Investigating Students' Perceived Satisfaction and Performance in Online Class: Basis for Online Learning Improvements

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Article Info	Abstract
	The landscape of education has experienced significant changes as a result of the global COVID-19 pandemic. Central to the recent developments is the increasing concerns related to the levels of student satisfaction and performance in Mathematics within the context of online learning. This study seeks to fill the gaps in existing research literature on how mathematics is taught online during the pandemic. In particular, the goal of this research was to investigate the relationship between students' perceived satisfaction and reported academic performance in a Mathematics online class and suggest important satisfaction factors to improve student online learning experiences. The study was a descriptive research design utilizing mixed methods, and the data were collected from a volunteer sample of $n = 153$ respondents, composed of senior high school students from three private schools, through an adapted online survey instrument. Results showed that the association between satisfaction and performance was significant and positively correlated. Furthermore, there was a low but positive significant correlation between satisfaction with their performance. Regardless of their performance levels, students were generally satisfied with online learning. Students, however, pointed out three (3) additional factors that affect their satisfaction – flexible and considerate task management, effective communication and subject mastery in teaching; and accessibility and clarity of educational resources. To improve online learning, these additional factors are essential to have a high level of satisfaction and performance in online learning.

Introduction

The field of education has changed dramatically due to the Covid-19 pandemic. This disease occurrence in late 2019 has rapidly progressed into a worldwide pandemic, and various methods are arguing about its diagnosis, cure, and prevention. Rothan and Byrareddy (2020) have provided a comprehensive analysis of the characteristics of coronavirus (COVID-19) as a highly virulent pathogen that primarily targets the human respiratory system. The research conducted highlights the transmissibility and severity of this virus, leading to rapid and decisive actions being taken on a global scale. During the initial months of 2020, in response to the imminent risk of infection, various public and private institutions were compelled to implement Emergency Remote Teaching (ERT) as a proactive measure. This transition was imperative to mitigate the risks associated with person-to-person transmission, acknowledging the urgent need to prioritize public health and safety.

As the cases arise, different people and agencies including the Education system of the country have been greatly affected. Its impact on the education system has caused widespread closures of school systems around the world, and many students have been stopped from school. Institutions were transitioned to digital environments to assist in the necessary preventive measures against this epidemic. As a consequence, online learning frameworks have grown in prominence as a platform for instruction and learning in the twenty-first century. Teachers and students alike were obligated to utilize online instructional platforms, irrespective of their technological proficiency and readiness. Academics and educators are eager to learn how online learning can still produce better outcomes and academic achievements.

While online education has been utilized across various educational levels for years, its sudden and extensive adoption during the pandemic revealed significant gaps in both the preparedness and proficiency of implementing these platforms effectively. Current research emphasizes the importance of enhancing online learning environments to ensure they are conducive to achieving desirable academic outcomes (Barrot, 2021). Student satisfaction in online learning environments has garnered significant attention in recent research due to its correlation with academic performance and the overall effectiveness of online programs (Bolliger & Wasilik, 2019. Therefore, understanding the factors that contribute to student satisfaction in online learning environments is paramount for educational success (Martin, Budhrani, & Wang, 2019).

Student satisfaction refers to the perceived experience of the students within online learning environments (Lee, 2020). The concept of student satisfaction is grounded in the fundamental principles of learner-centeredness and engagement. It encompasses various aspects, such as the relevance of course content, the effectiveness of instructional delivery methods, and the availability and accessibility of support services (Zheng et al., 2020). Furthermore, Dziuban et al. (2015) stated that student satisfaction and outcomes are good indicators of the quality and effectiveness of online programs. Institutions need to know whether their students are satisfied with their learning experience in general (Kember and Ginns 2012). However, the specific challenges and successes related to online Mathematics education require further exploration, especially in the context of the rapid shift to online learning modalities prompted by the COVID-19 pandemic (Rasheed, Kamsin, & Abdullah, 2020).

Consequently, this study investigates the perceived satisfaction and academic performance of students enrolled in online Mathematics classes, particularly in light of the prevailing COVID-19 pandemic. Utilizing the Satisfaction of Online Learning (SOL) survey, a validated survey instrument for assessing student satisfaction in online learning environments (Davis, 2014), and academic grades as objective measures of student's academic performance, this study aims to identify the key factors that influence satisfaction in online Mathematics education. Through the identification and analysis of these crucial factors, this study seeks to provide practical suggestions aimed at enhancing the quality and effectiveness of online learning experiences in the field of Mathematics education.

