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STUDENTS' SATISFACTION ON ONLINE MATHEMATICS LEARNING AND ACADEMIC PERFORMANCE OF COLLEGE STUDENTS

ETHELLE DAYNE O. BONCALES[1], MARY FELANIE G. BLASQUEZ[1], JOHANE H. BLAWIS[1], CATHRINA G. GALLEROSO[1], NEZSA A. GEMPISAO[1], ELIZABETH A. SALDIA[1], LOREFI P. AUSTRAL[1], SYLVIA G. TUPAZ[1]
Teachers College, College of Arts and Sciences, University of Bohol, Tagbilaran City, Philippines

Corresponding Author: dayneboncales@gmail.com

ABSTRACT

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Keywords— online mathematics learning, academic performance, level of satisfaction

This study investigated the relationship between student satisfaction with online mathematics learning and their academic performance at the University of Bohol's Teachers College Department during the 2020-2021 academic year. Satisfaction with online mathematics learning was measured by student perceptions of their experience in the online environment. Academic performance was assessed using final grades in mathematics courses. A quantitative, correlational research design was employed and the target population consisted of 431 students enrolled in mathematics courses within the department. A sample of 65 students was randomly selected, based on a 95% confidence interval and a 5% margin of error. A researcher-developed questionnaire, demonstrating acceptable

reliability with a Cronbach's alpha of .827 in a pilot test of ten students, was used to collect data on student satisfaction. Ethical considerations were prioritized, with informed consent obtained from all participants and strict adherence to privacy and anonymity protocols, ensuring a "do no harm" approach. Spearman's Rank Correlation Coefficient was used to analyze the data. The findings indicated no statistically significant correlation between student satisfaction with online mathematics learning and their academic performance. This suggests that, within the context of this study, satisfaction with the online learning environment did not appear to be related to students' final grades in mathematics

INTRODUCTION

In the late months of 2019, the world was horrified by the novel coronavirus or the COVID-19 virus. The World Health Organization (WHO) issued an immediate countermeasure to control the spreading of the virus that changed the whole education system. Different institutions, colleges, and schools not only in the Philippines but all the countries across the globe altered their way of teaching, pulled out face-to-face learning mode, and pulled in a blended way of learning. Hubackova Sarka (2015), blended learning with the combination of synchronous and asynchronous teaching was proposed to be beneficial. The asynchronous teaching is conducted in real-time wherein all students accept the presentation done by the teacher simultaneously and they can react mutually. Asynchronous teaching is usually catered to different students at different times and students can choose the pace but cannot react mutually in real-time. Online learning has been used as a medium of instruction in some universities globally and challenges in instilling this mode to Mathematics learning is evident as it is one of the subjects that needs to be inculcated best in face-to-face mode for a better understanding.

The University of Bohol as a premier university transforming lives for a great future adopts the UBlended Quality Flexible Learning which is basically an online class. This study aims to determine if there is an association between the respondents' level of satisfaction on online Mathematics learning and Academic Performance in the hope of proposing recommendations to improve teaching strategies and revisit the curriculum in teaching Mathematics.

Related Literature. According to Daher & Baya'a (2009), discourse analysis supports the New Normal Education system within local and international aspects to provide quality education despite the pandemic aligned to the worldwide health protocols. According to Moore (1997), attending to conversation, structure, and learner autonomy is required when learning distance education. Moore clarified that these problems are distinguished from technical concerns, which concentrate on instructional and learning habits. The findings of this study premise that, compared to face-to-face coaching, remote learning needs distinct instructional methodologies and learning

dynamics. Moore explained that pedagogy requires course structure and academic discussion. He claimed that distance learning comprises these two factors and learner autonomy. Moore expounded on the transactional distance theory, which posits that interaction among learners, instructors, and course structure impacts the training environment. According to Spies, Grobbelaar & Botha (2020), The Task-Technology Fit (TTF) principle attempts to evaluate how efficient technology is in a system by testing the interaction between the technology and the activities technology intends to serve. This theory implies that technology tools as a factor in an efficient teaching-learning process' effectiveness for a positive outcome.

