning science experience by learners residing far away from school and its relation to their academic performance in a time when blended and full onsite learning can already be implemented.

This study aims to determine the barriers that inhibit online learners residing far away from school from learning science and what is its relationship to their science academic performance. This is beneficial in establishing online learning programs that will cater to learners who reside far because their parents wish to spend time and watch over the growth and development of their children. The study may also provide evidence for policy making and change for online learning programs. Ascertaining the problems can help the educational sectors and their administrators make data-driven decisions that will increase learning in the online modality.

2. Material and methods

The methodology adopted for this study is a mixed-method approach that seeks to establish the correlation between the level of barriers to learning science and science academic performance. In ensuring a well-targeted selection of participants, a set of criteria was strictly followed. The respondents had to be enrolled in a fully online learning environment at the time of the study. Furthermore, only those living overseas or outside the city during the period of online learning were considered. This led to the purposeful selection of sixteen respondents for the quantitative phase and six for the qualitative phase of the study due to the unique nature and descriptions of such learners.

In this study, the researcher utilized preconceived themes that were based on the study of [14]. The themes explored in this study include Academic Skills (AC), Lack of Concentration (LOC), Motivation and Interaction (MI), Cost and Access to the Internet (CAI), Technical Skills (TS), and Time and Support for Studies (TSS). AC refers to the extent to which the learners learn what was discussed during their online class. LOC refers to the challenges the learner encounters in concentrating during online class, this includes the extent to which they are easily distracted by their environment. MI refers to the challenges experienced by learners in isolation and in the motivation of attending the online class. CAI refers to internet accessibility and power interruptions. TS refers to the barriers experienced by learners in utilizing applications and the learning management system used by the school. TSS refers to the availability of feedback, communication with the teacher, length of time given for activities and availability of tools for learning.

The primary instrument employed in this research was the Barriers to Learning Science Scale (BLSS), which was specifically designed for the study and administered through Google Forms. The score interpretation was adapted from the study by [12], with different ranges indicating varying levels of difficulty from Very Low to Very High. Concurrently, the Department of Education grade descriptor was adapted to provide qualitative descriptions of the learners'

quantitative grades, ranging from "Did Not Meet Expectations" for those scoring below 75% to "Outstanding" for scores above 90%.

In order to collect data, an open-ended interview question was prepared, which the respondents answered through online interviews. To ensure the validity of the instrument, it was validated by four experts. This included two science experts to ensure that the content was exclusively related to science-based barriers and one language and one research expert to avoid double-barreled and ambiguous statements.

Upon approval from the target school's principal, the data collection process commenced. The nature and aims of the study were communicated to the administration and participants, and grades were subsequently obtained from the school's registrar. The quantitative phase involved gathering respondents in a Google Meet session, where the study's purpose was explained, and their voluntary participation was emphasized. Instruction was given on how to answer the questionnaire through Google Forms.

The qualitative phase consisted of a Focus Group Discussion (FGD) with six respondents gathered during their break to answer interview questions. The session was initiated with a prayer, after which the voluntary nature of participation and the recording process were conveyed.

Data analysis involved both quantitative and qualitative approaches. The former involved descriptive and inferential statistical tools, with mean scores computed to identify the barriers to online science learning using descriptors adapted from [12] study. Pearson correlation was used to identify the relationship between the level of barriers to learning science and academic performance. For the qualitative phase, a thematic analysis was applied to pinpoint patterns and recurring themes in the learners' responses. Comparisons of transcripts were made, assigning them to pre-determined themes based on their relatedness in properties and dimensions.

Ethical considerations were given paramount importance, with the nature of the study and its aims clearly communicated to the respondents. Participation was voluntary, and anonymity was maintained. No judgments or persecutions were made against learners who chose not to participate. Prior to data collection, assent from the respondents, consent from parents, and permission from school administrators was secured.

