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Mathematics Teachers' Views on Online Learning Implementation Barriers

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Abstract

Mathematics teachers face challenges when it comes to delivering instruction, particularly on topics that require practical applications. This study aimed to determine the barriers encountered in implementing online learning during the pandemic. A quantitative descriptive research design was employed, utilizing a survey technique, with twelve mathematics teachers from St. Paul University Surigao as participants. The primary instrument used to gather data was an adapted questionnaire from Mailizar et al. (2020). Statistical tools employed in this study included Frequency Count and Percentage Distribution, Mean and Standard Deviation, and Analysis of Variance. Findings revealed that respondents poorly perceived the identified online learning implementation barriers, specifically, the teacher-level and student-level barriers. Consequently, the school provided them with enough support for the online learning implementation during the pandemic. It is also concluded that the teachers' number of years in service affects the perception of the online learning implementation barrier in terms of the teacher level barriers. Based on the results, it is recommended that additional training and support be provided to both teachers and students to create an effective online teaching and learning environment, as the teacher-level and student-level barriers were found to be most prominent.

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INTRODUCTION

Louis-Jean and Cenat (2020) stated that the COVID-19 pandemic had altered every aspect of life worldwide. It affected the global economy, health care systems, social life, and most importantly, education. The teachers changed their teaching pedagogy from the physical walls of the classroom [face-to-face learning] to web-based distance learning.

St. Paul University Surigao implemented a full online distance learning modality. SPUS pursued a more adaptive and inclusive Remote Flexible Learning Experience (ReFLEx) where instructional processes, assessment methods, and student advancement programs can be done synchronously or asynchronously and shall be accomplished mainly through online learning platforms. This was included in the Basic Education Learning Continuity Plan of the university as submitted and approved by the Department of Education.

Through the implementation of ReFLEx, SPUS' goal to continually serve the Paulinians in the pursuit of academic excellence and spirituality and to provide more adaptive and inclusive learning became possible. SPUS also used Quipper as their learning management system. Garcia et al. (2022) found that teachers highly utilized Quipper as Learning Management System in teaching in terms of Sending Assignments and Practice Examinations, Creating Educational Content, and Viewing and Downloading Analytics. The Junior High School has been using Quipper for four years, Senior High School for three years, while Grade School for two years.

However, the school faced opportunities and challenges in its implementation. One of the major challenges that teachers, parents, and students face is internet connectivity. Other concerns that the students gave through the survey include difficulty understanding higher concepts, their preference to have classroom classes instead of online, lack of social interaction, and lack of motivation. These concerns corroborate with Alawamleh, Al-Twait, and Al-Saht (2020), who found that students still preferred classroom classes due to the many problems they face. These include lack of motivation, understanding of the material, decreased communication levels, and feelings of isolation caused by online classes. Moreover, students feel that lack of community, technical problems, and difficulties in understanding instructional goals are the major barriers to online learning (Song et al., 2004).

Mailizar et al. (2020) identified barriers that mathematics teachers view as significant to e-learning use during the pandemic. Mathematics teachers are challenged in terms of delivering instruction, especially on topics that require practical applications. With this, the researchers conducted this study to determine the online learning implementation barriers during the pandemic as perceived by the high school mathematics teachers of St. Paul University Surigao. This study also looked into the profile of the respondents in terms of age, sex, number of years in service, highest educational attainment, devices used for online learning, and internet connection. A significant degree of variance between the respondents' profile and their perceptions of the online learning implementation barriers was also tested. The findings will also serve as an additional basis for future projects to be implemented by the university, especially on online learning implementation.

RESEARCH METHODS

This study employed a quantitative research design using a survey technique. This design is deemed appropriate because descriptive research design is a scientific method in which the behavior of a subject is observed and described without influencing him in any way; it is also a valid method for researching specific topics and as a precursor to more quantitative studies (Shuttleworth, 2008 as cited by

Lucero, Guerra, & Arpilleda, 2022). By using this research design, the researchers will be able to determine the online learning implementation barriers during the pandemic as perceived by the high school mathematics teachers.