Schools are encouraged by UNICEF Philippines to plan for learning continuity. We encourage communities, caregivers, and parents to learn about COVID-19 from reputable sources such as the Department of Health, local government units, WHO, and UNICEF so that they can recognize symptoms, work with schools to support safety efforts and help children cope with the stress caused by the current situation. According to the Global Goals for Sustainable Development Goal: Goal 4 – Quality Education ensures inclusive and equitable quality education and promotes lifelong learning opportunities for all. Thus, amidst the pandemic, schools altered their way of teaching approaches as well as their rules and regulations to follow health protocols and provide quality education to students.

Some factors are highly related to students' satisfaction with online courses, including presence (social, cognitive, and teaching) (Pelz, 2004). The research literature indicates what components or indicators of student satisfaction in the online environment can be considered. These components include personalized feedback, student-student/student-instructor interaction, social presence, and perceptions of learning. Irons, Keel & Bielema (2020) found that providing students with a choice of communication tools increases student satisfaction. When students have alternatives, student characteristics such as learning styles and life characteristics tend to influence the decision of whether and how to use computer technology 17 to assist in the learning process (Wilson & Weiser, 2001). However, the study by Ichinose & Bonsangue (2016) suggested that depending on the student's experiences and expectations can show that online learning can be either a practical or ineffective mode for learning mathematics.

Related Studies. One of the educational systems' concerns is how to teach and input understanding of mathematics towards students, as believed by Guinocor, Mamites, Almerino & Lumayag (2020). Learning Mathematics, especially during a pandemic time, is very crucial. As stated in the article of Srinivas Susheela (2020), mathematics can be an important ally in the battle against pandemics. We have seen numbers of cases worldwide, the number of infected individuals, people recovered, and even numbers of deaths, but how did the experts come up with these numbers, and how did some of them come up with solutions to fight these numbers linked to the pandemic? The answer lies in mathematics. Mathematical functions can be used to describe the dynamics

of how infectious diseases spread among people. Though online learning has been used as a medium of instruction in some universities globally, challenges in instilling this mode in Mathematics learning are evident as it is one of the subjects that need to be inculcated best face to face for a better understanding. This is one of the reasons for the gaps between teachers and students, which are reflected in the students' academic performances. There has been some positive feedback on the usage of online Mathematics learning; however, it shows lacking studies in terms of its effectiveness. Colleges and universities worldwide have struggled to find a way to measure the level of satisfaction in online learning, specifically in Mathematics. However, Hannay & Newvine (2006), distance learning allows students to balance their other engagements and commitments, and the study indicates that students highly preferred this approach. Students believe that quality education was not sacrificed despite the convenience of teaching and learning, thus, producing higher quality educational outcomes. Moreno-Guerrero, Aznar-Díaz, Caceres-Reche & Alonso-Garcia (2020) stated that positive influences on students, such as motivation, autonomy, participation, mathematical concepts, results, and especially grades, are enhanced by the e-learning method.

According to Fidalgo, Thormann, Kulyk & Lencastre (2020), distance Education caters to students with some advantages: timesaving, fewer expenses, self-paced study, and disadvantages: lack of face-to-face interaction, struggle to stay motivated, less feedback, and there is a need for stable resources and connection. Students tend to be comparative when comparing race, sex, financial status, and physical distance from the institution. Students who take online courses tend to be marginally more seasoned than offline classes (Doyle, 2009). Several necessary studies have documented that these students have good learning outcomes in online courses. After controlling for prior performance and confidence, Choi & Walters (2018) found that higher self-efficacy and mindset scores are associated with higher final math course scores and math state assessment performance when students attend more sessions. Choi, Walters, and Hoge (2017) found that more difficult themes have a minimal impact on students' self-reflection and involvement in unit examinations and performances.