3. Results and discussion

To answer research question one (1), the researcher calculated the mean of each item in the instrument. Based on the data gathered, the level of barriers to learning science experienced by the learners ranges from a mean score of 1.50 (very low) to 2.88 (moderate), with an average of 2.08 (low). It is also apparent that the greatest barrier the learners' experience is linked to time and support for studies (TSS), specifically on the item "I have no alternative material/tools that I can use in place of a laboratory apparatus." and on lack of concentration (LOC) specifically on the item "I feel sleepy in the entire class hours." Which has gained the same mean score of 2.88 (moderate). The second highest barrier experienced by the learners is linked with motivation and interaction (MOI), specifically on the item "I feel far away from my classmates and teacher." And the third highest barrier experienced by the learners is linked with their academic skills (AS), specifically on the item "I do not understand the laboratory activity when I do it alone."

Based on the average of each theme, it is also apparent that the highest average mean score is garnered by the time and support for studies (TSS), followed by lack of concentration (LOC), motivation and interaction (MOI), and academic skills (AS).

To answer the researcher question three (2), the researcher utilized Pearson correlation to determine if there is a correlation between the level of barriers experienced by the learners and their science academic performance using IBM SPSS Statistics 25. Based on the results, the Pearson R coefficient is -.517 and the p-value is 0.040 with alpha 0.050. This data reveals that there is a significant relationship between the barriers to science learning experienced by learners online and their science academic performance. Additionally, there is a negative relationship between the level of barriers to science learning experienced by the learners and their science academic performance. Therefore, the researcher concludes that as the barriers to science learning experienced by learners' online increase, their science academic performance decreases and vice versa.

The qualitative phase reveals that the greatest barriers that the learners experience is linked with Cost and Access to the Internet (CAI), sample response given by the respondents includes "Sometimes it lags, or we cannot hear the teacher" which then affects the continuity of the discussion as elaborated "I find it hard to understand my teacher because his voice is always choppy and is always lagging." Furthermore, one of the respondents agreed by saying, "My

understanding gets fuzzy sometimes” another respondent agreed by saying, “Sometimes, when the teacher explains something online what we are going to do with (a) specific activities, sometimes they lag, so I do not understand what they are trying to say or explain.”

Additionally, besides CAI, another barrier to learning experienced by learners is linked with Time and Support for Studies (TSS) sample response includes “Sometimes, since some science lessons involve actual experiments and doing said experiments in the online medium is either a hassle or cannot be done.” another respondent agreed by saying “it is kind of hard to learn sometime, usually they just tell us to do something. The instructions are clear, but sometimes it gets confusing for me”. Furthermore, another barrier to learning science online is also linked to Academic Skills (AS). This coincides with the results of [13] in which the study revealed that the most common challenges online learners face are in their competency, in this case, the Academic Skills of the learners.

Learners experience several barriers to learning in an online class setup. This was apparent in the results of the data. Further, support is a necessary ingredient for learning. However, learners are so isolated from their teachers, limiting the support they may provide in the learning process; giving learners enough time and support by making them realize that materials at home may be used to facilitate learning and in their process of understanding the lesson discussed. Further, learners’ concentration is also compromised as they are only staring at a device and is surrounded by many distractions and diversion, which affects the continuity of what they are learning; hence, if parents want their children to attend online class in events when on-site is not an option, they must ascertain that the learners have a quiet place for the class sessions and teachers must implement rules and routines for learners to follow utilized activities that are enough for learners to concentrate given their span of attention at the same time fitted with the learning style of the learners, differentiated learning may be used in this case.

Actions and solutions to eliminate or lessen the barriers to science learning are imperative to guarantee that online learning will be as effective as traditional learning, as barriers to science learning are inversely proportional to the learners’ academic performance. This is important as we are now transitioning to a more open type of education in which we explore several types of learning modality that suits our needs, capacities, and necessities.

4. Conclusion

Based on the data gathered, the following conclusions are drawn; firstly, the greatest barrier to online science learning experienced by the learners, as revealed by the quantitative and qualitative phases, is linked with time and support for studies (TSS) and academic skills (AS). Additionally, the qualitative phase has also revealed that the learners experience high barriers to learning linked with cost and access to the internet (CAI).

Lastly, there is a significant relationship between the barriers to science learning experienced by learners online and their science academic performance. Hence, as the barriers to science learning experienced by learners online increase, their science academic performance decreases and vice versa.