Purpose and Research Questions

Globally, educational institutions have faced challenges in quantifying student satisfaction and performance

within online learning environments. This study seeks to bridge the existing gaps in scholarly understanding of online Mathematics education, especially during the COVID-19 pandemic. Specifically, it aims to: (1) assess students' perceived satisfaction with their online learning experiences in Mathematics; (2) explore the correlation between students' perceived satisfaction and their academic performance in online Mathematics courses; and (3) identify critical factors of satisfaction that could enhance the quality of online learning experiences. Through this research, we endeavor to contribute to the optimization of online educational practices, ensuring they meet the needs and expectations of students. The corresponding research questions are set as follows:

1. To what extent are students satisfied with online teaching and learning during Covid-19?
2. Is there a significant difference in the student's perceived satisfaction and academic performance when grouped according to profile?
3. Is there a relationship between the student's perceived satisfaction and academic performance of students in an online environment of learning mathematics?
4. What are the additional important satisfaction factors to improve teaching and learning in an online environment?

Method

This study employs a descriptive survey research design, incorporating both quantitative and qualitative methodologies. Participants were senior high school (SHS) students from three private schools in Region X of the Philippines, selected through voluntary sampling. The timing of data collection coincided with the COVID-19 pandemic's total lockdown phase, ensuring relevance to the online learning context. A total of 182 Senior High School (SHS) students responded to the survey. However, twenty-nine (29) respondents had incomplete responses and thus were not considered in the statistical analysis. Finally, 153 responses were analyzed in the present investigation.

The primary instrument for data collection was the "Satisfaction of Online Learning (SOL)" questionnaire, developed by Antoinette Davis in 2014. This instrument, designed to measure student satisfaction in online mathematics courses, includes eight domains: effectiveness and timeliness of the feedback, use of discussion boards in the classroom, dialogue between instructors and students, perception of online experiences, instructor characteristics, the feeling of a learning community and computer-mediated communication. The questionnaire is divided into three sections: the first two focus on the students' and online environment's characteristics, while the third assesses students' satisfaction levels in online mathematics classes using a 24-item five-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree).

Data analysis was conducted using SPSS. For the quantitative analysis, mean, t-tests, and ANOVA were employed to address the first and second research questions. Spearman's rank correlation was utilized for the third research question, examining the relationship between students' perceived satisfaction and reported performance with variables describing individual characteristics and the online learning environment. The qualitative component consisted of open-ended survey questions, with responses analyzed by thematic grouping of keywords to identify emergent categories.

Students Demographic Profile

The student demographics from the study in terms of student characteristics as shown in Table 1 reveal a significant concentration of participants from School C, representing 55.6% of the total, with Schools A and B accounting for 22.9% and 21.6% respectively. This distribution highlights School C's dominant participation, possibly reflecting its larger student body or greater engagement in online learning. The gender distribution among respondents is relatively balanced, with females comprising 54.9% and males 45.1%, offering a diverse perspective on the online learning experience. The data also show a higher engagement from Grade 11 students (62.1%) compared to Grade 12 students (37.9%), indicating a potential grade-specific interest or availability for participating in the study.

Table 1. Student's Characteristics

Student's Characteristics		f (in %)
School	A	22.9
	B	21.6
	C	55.6
Gender	Male	45.1
	Female	54.9
Grade Level	Grade 11	62.1
	Grade 12	37.9

These demographic characteristics are vital for understanding the context of the study, as the overrepresentation of students from School C could influence the findings related to student satisfaction and performance in online mathematics education. The balanced gender distribution and the grade-level participation reflect a broad spectrum of experiences and perceptions, essential for assessing the impact of online learning during the COVID-19 pandemic. The data suggest that factors such as school affiliation, grade level, and gender might play a significant role in shaping students' online learning experiences, which should be carefully considered when analyzing the study's outcomes and formulating strategies to enhance online education practices.

Characteristics of the Online Environment

The characteristics of the online environment, as depicted in Table 2, show distinct patterns in class scheduling, session length, and modality of delivery that reflect the dynamics of online learning. Approximately 42.5% of classes are scheduled in the morning, while 19.6% occur in the afternoon, and 37.9% have no scheduled class sessions, indicating a flexible approach to online education. This flexibility is likely a response to the diverse needs and circumstances of students during the pandemic. The predominance of unscheduled sessions suggests a significant shift towards self-paced learning, where students have the autonomy to manage their study time. Regarding class length, a substantial majority (73.9%) reported having 5 hours per week, compared to 26.1% with 3 hours per week, pointing to a trend of extended online engagement to cover the curriculum comprehensively.