Further, according to Gorra & Bhati (2016), improving learning-related activities in the classroom through technology has a favorable outcome. They did, however, evaluate the drawbacks, such as interruptions in the classroom due to pupils' enthusiasm for technology. The purpose of e-learning content is to serve learners with different backgrounds interactively. In e-learning, the contents are delivered through the Internet, intranet, extranet, satellite television, virtual classrooms, and digital collaboration (Sintema, 2020). It shows that among first-time course takers and course retakers, those in virtual courses are more likely to pass the system (with a grade of C or higher) than their face-to-face counterparts. Harrington (1999) found that when students with a high GPA were enrolled in a distance-education statistics course, they

did as well as those in a traditional class. However, when students with a lower GPA were enrolled in the online class, they did not do as well as their counterparts in the traditional statistics class. Moreover, the study by Davis (2014) found that the age of the students shows significant relative effects on satisfaction of online mathematics courses; thus, satisfaction depends on the age and profile of the students. Students tend to be comparative when comparing race, sex, financial status, and physical distance from the institution. The review of studies on student satisfaction shows that student satisfaction is an important issue in online learning and develops a theoretical framework for measuring and explaining student satisfaction with their learning in the online environment.

This study aimed to determine the students' satisfaction on online Mathematics learning in relation to academic performance at the University of Bohol. It also seeks to explore the association between students' level of satisfaction and academic performance on online Mathematics learning.

RESEARCH METHODOLOGY

The study utilized a quantitative-correlational approach through a survey questionnaire to gather data. The study was conducted at the Teachers College Department of the University of Bohol. The respondents of this study were the randomly selected 65 students from 1st year to 4th year taking Mathematics classes during the first and second semesters in 2020-2021. The researchers used a 5% margin of error with a confidence interval of 95%. The respondents were chosen as they qualified for the following inclusion: a.) were officially enrolled in the University of Bohol; b.) they belong to the Teachers College department; and c.) lastly, the participants are willing to engage in the study. A researcher-made questionnaire presented in Google Forms was used to gather data to attain the essential information for the success of this work. The tool was pilot-tested on ten samples and obtained a Cronbach's alpha value of 0.94, showing excellent internal consistency.

Further, the study went through an Ethics Review by the institution's Ethics Board Committee. Consent forms were obtained from the respondents before answering the tool, and the participants have the right to pull back from the survey at any arrange on the off chance that they wish to do so. The assessment handle does not appear to hurt (unintended or something else) respondents. The respondents' privacy and anonymity are vital; therefore, the "do no harm policy" is highly observed.

Moreover, after collecting the required information, the researchers organized and analyzed the gathered data using SPSS. The normality result of 0.000 indicates that the data is skewed. Thus, a non-parametric test was utilized. The percentage and frequency distribution were used to make the respondents' profile and academic performance easier to analyze, handle, and interpret data, thus using the weighted mean to categorize the level of

respondents' satisfaction as Strongly Disagree, Disagree, Agree, Strongly Agree. Chi-Square is used to determine the relationship between the Level of Satisfaction on online Mathematics learning and the profile of the respondents. To determine the significant correlation between the respondents' level of satisfaction on online Mathematics learning and their academic performance. The researchers will make use of Spearman's Rank Correlation Coefficient with a 0.05 level of significance.

RESULTS AND DISCUSSION

Level of Satisfaction in Online Mathematics Learning

In the Level of Satisfaction in Online Mathematics Learning, results revealed that the respondents were Moderately Satisfied with a weighted mean of 2.89. This means that the students were moderately satisfied in the conduct of Mathematics learning online.

Parameters:

Scaling	*Description*	*Interpretation*
3.25-4.00	*Strongly Agree*	*Very Satisfied*
2.50-3.24	*Agree*	*Moderately Satisfied*
1.75-2.49	*Disagree*	*Slightly Satisfied*
1.00-1.74	*Strongly Disagree*	*Not Satisfied*

Table 1. *Academic Performance of Respondents*

n = 65

Grades	Frequency	Percentage	Description	Rank
1.0 – 1.4	11	16.92%	Excellent	3
1.5 – 1.9	28	43.08%	Very Good	1
2.0 – 2.4	10	15.38%	Good	4
2.5 – 3.0	15	23.08%	Fair	2
NG-LR	1	1.54%	Poor	5

Mean Academic Performance = 2.40
Level of Performance = Good

The academic performance of the students was categorized based on the following levels of proficiency namely: Excellent, Very Good, Good, Fair, and Poor. The level of proficiency at which the student is performing shall be based on the numerical value arrived at after summing up the results of the students' performance. The weighted mean of the academic performance of Teachers College is 2.40 which is interpreted as a good level.