The respondents of this study were the high school Mathematics teachers from St. Paul University Surigao. Total population sampling was applied where all of the high school mathematics teachers were taken as respondents.

The researchers used an adapted questionnaire from Mailizar et al. (2020) in this study. It consists of two parts. The first part asked about the profile of the respondents in terms of age, sex, number of years in service, highest educational attainment, the device used for online learning, and internet connection. The second part asked about the online learning implementation barriers in terms of teacher-level barriers, school-level barriers, curriculum level barriers, and student level barriers.

In the analyzing the gathered data, the researchers used Frequency Count and Percentage to present the profile of the respondents, Mean and Standard Deviation to determine the online learning implementation barriers as perceived by the high school mathematics teachers, and Analysis of Variance to test the significant degree of variance in the online learning implementation barriers when grouped according to the respondent's profile.

RESULTS AND DISCUSSION

This study aimed to determine the perceptions of the high school mathematics teachers on the online learning implementation barriers during the pandemic. A quantitative descriptive research design using a survey technique was employed. The respondents of this study were the high school mathematics teachers from St. Paul University Surigao. The main instrument used to solicit information is an adapted questionnaire from Mailizar et al. (2020). The statistical tools used in this study were the Frequency Count and Percentage, Mean and Standard Deviation, and Analysis of Variance.

Based on the analysis done on the data gathered, the findings revealed in this study are as follows.

Table 1 shows the profile of the respondents. As to the age of the respondents, 4 (33.33%) belong to the 25-29 years old bracket, 3 (25.00%) from 35-39 years old, 2 (16.67%) from 20-24 years old, and 1 (8.33%) from 30-34, 50-54, and 55-59 years old. As to the sex of the respondents, 6 (50.00%) were males, and 6 (50.00%) were females. As to the number of years in service, 5 (41.67%) served for 0-3 years, 4 (33.33%) served for 4-7 years, 1 (8.33%) served for 8-11, 24-27, and 32-35 years. As to the highest educational attainment, 8 (66.67%) attained a bachelor's degree, and 4 (33.33%) attained a master's degree. As to the devices used for online learning, 9 (75.00%) used both mobile/ handheld devices and computer/laptops, while 3 (25.00%) used only computer/laptops. As to the internet connection used, 5 (41.67%) used Postpaid Wifi/ Landline Connection, 2 (16.67%) used mobile data and prepaid wifi, and mobile data, prepaid wifi, and postpaid wifi/ landline connection, 1 (8.33%) used only mobile data, prepaid wifi, mobile data, and postpaid wifi/ landline connection, respectively.

Table 1. Profile of the Respondents

Profile Variables	*f* (*n*=12)	%
Age		
20-24 years old	2	16.67
25-29 years old	4	33.33
30-34 years old	1	8.33
35-39 years old	3	25.00
50-54 years old	1	8.33
55-59 years old	1	8.33
Sex		
Male	6	50.00
Female	6	50.00
Number of Years in Service		
0-3 years	5	41.67
4-7 years	4	33.33
8-11 years	1	8.33
24-27 years	1	8.33
32-35 years	1	8.33
Highest Educational Attainment		
Bachelor's Degree	8	66.67
Master's Degree	4	33.33
Device Used for Online Learning		
Computer/ Laptop	3	25.00
Mobile/ Handheld Device and Computer/ Laptop	9	75.00
Internet Connection		
Mobile Data	1	8.33
Prepaid Wifi	1	8.33
Postpaid Wifi/ Landline Connection	5	41.67
Mobile Data and Prepaid Wifi	2	16.67
Mobile Data and Postpaid Wifi/ Landline Connection	1	8.33
Mobile Data, Prepaid Wifi, Postpaid Wifi/ Landline Connection'	2	16.67

Based on Table 2, as to the respondents' perception of the online learning implementation barriers in terms of teacher-level barriers, the indicator I am not confident in using e-learning during the Covid-19 pandemic got the highest mean (*M*=2.17, *SD*=0.83) which can be verbally interpreted as disagree and qualitatively described as poorly perceived. This means that the respondents are confident in delivering instruction during the pandemic with the use of online learning. This is true because e-learning gives remote accessibility and flexibility.