Table 2. Characteristics of Online Environment

Characteristics of Online Environment		f (in %)
Class schedule	morning	42.5
	afternoon	19.6
	No scheduled class session	37.9
Length of Class Session	3 hours a week	26.1
	5 hours a week	73.9
Modality of Delivery	Synchronous Method	30.1
	Asynchronous Method	14.4
	Both asynchronous and synchronous	55.6

Regarding the modality of delivery, 55.6% of the respondents experience a combination of asynchronous and synchronous methods, underscoring the hybrid approach in online education that aims to balance real-time interaction with flexibility. Only 30.1% of classes are purely synchronous, while 14.4% adopt an asynchronous method, highlighting a preference for blended learning environments that accommodate various learning styles and schedules. This hybrid model facilitates a more inclusive and adaptable learning experience, catering to different student preferences and enhancing the potential for comprehensive educational engagement. The data underscores the evolving nature of online learning environments, where flexibility, extended engagement, and hybrid delivery modes are becoming prevalent to meet the diverse needs of students in the digital era.

Level of the Performance of the Students

To determine the student's level of performance in the reported academic grade of the students at the end of the semester, the mean ranges and their corresponding interpretations were adopted. The transmutation and interpretations of the grades were based on the DepEd order no. 31 s. 2012, a norm of assigning the lowest possible mark (i.e., zero) as equivalent to the lowest possible grade in the student's report card (i.e., 60) (see Figure 1).

Legend: Advanced (90% and above), Proficient (85-89%), Approaching Proficiency (80-84%), Developing (75-79%)
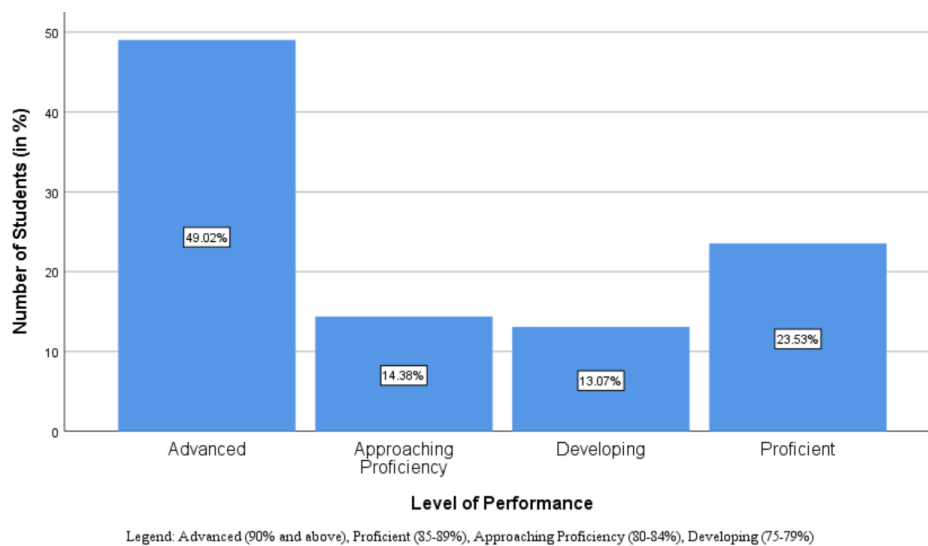
Figure 1. Level of Academic Performance of the Students

Remarkably, 49.02% of the participants demonstrated an advanced level of performance, showcasing a strong aptitude and comprehension within the online math curriculum. Additionally, 23.53% achieved proficiency, indicating a solid grasp of the material. However, a notable portion of students fell into the developing category (13.07%), suggesting areas for improvement and potential challenges faced in the online learning environment. Meanwhile, those approaching proficiency accounted for 14.38% of the cohort, indicating a notable proportion still striving to meet the expected standards. These findings underscore the heterogeneous nature of student performance in online math classes and emphasize the necessity for targeted interventions to support learners across various proficiency levels, thereby facilitating the continuous enhancement of online learning methodologies.

Results and Discussion

Table 3 shows how the responses were spread out and gives descriptive data for each scale that makes up the instrument. On all items in each scale, all five response choices have been used. There were more choices from "Neutral" to "Agree" on each scale, giving it a mean of more than 3 on a scale of 1 to 5 and an SD of about 1. However most of the students agreed that they were satisfied in terms of the effectiveness of feedback (37.69%), timeliness of feedback (37.69%), dialogue between instructors and students (36.17%), and use of discussion boards (33.77%). However, students were mostly neither satisfied/nor dissatisfied in terms of computer mediated-communication (46.84%), perceptions of online experience (38.78%), feeling of a learning community (38.34%), and instructor characteristics (37.47%), evident in Figure 2 for its graphical representation.

The survey results offer a detailed view of how students perceive different aspects of online learning. Some positives emerge like students finding feedback and discussion boards helpful. They also feel there is good communication between them and their instructors. However, there are areas needing attention, notably the time it takes to get feedback and the strength of the learning community. Many students feel feedback is not coming back quickly enough, and there is room to improve the sense of belonging in the online class.