Significant degree of Relationship between Respondents' Profiles and Satisfaction on Online Mathematics Learning and Academic Performance

Table 2 revealed that there is no significant degree of relationship between the profile of the respondents and their level of satisfaction on online mathematics learning. This implies that the respondents' sex, age, civil status, and year level do not affect the respondents' satisfaction on online Mathematics learning. This finding negates the study by Davis (2014) entitled "Measuring Student Satisfaction in Online Math Courses," which says that the age of the students shows a significant effect on satisfaction of online mathematics courses; thus, satisfaction depends on the age and profile of the respondents.

Table 2. *Summary of the Results on Respondents' Profile and Satisfaction on Online Mathematics Learning*

n = 65

Variables Associated to Online Math Learning	Chi-Square Test Value	p-value	Decision	Variables
Sex	2.698	.949	Failed to reject Ho	There is no significant relationship between the variables
Age	5.786	.314	Failed to reject Ho	There is no significant relationship between the variables
Civil Status	1.011	.149	Failed to reject Ho	There is no significant relationship between the variables
Year Level	3.509	.213	Failed to reject Ho	There is no significant relationship between the variables

As for the data presented in Table 3, it revealed no significant degree of relationship between the profile of the respondents and their academic performance. It can be inferred that it failed to reject the null hypothesis, thus, this implies that the respondents' sex, age, civil status, and year level do not influence the respondents' academic performance on online Mathematics learning.

Table 3. *Summary of the Results on Respondents' Profile and Academic Performance*

n = 65

Variables Associated to Academic performance	Chi-Square Test Value	p-value	Decision	Variables
Sex	7.237	.213	Failed to reject Ho	There is no significant relationship between the variables
Age	13.192	.089	Failed to reject Ho	There is no significant relationship between the variables
Civil Status	2.878	.783	Failed to reject Ho	There is no significant relationship between the variables
Year Level	15.381	.092	Failed to reject Ho	There is no significant relationship between the variables

Correlation between the Respondents' Level of Satisfaction on Online Mathematics Learning and their Academic Performance

Revealed on Table 4 that there is no significant correlation between the level of satisfaction on mathematics online learning and their academic performance

Table 4 . *Correlation Between the Respondents' Level of Satisfaction on Online Mathematics Learning and Their Academic Performance*

P-value	Spearman Rank Test Value	Decision	Variables
0.080	-0.218	Failed to reject Ho	There is no significant correlation between the variable

The results revealed that $r = -.218$, $n=63$, $p < 0.05$ which found out to be insignificant at 0.05 level of significance, thus failed to reject the null hypothesis. There is no significant correlation between the respondents' level of satisfaction on online Mathematics learning and their academic performance. There is no mutual relationship between the respondents' level of satisfaction and their academic performance. The result negates the study of Hatcher et al. (1992) entitled "Predicting College Student Satisfaction, Commitment, and Attrition from Investment Model Constructs," which elaborates on how reward rewards and other factors affect each student. When the student obtains high academic performance, then the level of satisfaction also increases.

CONCLUSIONS

Students in the University of Bohol's Teachers College Department reported moderate satisfaction with their online mathematics learning experiences. Their academic performance in mathematics was generally positive, with an average grade of 2.4.

Furthermore, the study found no statistically significant relationship between demographic factors (sex, age, civil status, and year level) and either satisfaction with online mathematics learning or academic performance.

Finally, and most importantly, there was no statistically significant correlation found between students' level of satisfaction with online mathematics learning and their academic performance in mathematics courses.

RECOMMENDATIONS

Based on the foregoing conclusions and findings, the following recommendations are offered:

1. Teachers may provide e-creative activities, keep in touch with students, and create real-life activities to promote collaboration among students and positive communication to help improve students' satisfaction on Mathematics online learning.
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2. The school should upgrade online platforms that facilitate teacher-student engagement to have conducive online mathematics learning. In productively integrating online platforms in teaching mathematics learning, it is recommended for schools to check teachers' progress regularly.