However, the indicator the use of E-learning during this pandemic is not convenient for me got the lowest mean (*M*=1.50, *SD*=0.90) which can be verbally interpreted as strongly disagree and qualitatively described as very poorly perceived. This means that the respondents are at ease with e-learning.

Table 2. Respondents' perception of the online learning implementation barriers in terms of teacher-level barriers

Indicators	*M*	*SD*	VI	QD
Teacher Level Barriers				
1. I do not have sufficient knowledge and skill to use e-learning during the Covid-19 pandemic	1.83	0.83	DA	PP
2. I am not confident in using e-learning during the Covid-19 pandemic	2.17	0.83	DA	PP
3. I do not have experience in using e-learning	1.75	0.75	DA	PP
4. I believe that the use of e-learning in teaching is not useful during this pandemic	1.58	0.90	SDA	VPP
5. The use of E-learning during this pandemic is not convenient for me	1.50	0.52	SDA	VPP
Average	1.77	0.77	DA	PP

Note: 1.00-1.74 (Strongly Disagree/ Very Poorly Perceived); 1.75-2.49 (Disagree/ Poorly Perceived); 2.50-3.24 (Agree/ Highly Perceived); 3.25-4.00 (Strongly Agree/ Very Highly Perceived).

On average, the respondents' perception of the online learning implementation barriers in terms of teacher-level barriers (*M*=1.77, *SD*=0.77) can be verbally interpreted as disagree and qualitatively described as poorly perceived.

Based on Table 3, as to the respondents' perception of the online learning implementation barriers in terms of school-level barriers, the indicator Because of workload, I do not have enough time to prepare e-learning materials got the highest mean (*M*=2.00, *SD*=0.85) which can be verbally interpreted as disagree and qualitatively described as poorly perceived. This means that the teachers are given the time to prepare instructional materials despite the current set-up and their workloads.

Table 3. Respondents' perception of the online learning implementation barriers in terms of school-level barriers

Indicators	*M*	*SD*	VI	QD
School Level Barriers				
1. My school does not have an e-learning system	1.25	0.45	SDA	VPP
2. My school does not have internet connection	1.33	0.49	SDA	VPP
3. School regulations do not support the use of e-learning during the Covid-19 pandemic	1.25	0.45	SDA	VPP
4. Textbooks are not in line with e-learning use	1.50	0.52	SDA	VPP
5. My school does not provide technical support for e-learning use	1.42	0.51	SDA	VPP
6. Because of workload, I do not have enough time to prepare e-learning materials	2.00	0.85	DA	PP
Average	1.46	0.55	SDA	VPP

Note: 1.00-1.74 (Strongly Disagree/ Very Poorly Perceived); 1.75-2.49 (Disagree/ Poorly Perceived); 2.50-3.24 (Agree/ Highly Perceived); 3.25-4.00 (Strongly Agree/ Very Highly Perceived).

However, the indicators My school does not have an e-learning system, and School regulations do not support the use of e-learning during the Covid-19

pandemic got the lowest means (*M*=1.25, *SD*=0.45) which can be verbally interpreted as strongly disagree and qualitatively described as very poorly perceived. This means that the school has an e-learning system. Garcia et al. (2022) as cited by Arpilleda et al. (2023) found that teachers highly utilized Quipper as Learning Management System in teaching in terms of Sending Assignments and Practice Examinations, Creating Educational Content, and Viewing and Downloading Analytics.

On average, the respondents' perception of the online learning implementation barriers in terms of school-level barriers (*M*=1.46, *SD*=0.55) can be verbally interpreted as strongly disagree and qualitatively described as very poorly perceived.