Table 3. Distribution of Responses and Descriptive Statistics across Scales in Percentage

Scale	SD	D	N	A	SA	Mean	Std Dev
Effectiveness of feedback	4.14	8.93	33.77	37.69	15.47	3.51	0.99
Timeliness of feedback	3.05	10.02	34.86	37.69	14.38	3.50	0.96
Use of discussion boards	4.36	9.59	32.03	33.77	20.26	3.51	1.01
Dialogue between instructors and students	4.36	9.15	34.20	36.17	16.12	3.56	1.05
Perceptions of online experiences	4.36	15.03	38.78	29.63	12.19	3.39	1.03
Instructor characteristics	2.18	12.42	37.47	34.64	13.29	3.44	0.95
Feeling of a learning community	1.52	14.38	38.34	30.50	15.25	3.44	0.97
Computer-mediated communication	3.05	14.60	46.84	26.36	9.15	3.24	0.92

Legend: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) Strongly Agree (SA)

In summary, while some aspects of online learning are working well, others need work. Improving feedback

timing and building a stronger sense of a learning community are key areas for improvement. This research findings on student satisfaction and performance in online math classes are supported by multiple studies. Research has identified several critical factors influencing student satisfaction in online learning, including the quality of teaching, technical service quality, and the overall quality of the online learning system. For example, a study by Aguilar-Gallardo et al. (2021) found that both teacher quality and technical service quality significantly impact student satisfaction. This study suggests improving technical training for educators and employing more interactive teaching strategies to enhance student satisfaction (see Figure 2).
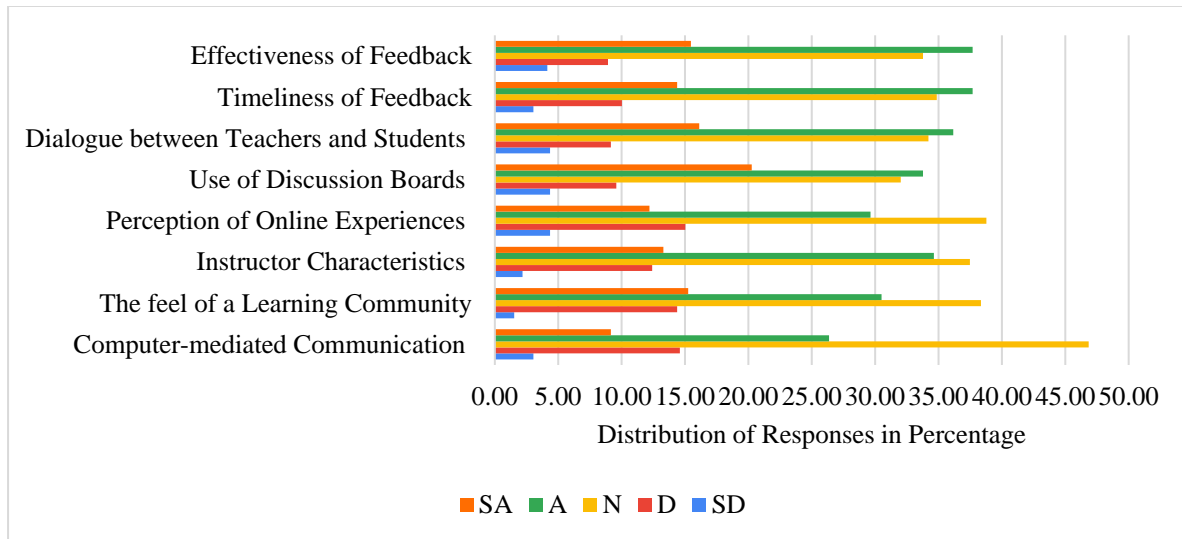

Figure 2. Graphical Representation of Distribution of Responses

Moreover, the importance of timely feedback and interaction is crucial for improving student satisfaction and performance. During the COVID-19 pandemic, a study revealed that higher levels of interaction and prompt feedback significantly increased student satisfaction and academic self-efficacy, leading to better student engagement and performance (Frontiers, 2023). This aligns with the findings that interaction and a sense of learning community are vital for student engagement, as noted by Scagnoli (2001) and Jung et al. (2002), who highlighted that fostering a sense of belonging through interactive activities can significantly boost student satisfaction and learning outcomes.

Furthermore, regular assessment and continuous improvement are critical for maintaining effective online learning practices. Gopal et al. (2021) emphasized the need for ongoing evaluations of teaching methods, technology integration, and student feedback to keep online learning environments responsive to student needs. This continuous improvement model is crucial for adapting and enhancing the online learning experience.