Compliance with ethical standards

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Disclosure of Conflict of interest

It is hereby declared that there are no financial or personal relationships that may have inappropriately influenced the conduct or the writing of this paper. No conflicts of interest exist in relation to the completion of this research.

Statement of ethical approval

The study was conducted following ethical guidelines and received approval from the relevant Ethical Review Board. All measures were taken to ensure the research was carried out ethically and responsibly.

Statement of informed consent

Before the commencement of data collection, all participants were clearly informed about the purpose and nature of the study. Assurances were given regarding the preservation of anonymity and the confidentiality of their responses. Participation was entirely voluntary, and written informed consent was obtained from each participant.

References

- [1] Cascella, M., Rajinik, M., Aleem, A., Delebohn, S., & Napoli, R. (2022). Features, Evaluation, and Treatment of Coronavirus (COVID-19). National Library of Medicine: National Center for Biotechnology Information. <https://www.ncbi.nlm.nih.gov/books/NBK554776/>
- [2] UNESCO (2022). United Nations Organization for Education, Sciences, Culture, Communication, and Information. Education: From disruption to recovery. <https://en.unesco.org/covid19/educationresponse>
- [3] Villegas, B. M. (2021, June 29). Addressing the Philippine Education Crisis. Business World. <https://www.bworldonline.com/opinion/2021/06/29/379015/addressing-the-philippine-education-crisis-2/>
- [4] Belgica, C. C., Calugan, J. S., Dumo, J. U., & Simber, L. A. (2020). Online Distance Learning: Thematic Study on the Challenges Faced By Educare College Inc. Primary Pupils. Proceedings of the 3rd International conference on Advanced Research in Education, Teaching & Learning, 94-111.
- [5] Febrianto, P. T., Mas'udah, S., & Megasari, L. A. (2020). Implementation of online learning during the COVID-19 pandemic on Madura Island, Indonesia. International Journal of Learning, Teaching and Educational Research, 19(8), 233-254. <https://doi.org/10.26803/ijlter.19.8.13>
- [6] Allo, M. D. G. (2020). Is online learning good during the COVID-19 pandemic? The case of EFL learners. Jurnal Sinestesia, 10(1), 1-10. <https://sinestesia.pustaka.my.id/journal/article/view/24>
- [7] Singh, K., Srivastav, S., Bhardwaj, A., Dixit, A., & Misra, S. (2020). Medical education during the COVID-19 pandemic: a single institution experience. Indian Pediatrics, 57(7), 678–679.
- [8] Pe Dangle, Y., & Sumaong, J. (2020). The Implementation of Modular Distance Learning in the Philippine Secondary Public Schools. Proceedings of The 3rd International Conference on Academic Research in Science, Technology and Engineering. <https://www.doi.org/10.33422/3rd.icate.2020.11.132>
- [9] Kansas State University. (2020). Online Modality. <https://www.k-state.edu/keepsteaching/course-modality/online-modality.html>
- [10] Santos, A. R. . (2023). Critical success factors toward a safe city as perceived by selected medium enterprises in the province of Nueva Ecija: A crafted business development policy model. *Asian Development Policy Review*, 11(1), 53–66. <https://doi.org/10.55493/5008.v11i1.4750>
- [11] Angelo R. Santos (2022). The Importance of Artificial Intelligence in Start-up, Automation, and Scalation of Business for Entrepreneurs. *International Journal of Applied Engineering & Technology* 4(3), pp.1-5.
- [12] Culajara, C. J. (2022). Barriers to learning and performing in physical education in modular remote learning and coping strategies perceived by the students. *Edu Sportivo: Indonesian Journal of Physical Education*, 3(1), 11-24. [https://doi.org/10.25299/es:ijope.2022.vol3\(1\).8559](https://doi.org/10.25299/es:ijope.2022.vol3(1).8559)
- [13] Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701.
- [14] Muilenburg, L. Y., & Berge, Z. L. (2005). Student Barriers to Online Learning: A factor analytic study. *Distance Education*. Vol.26, No.1. pp.29-48.