Table 4. Respondents' perception of the online learning implementation barriers in terms of curriculum-level barriers

Indicators	*M*	*SD*	VI	QD
Curriculum Level Barrier				
1. Learning and teaching resources that are available on the e-learning system are not in accordance with the curriculum	1.50	0.52	SDA	VPP
2. Schools require students' assessments that are not in line with e-learning use	1.42	0.51	SDA	VPP
3. The contents of my subject cannot be taught using e-learning	1.42	0.67	SDA	VPP
4. The contents of my subject are difficult to be taught using e-learning	1.75	0.87	DA	PP
5. The contents of my subject are difficult to be understood by students through e-learning	1.92	0.79	DA	PP
Average	1.60	0.67	SDA	VPP

Note: 1.00-1.74 (Strongly Disagree/ Very Poorly Perceived); 1.75-2.49 (Disagree/ Poorly Perceived); 2.50-3.24 (Agree/ Highly Perceived); 3.25-4.00 (Strongly Agree/ Very Highly Perceived).

Based on Table 4, as to the respondents' perception of the online learning implementation barriers in terms of curriculum level barriers, the indicator The contents of my subject are difficult to be understood by students through e-learning got the highest mean (*M*=1.92, *SD*=0.79) which can be verbally interpreted as disagree and qualitatively described as poorly perceived. This means that the respondents understood the contents of their subject and this helped them in delivering the instruction efficiently and effectively. This is true because the department gives a month-long training to prepare the teachers before the start of classes. This training includes strategies on delivering instruction, competence in delivering online classes, and other related activities that equip the teachers with suitable professional qualifications and pedagogical skills and strategies.

However, the indicators Schools require students' assessments that are not in line with e-learning use and the contents of my subject cannot be taught using e-learning got the lowest means (*M*=1.42, *SD*=0.52 and 0.67, respectively) which can be verbally interpreted as strongly disagree and qualitatively described as very poorly perceived. Despite being the lowest indicators, the respondents still described these indicators as very poorly perceived which means that the

assessments required by the school are aligned to the use of e-learning and contents can be discussed using online learning. The school uses online learning to continue delivering instruction amid the pandemic.

On average, the respondents' perception of the online learning implementation barriers in terms of curriculum level barriers (*M*=1.60, *SD*=0.67) can be verbally interpreted as strongly disagree and qualitatively described as very poorly perceived.

Table 5. Respondents' perception of the online learning implementation barriers in terms of student-level barriers

Indicators	*M*	*SD*	VI	QD
Student Level Barriers				
1. My students do not have sufficient knowledge and skill in the use of e-learning	1.92	0.67	DA	PP
2. My students do not have devices (i.e. laptop and tablet) for the use of e-learning	1.75	0.62	DA	PP
3. My students are not interested in using e-learning	1.83	0.39	DA	PP
4. My students do not have internet connection	1.83	0.58	DA	PP
5. My students are not able to access the e-learning system	1.50	0.52	SDA	VPP
Average	1.77	0.56	DA	PP

Note: 1.00-1.74 (Strongly Disagree/ Very Poorly Perceived); 1.75-2.49 (Disagree/ Poorly Perceived); 2.50-3.24 (Agree/ Highly Perceived); 3.25-4.00 (Strongly Agree/ Very Highly Perceived).

Based on Table 5, as to the respondents' perception of the online learning implementation barriers in terms of student level barriers, the indicator My students do not have sufficient knowledge and skill in the use of e-learning got the highest mean (*M*=1.92, *SD*=0.67) which can be verbally interpreted as disagree and qualitatively described as poorly perceived. This means that the students are knowledgeable and skillful enough in the use of e-learning. Before the classes begin, a week-long student orientation is given to students especially on the use of the e-learning platforms. They were taught on how to navigate, especially the learning management system.

However, the indicator My students are not able to access the e-learning system got the lowest mean (*M*=1.50, *SD*=0.52) which can be verbally interpreted as strongly disagree and qualitatively described as very poorly perceived. This means that the learning management used by the school is accessible and student friendly. Quipper gives an annual orientation to the students on Quipper use.

On average, the respondents' perception of the online learning implementation barriers in terms of student level barriers (*M*=1.77, *SD*=0.56) can be verbally interpreted as disagree and qualitatively described as poorly perceived.

Based on Table 6, there is no significant degree of variance between the respondents' age and the online learning implementation barriers in terms of teacher-level, school-level, curriculum-level, and student-level barriers (*p*-values=0.394, 0.411, 0.556, and 0.207, respectively). This means that perceptions of the respondents are not affected by their age. The result contradicts the findings of Esteve et al. (2016) as cited by Arpilleda et al. (2023) that the youngest group had a higher perception of digital competence (between 20 and 24 years old).