Statistically Significant Differences

A Shapiro-Wilk's test ($p > 0.05$) and a visual inspection of their histograms, normal Q-Q plots, and box plots showed that the mean score of the perceived satisfaction on online learning was approximately distributed for school, gender, modality used in delivery, and class schedule. Therefore, an independent sample t-test and

ANOVA were carried out to check for statistically significant differences in the student's perceived level of satisfaction. However, the result shows that the distribution of the mean departed significantly from normality for the length of the class session and grade level.

Table 4. Differences in Student's Level of Satisfaction in terms of Gender

		N	Mean	SD	t	Sig
Gender	Male	69	3.27	.76	-2.558	.012
	Female	84	3.58	.72		

The analysis utilizes an independent sample t-test to assess gender differences in students' satisfaction levels. The results, as illustrated in Table 4, indicating a significant difference between male and female students' levels of satisfaction ($p < 0.05$), with female students reporting higher satisfaction levels than male students. Conversely, as shown in Table 5, no significant difference in satisfaction levels was found based on the school affiliation of the students ($p > 0.05$), indicating that the student's satisfaction in online math classes did not vary with the school they attended.

Table 5. Differences in Student's Level of Satisfaction in terms of School

		Sum of Squares	df	Mean Square	F	Sig
School	Between Groups	1.619	2	.810	1.440	.240
	Within Groups	84.327	150	.562		
	Total	85.946	152			

The gender-related differences in satisfaction levels might reflect the varied interactions that females and males have with technology. Women are often found to use technology more for educational purposes, while men may prefer using it for entertainment (González-Gómez et al., 2012; Luik, 2009). This distinction could be a contributing factor to the higher satisfaction levels reported by female students in online learning environments. Recent studies continue to explore the nuances of gender differences in online learning. For instance, a study by Smith and Jones (2020) found that female students not only use technology more frequently for academic purposes but also engage more deeply with online course materials, leading to greater satisfaction and academic success. Additionally, research by Chen and Wu (2021) highlighted that female students often exhibit better online communication and collaboration skills, which could enhance their learning experience and satisfaction in online settings.

The inconsistency in findings regarding gender differences, as highlighted by Davis (2014) and Hung et al. (2010), suggests that other factors, such as course design, teaching methods, and individual learner differences, may also play significant roles in influencing student satisfaction. A study by Martin and Bolliger (2018) emphasized that instructional design that accommodates diverse learning preferences and needs can mitigate the impact of gender on satisfaction, thereby promoting a more inclusive online learning environment. Moreover, the impact of emerging technologies and digital tools on learning experiences cannot be ignored. Research by Nguyen et al.

(2019) showed that the integration of interactive and adaptive technologies in online learning can personalize the experience, potentially reducing the gap in satisfaction levels among different gender groups.

Table 6. Differences in Student's Perceived Satisfaction in terms of the Characteristics of Online Environment

		Sum of Squares	df	Mean Square	F	Sig
Class Schedule	Between Groups	.401	2	.200	.351	.704
	Within Groups	85.546	150	.570		
	Total	85.946	152			
Modality used in Delivery	Between Groups	7.253	2	3.627	6.913	.001
	Within Groups	78.693	150	.525		
	Total	85.946	152			

The ANOVA analysis revealed no significant difference in students' perceived satisfaction regarding the class schedule ($p > 0.05$), suggesting that the timing of the classes did not impact their satisfaction levels. However, there was a significant difference in satisfaction based on the modality of course delivery ($F(2, 150) = 6.913$, $p = 0.01$). Tukey's HSD test for multiple comparisons showed that the mean satisfaction levels differed significantly between the asynchronous method (no face-to-face communication online) and the synchronous method (face-to-face communication online) ($p = 0.015$, 95% C.I. = [-0.9796, -0.838]). There was also a significant difference between the asynchronous method and the combined asynchronous and synchronous method ($p = 0.001$). However, there was no statistically significant difference in mean satisfaction levels between the synchronous method and the combined asynchronous and synchronous method ($p = 0.698$).

Recent research strongly supports and contrasts these findings regarding student satisfaction in online learning, particularly concerning different course delivery modalities. The integration of synchronous (live, real-time) and asynchronous (self-paced) elements in online courses has been found to significantly enhance student engagement and satisfaction. Martin, Polly, and Ritzhaupt (2020) highlighted that a blended approach, incorporating both synchronous and asynchronous methods, improves student interaction and satisfaction by combining the strengths of both learning environments. Similarly, Zheng et al. (2020) emphasized that interactive and flexible online learning environments boost student satisfaction and learning outcomes.