3. A further study will be conducted as to the use of distance learning in Education to fully address the issues related to satisfaction of students in online learning.

REFERENCES CITED

Bao, W. (2020). COVID -19 and online teaching in higher education. A case study of Peking University. Retrieved from: https://bit.ly/3bBHFF6, (accessed last March 26, 2021).

Barbara, M., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluating Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. Retrieved from: https://bit.ly/3cgm0mh, (accessed last April 17, 2021).

Barr, B. & Miller, S. (2013). Higher Education. The Online Teaching and Learning Experience. Retrieved from: https://bit.ly/3tXAXzC, (accessed last March 26, 2021).

Baya'a, N., & Daher, W. (2009). Learning mathematics in an authentic mobile environment: The perceptions of students. *International Journal of Interactive Mobile Technologies*, *3*. Retrieved from: https://bit.ly/3tdiTUA, (accessed last June 6, 2022).

Bruner, D. (2006). The Potential of the Hybrid Course vis-à-vis Online and Traditional Courses. Retrieved from: https://bit.ly/3g1M3P8, (accessed last May 22, 2021).

Chaney, E.G. (2010). Web-based instruction in a rural High School. A collaborative inquiry into its effectiveness and desirability. Retrieved from: https://bit.ly/2SU6aXx, (accessed last March 26, 2021).

CHED. (2020). CMO No. 4, Series of 2020: Guidelines on Implementation of Flexible Learning. Retrieved from: *https://bit.ly/3dO5Wtv,* (accessed last March 16, 2021).

CHED. (2000). CMO 35 s 2000: Updated Policies and Guidelines on Open Learning and Distance Education. Retrieved from: *https://bit.ly/3bEN3aB,* (accessed last March 17, 2021).

Choi, J. & Walters, A. (2018). Exploring the impact of small-group synchronous discourse sessions in online math learning. Online Learning, 22(4), 47-64. Retrieved from: https://bit.ly/3v5qP9s, (accessed last April 11, 2021).

Choi, J., Walters, A., & Hoge, P. (2017). Self-reflection and math performance in an online learning environment. Online Learning Journal, 21(4). Retrieved from: https://bit.ly/3f1O2ni (accessed last April 11, 2021).

Cortez, C. P. (2020). Blended, Distance, Electronic and Virtual-Learning for the New Normal of Mathematics Education: A Senior High School Student's Perception. Retrieved from: https://bit.ly/3ySe5EP (accessed last August 3, 2021).

Davidson-Shivers, G., Tanner, E., & Muilenburg, L. (2000). Online Discussion: How Do Students Participate? Retrieved from: https://bit.ly/3igEZB4, (accessed last May 22, 2021).

Davis, A. (2014). Measuring Student Satisfaction in Online Math Courses. Retrieved from: https://bit.ly/3z1EWPX, (accessed last May 20, 2021).

Doyle, W. (2009). Online education. The revolution that wasn't changed. Retrieved from: https://bit.ly/3ovX9j8, (accessed last March 23, 2021).

Ebojoh, O. (2007). Effectiveness of Online Learning Program: A case study of a Higher Education Institution. Retrieved from: https://bit.ly/3vklKcg, (accessed last April 18, 2021).

Fidalgo, P., Thormann, J., Kulyk, O. & Lencastre, J. (2020). Students' perceptions on distance education: A multinational study. Retrieved from: https://bit.ly/3u3OhTc, (accessed last March 23, 2021).

Garnham, C., & Kaleta, R. (2002). Introduction to Hybrid Courses. Retrieved from: https://bit.ly/3chvU75, (accessed last May 23, 2021).

Gorra, V., & Bhati, S. (2016). Students' perception on the use of technology in the classroom at higher education institutions in the Philippines. Faculty of Business - Papers (Archive). 874. Retrieved from: https://bit.ly/3v35zBe, (accessed last April 14, 2021).

Guinocor, M., Mamites, I., Almerino, J. P., & Lumayag, C. (2020). Mathematics performance of students in a Philippine State University. Retrieved from: https://bit.ly/3u3Oo14 (accessed last March 21, 2021).