Although the concepts being studied are different, both studies look into differences between perceptions and age.

Table 6. Significant degree of variance between the respondents' profile and the online learning implementation barriers

Profile	Dependent	*F*	*p*-values
Age	Teacher Level Barriers	1.24	0.394
	School Level Barriers	1.19	0.411
	Curriculum Level Barriers	0.86	0.556
	Student Level Barriers	2.03	0.207
Sex	Teacher Level Barriers	4.60	0.057
	School Level Barriers	0.11	0.749
	Curriculum Level Barriers	0.04	0.849
	Student Level Barriers	1.69	0.223
Number of Years in Service	Teacher Level Barriers	4.31	0.045*
	School Level Barriers	0.44	0.779
	Curriculum Level Barriers	0.74	0.596
	Student Level Barriers	0.26	0.894
Highest Educational Attainment	Teacher Level Barriers	0.02	0.878
	School Level Barriers	0.37	0.554
	Curriculum Level Barriers	0.40	0.542
	Student Level Barriers	0.03	0.868
Device Used for Online Learning	Teacher Level Barriers	0.02	0.900
	School Level Barriers	0.00	0.971
	Curriculum Level Barriers	0.00	1.000
	Student Level Barriers	0.18	0.683
Internet Connection	Teacher Level Barriers	3.49	0.080
	School Level Barriers	0.16	0.968
	Curriculum Level Barriers	0.57	0.724
	Student Level Barriers	0.23	0.938

Note: * - significant at $p<0.05$

There is no significant degree of variance between the respondents' sex and the online learning implementation barriers in terms of teacher-level, school-level, curriculum-level, and student-level barriers (*p*-values=0.057, 0.749, 0.849, and 0.223, respectively). This means that perceptions of the respondents are not affected by their sex. This concurs with the findings of Mula et al. (2022) that sex of the respondents does not affect their perception. The dominance of male teachers over female teachers in e-learning use is no longer valid (Mailizar, 2020).

There is no significant degree of variance between the respondents' number of years in service and the online learning implementation barriers in terms of school-level barrier, curriculum level barrier, and student level barrier (*p*-values=0.779, 0.596, and 0.894, respectively). However, there is a significant degree of variance between the respondents' number of years in service and the online learning implementation barriers in terms of teacher-level barriers (*p*-value=0.045). This means that perceptions of the respondents, specifically on teacher-level barriers, are affected by their length of service. In the study conducted by Arpilleda et al. (2023)

on Education 4.0, they found out that the length of service of the participants affects how they understand, value, and accept the nature and demands of Education 4.0.

There is no significant degree of variance between the respondents' highest educational attainment and the online learning implementation barriers in terms of teacher-level barrier, school level barrier, curriculum level barrier, and student level barrier (*p*-values=0.878, 0.554, 0.542, and 0.868, respectively). This means that perceptions of the respondents are not affected by their educational attainment. It is generally accepted that more experienced teaching is necessary to build the skills needed for effective teaching (Mailizar et al., 2020).

There is no significant degree of variance between the respondents' devices used for online learning and the online learning implementation barriers in terms of teacher-level barrier, school level barrier, curriculum level barrier, and student level barrier (*p*-values=0.900, 0.971, 1.000, and 0.683, respectively). This means that perceptions of the respondents are not affected by their devices used for online learning.

There is no significant degree of variance between the respondents' internet connection and the online learning implementation barriers in terms of teacher-level barrier, school level barrier, curriculum level barrier, and student level barrier (*p*-values=0.080, 0.968, 0.724, and 0.938, respectively). This means that perceptions of the respondents are not affected by their internet connection.

CONCLUSION

Based on the findings gathered, it is concluded that the St. Paul University Surigao provided the teachers with enough support for the online learning implementation during the pandemic as the teachers very poorly perceived the identified online learning implementation barriers. It is also concluded that the teachers' number of years in service affects the perception of the online learning implementation barrier in terms of the teacher level barriers.

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