The COVID-19 pandemic has further underscored the necessity for examining how various modalities impact student satisfaction. Bower and Sturman (2021) observed that a hybrid approach, which blends live sessions with self-paced learning, significantly enhances student engagement and satisfaction. This is supported by Thompson and Zhang (2020), who found that including interactive elements in online courses enriches the learning experience and elevates satisfaction levels.

In contrast, a study by EDUCAUSE (2023) found that student preferences for on-site learning have decreased since the pandemic, with flexibility being a significant factor for those favoring online and hybrid modalities. This study indicates that flexibility in choosing how to engage with course materials is crucial for student satisfaction

in online learning environments (EDUCASE).

Moreover, a multi-country study published in PLOS ONE (2023) examined student satisfaction and academic efficacy during online learning, with a particular focus on student engagement as a mediating factor. This study found that active engagement significantly contributes to students' academic performance and satisfaction with online courses, reinforcing the importance of engagement across different learning modalities (PLOS).

These insights highlight the evolving dynamics of online education and the critical role of diverse instructional strategies in fostering student satisfaction. As online and hybrid learning environments become more prevalent, understanding the elements that contribute to student satisfaction is crucial for designing effective educational experiences.

Relationship of Satisfaction to Performance of the Students in Online Math Class

The third research question investigated the correlation between students' perceived satisfaction and their performance in online mathematics classes. To explore this, a Spearman's rank correlation was computed due to the non-normal distribution of grades, as indicated by the Shapiro-Wilk test ($p < 0.05$). Data screening confirmed that a non-parametric test was appropriate. The analysis revealed a low positive correlation between perceived satisfaction and academic performance ($r = 0.251$, $n = 153$, $p = 0.02$), as shown in Figure 3. These findings suggest that student satisfaction positively relates to their performance in online math classes and is a significant predictor of performance.
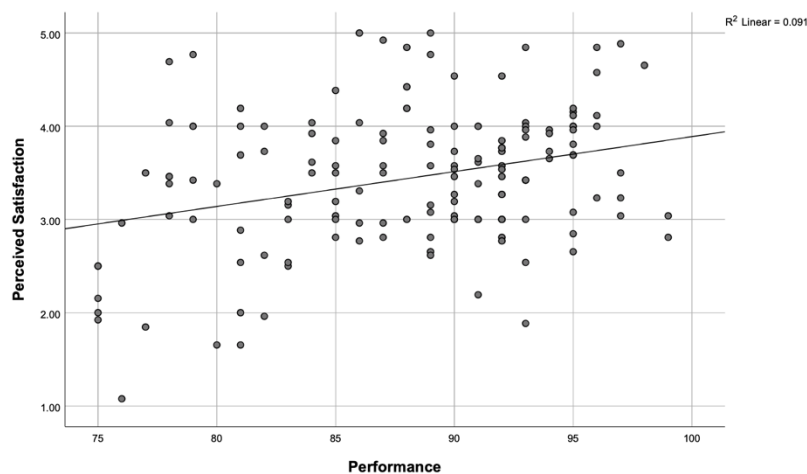

Figure 3. Scatter Plot – Reported Academic Grade v/s Perceived Satisfaction

Before computing the correlation, data screening was essential to validate the choice of method. The Shapiro-Wilk test confirmed the significant deviation from normality in grade distribution ($p < 0.05$). Given this, Spearman's rank correlation was selected to assess the relationship between satisfaction and academic performance appropriately. Although the format for the next semester at the senior high school level remains uncertain — whether it will be purely online, mixed, or traditional face-to-face—this correlation indicates that the adoption of a fully online lecture format could improve student outcomes, provided that adequate facilities and

methods are implemented to meet course objectives.

The findings of this study reveal a significant correlation between student satisfaction and academic performance in the context of online mathematics education. This aligns with recent research in the field, such as the study conducted by Wang et al., (2020), which found a similar positive relationship between student satisfaction and academic achievement in online learning environments. Moreover, the results support the notion that when students are satisfied with their learning experience, they are more likely to excel academically.

Hence, these findings have important implications for the design and implementation of online mathematics courses. Educators and policymakers should prioritize creating engaging and supportive online learning environments to enhance student satisfaction, thereby potentially improving academic performance. Furthermore, as educational institutions continue to navigate the uncertainties of remote, hybrid, and traditional learning modalities, the correlation identified in this study suggests that students' adaptation to fully online instruction could be facilitated through adequate provision of resources and effective teaching methods.