Hannay, M., & Newvine, T. (2006). Perceptions of distance learning: A comparison of online and traditional learning. Retrieved from: https://bit.ly/3v3qrYR, (accessed last March 22, 2021).

Harrington, D. (1999). Teaching Statistics: A Comparison of Traditional Classroom and Programmed Instruction/Distance Learning Approaches. Retrieved from: https://bit.ly/3ifovsY, (accessed last May 21, 2021).

Hatcher, L., Kryter, K., Prus, J.S., & Fitzgeralds, V. (1992). Predicting College Student Satisfaction, Commitment, and Attrition from Investment Model Constructs. Retrieved from: https://bit.ly/3xWWJpx, (accessed on June 3, 2021).

Hubackova, S. (2015). E-learning in English and German language teaching. Procedia – Social and Behavioral Sciences, 199(2015), 525-529. Retrieved from: https://bit.ly/3CQ425J, (accessed on July 4, 2021).

Ichinose, C., & Bonsangue, M., (2016). Mathematics self-related beliefs and online learning. Retrieved from: https://bit.ly/3ovFcRK. (accessed last March 27, 2021).

Irons, L. R., Keel, R., & Bielema, C. L. (2020). Blended Learning and Learner Satisfaction: Keys to User Acceptance? Retrieved from: https://bit.ly/34KuAw8, (accessed last May 24, 2021).

Jolliffe, A., Ritter, J., & Stevens, D. (2001). Developing and Using Web-Based Learning. Retrieved from: https://bit.ly/3i9ElFo, (accessed last May 20, 2021).

Karal, H., Kokoc, M., Colak, C., & Yalcin, Y. (2015). A Case Study on Online Mathematics Teaching with Pen-based Technology: Experiences of Two Instructors. Retrieved from: https://bit.ly/3wlZ9xi, (accessed last April 16, 2021).

Moore, M. G. (1997). Theory of transactional distance. Retrieved from: https://bit.ly/3bKKCmQ, (accessed last March 9, 2021).

Moreno-Guerrero, A. J., Aznar-Díaz, I., Caceres-Reche, P., & Alonso-Garcia, S. (2020) E-Learning in the Teaching of Mathematics: An educational experience in adult high school. Retrieved from: https://bit.ly/3oJdmBX,

Official Gazette. (2014). Republic Act No. 10650: Open Distance Learning Act. Retrieved from: *https://bit.ly/3yiVIcm,* (accessed last March 17, 2021).

Official Gazette. (2016). Republic Act No. 10844: Department of Information and Communication Technology Act of 2015. Retrieved from: *https://bit.ly/3u1RpPl,* (accessed last March 16, 2021).

Pelz, B. (2004). Three Principles of Effective Online Pedagogy. Retrieved from: https://bit.ly/3ulbwCF, (accessed last May 25, 2021).

Sintema, E, J. (2020) Effect of COVID -19 on the performance of Grade 12 students: Implications for STEM ED. EURASIA JOURNAL OF MSTE 16(7). Retrieved from: https://bit.ly/3f7Uk53, (accessed last March 27, 2021).

Smart, K. & Cappel, J. (2006). Students' Perception of Online Learning: A Comparative Study, Journal of Information Technology Education: Research 5 (1), 201-219. Retrieved from: https://bit.ly/3feaSlz, (accessed last April 19, 2021).

Spies, R., Grobbelaar, S., & Botha, A. (2020). A scoping review of the application of the task-technology fit theory. Retrieved from: https://bit.ly/3u16RLt

Srinivas, S. (2020). How maths helps us battle the spread of infectious diseases. Retrieved from https://bit.ly/2W2tlRk, (accessed last July 29, 2021). United Nations Educational, Scientific and Cultural Organization. (2020). Sustainable Development Goals: Quality Education. Retrieved from: https://bit.ly/3j7vpRi

UNICEF. (2020). UNICEF Philippines statement on COVID-19. Retrieved from: https://uni.cf/3tgUopG, (accessed on June 6, 2022).

Wilson, R. L., & Weiser, M. (2001). Adoption of Asynchronous Learning Tools by Traditional Full-Time Students. Retrieved from: https://bit.ly/34LfBew