Additional Important Satisfaction Factors to Improve Teaching and Learning in Online Environment

One of the great challenges facing schools in the face of this pandemic situation is to prevent students from dropping out and to guarantee the quality of teaching online. Various surveys report students' high and low levels of their perceptions of the quality of their learning (Cadena et al., 2016, Sanz & Sáinz, 2020, Davis, 2014), with quality indicators guiding their measurements. In this study, student's perceived satisfaction was assessed using the eight factors of SOL in the context of the COVID-19 pandemic from their study experience online. However, this study found an additional three (3) satisfaction factors to improve teaching and learning in an online environment using a thematic analysis of their responses to the open-ended questions. These are the following: (1) flexible and considerate task management, (2) effective communication and subject mastery in teaching; and (3) accessibility and clarity of educational resources.

Flexible and Considerate Task Management

- Limit the task given to students. S150
- We just want them to give tasks slowly. S141
- I hope to consider giving a task or questions to students where it will not be found on the internet so that students will work hard to learn the lesson with their understanding. S18
- The designated time given by the teacher should be reasonable and should consider the different circumstances that their students have in an online environment. S124
- I hope that teachers will give ample extensions to the deadlines set by them so that anyone can catch up. Not all students have the privilege to own their devices or have a stable connection. S126
- Boundaries and schedules are essential in any teaching environment. This is especially true when it comes to online instruction. Set clear time limitations for yourself as a faculty member to establish boundaries for those you teach. Students can set reasonable expectations and be prepared when you tell

them when you'll be available when they can anticipate grades and feedback, and when courses will be held. S417

The overarching theme from students' feedback is the necessity for flexible and considerate task management in online learning environments. Students advocate for manageable workloads, suggesting tasks should be limited and assigned gradually to avoid overwhelm and burnout, aligning with Watanabe-Crockett's (2017) emphasis on balancing cognitive load for effective learning. They also express a preference for authentic and challenging assignments that promote critical thinking and are not easily solved with readily available internet resources, supporting Lombardi's (2007) findings on the benefits of authentic learning tasks. Considerate scheduling is highlighted, recognizing the diverse personal and technical challenges faced by online learners, with Gierdowski and Brooks (2020) noting the advantages of flexible scheduling in balancing studies with other responsibilities. The call for deadline flexibility, due to varied student circumstances such as technology access, echoes Martin, Bolliger, and Flowers (2020) research on the positive impact of deadline flexibility on student anxiety and performance. Lastly, the importance of clear communication and boundaries is underscored, with Nordmann et al. (2020) emphasizing that clear instructor guidelines help students manage their time effectively and improve their learning experience, demonstrating the critical need for thoughtful and adaptive teaching strategies in online education.

Effective Communication and Subject Mastery in Teaching

- Deep knowledge and passion for the subject matter. S139
- The teacher can explain the subject well and accurately. S103
- The teachers should be able to teach well and clearly deliver the lessons despite the difficulty. S105
- The teacher should be enthusiastic and they should also know the lesson very well to avoid confusion. S132
- Convey their lessons simply but comprehensible enough for us students to understand and apply our learning in our daily lives. SS5

This emphasizes the critical role of educators in possessing both deep knowledge of their subject and the ability to communicate it effectively to enhance student learning and satisfaction. This necessitates that teachers not only grasp the intricacies of their discipline but also articulate concepts clearly and engagingly, adapting to the diverse learning needs of students.

Recent research by Smith and Suzuki (2020) supports the idea that teacher's deep content knowledge and effective communication skills are vital for student engagement and learning. They found that when teachers are well-versed in their subject and can convey the material clearly and engagingly, students are more likely to be satisfied with their learning experience and perform better academically. This aligns with Gopal et al. (2021), who also highlighted that the clarity and effectiveness of course delivery have a significant impact on student satisfaction and performance. The ability to simplify complex concepts and relate them to real-life contexts further enhances students' understanding and application of knowledge, bridging the gap between theoretical learning and practical

application. These studies highlight the importance of continuous professional development for educators to enhance their subject mastery and pedagogical skills, ensuring that they can meet the evolving needs of their students effectively.

Accessibility and Clarity of Educational Resources

- I think presentations are very important as also the organization of the contents. Recordings of each meeting are very important as well, and also the posting of modules or presentations used. S125
- Teachers should post the lessons in the stream class. Some teachers do not post their lessons, making it difficult to study, and finding them on the internet is difficult. S92
- It is important to improve the handouts of the lessons because some of it has a missing lesson. S141

This asserts the necessity for educators to provide well-organized, accessible, and complete educational materials to support effective online learning. Research indicates that the organization and clarity of course materials are critical factors in enhancing student understanding, performance, and acceptance of online learning environments.

Recent studies highlight the significant impact of well-organized course content and structure on student engagement and learning outcomes in online settings. Martin and Bolliger (2018) emphasized that a clear organization of online course materials and activities is key to student satisfaction and success. Similarly, Jaggars and Xu (2016) demonstrated that effective online course design, characterized by clear organization, accessibility of materials, and comprehensive content, is essential for student achievement and satisfaction.

Building on this, Mtebe and Raisamo (2014) pointed out the critical role of organized and effective course design in enhancing learners' knowledge and skills. Their findings are corroborated by Khan and Yildiz (2020) and Mohammed et al. (2020), who observed that well-structured content organization substantially influences student performance and engagement. Moreover, Mtebe and Raisamo (2014) noted that such well-designed courses lead to higher acceptance of online learning platforms among students, who are more likely to engage with and benefit from these organized and accessible resources.

Conclusion

It is critical for schools to comprehend the emerging online learning environment, particularly the level of student satisfaction, which is closely related to learning outcomes. This study focuses on students and provides empirical data on the field of online math education to make online learning more meaningful to students. Overall, the survey results reflect a mixed perception of various aspects of the online learning experience. While there are areas of strength such as the effectiveness of feedback and the use of discussion boards, there are also notable areas for improvement such as the timeliness of feedback and fostering a stronger sense of community. Addressing these areas of concern through targeted interventions, such as enhancing communication channels and instructor development, could lead to an improved online learning environment that better meets the needs and expectations of students. Further research and ongoing assessment are also essential to refine and enhance the online learning experience continuously.

 It also emerges that there is a significant difference in student's perceived satisfaction in terms of gender. The present study suggests that certain individual characteristics (e.g., gender) may still influence student satisfaction. While gender may influence student satisfaction in online learning environments, the interplay of technology use, instructional design, and individual learner characteristics plays a crucial role. Continued research is necessary to understand these dynamics and to ensure equitable and effective online learning experiences for all students.

In the characteristics of an online environment, a significant difference was found in their level of satisfaction in terms of the modality used in delivery. The results of the ANOVA analysis indicated that while the schedule of classes did not significantly impact student satisfaction, the modality of course delivery did have a notable effect. Specifically, students who experienced a combination of synchronous and asynchronous classes reported higher levels of satisfaction compared to those attending classes that were solely synchronous or asynchronous. This finding resonates with recent research highlighting the benefits of a hybrid or blended learning approach, which emphasizes the importance of flexibility and interaction in online education. As the educational landscape continues to evolve, understanding the factors that contribute to student satisfaction becomes increasingly crucial for designing effective learning experiences in both online and blended environments. Additionally, this study sheds light on the relationship between student perceived satisfaction and academic performance in online mathematics classes, emphasizing the importance of catering to students' needs and preferences in online learning environments. By recognizing and addressing these factors, educators can optimize the effectiveness of online instruction and contribute to the attainment of course learning outcomes.

Finally, this study has identified three additional key satisfaction factors crucial for enhancing teaching and learning in an online environment. Firstly, flexible and considerate task management emerged as a central theme, emphasizing the importance of manageable workloads, authentic assignments, and deadline flexibility to accommodate diverse student circumstances. Secondly, effective communication and subject mastery among educators were highlighted as essential for facilitating student understanding and engagement. Lastly, the accessibility and clarity of educational resources were emphasized, underlining the significance of well-organized materials in supporting student learning outcomes. These findings underscore the importance of adaptive teaching strategies, clear communication, and comprehensive resource provision in optimizing the online learning experience for students. In the current landscape where educational institutions are increasingly transitioning to online platforms to ensure uninterrupted learning, these identified factors play a pivotal role in fostering improved learning outcomes and enhancing the overall educational experience for students.

Recommendations

Based on the findings of this study, educational institutions transitioning to online platforms should prioritize several key strategies to enhance the online learning experience and bolster student satisfaction. Firstly, this includes implementing interventions to address identified areas for improvement, such as timely feedback and online learning community building. Additionally, schools should recognize the influence of individual characteristics like gender on student satisfaction while understanding the broader impact of technology use and instructional design.

Adopting a hybrid or blended learning approach, which combines synchronous and asynchronous method, can significantly enhance student satisfaction by providing flexible course delivery and diverse instructional methods. Additionally, institutions should tailor instruction to meet individual needs, understand students' preferences, and adapt teaching methods accordingly. This approach enables educators to create a more inclusive and engaging learning environment.

Furthermore, institutions must prioritize effective communication, subject mastery, and the accessibility of educational resources. Clear communication channels, comprehensive explanations, and well-organized materials are essential for fostering student understanding and engagement in online classes. Moreover, promoting flexible task management, including manageable workloads and deadline flexibility, is crucial for accommodating diverse student circumstances and alleviating stress. By implementing these recommendations, educational institutions can optimize the effectiveness of online instruction, improve learning outcomes, and ultimately enhance the overall educational experience for students in the digital learning environment.

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