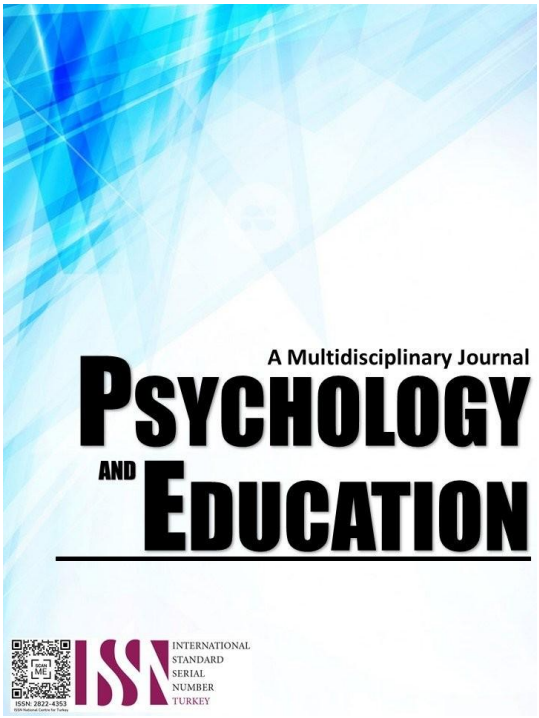
RELATIONSHIP OF KNOWLEDGE, SKILLS, AND ATTITUDE TO BLENDED LEARNING UTILIZATION AMONG MATHEMATICS TEACHERS



PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 44
Issue 8
Pages: 1035-1046
Document ID: 2025PEMJ4308
DOI: 10.70838/pemj.440802
Manuscript Accepted: 03-31-2025

Psych Educ, 2025, **44**(8): 1035-1046, Document ID:2025PEMJ4308, doi:10.70838/pemj.440802, ISSN 2822-4353

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Research Article

Relationship of Knowledge, Skills, and Attitude to Blended Learning Utilization among Mathematics Teachers

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Abstract

Classrooms are spaces where teachers and students engage, explore concepts, share ideas, and learn together. Teachers use a variety of digital and non-digital resources to support and track students' learning in Mathematics. This study explores the implementation of Blended Learning Approaches among Mathematics teachers in Calbayog City, focusing on three school districts. It examines the characteristics and perceptions of teachers regarding the use of blended learning in the context of the COVID-19 pandemic. The majority of the teachers were female, aged 21-30, with 1-5 years of experience and a master's degree. These teachers exhibited strong knowledge, skills, and attitudes in mathematics, though their use of blended learning was moderate. The study also found that teachers' age, highest educational attainment, and years of teaching experience significantly influenced their knowledge, skills, and attitudes toward blended learning. Furthermore, there was a notable correlation between teachers' proficiency in blended learning and the extent of its use. A key challenge identified by teachers in the Oquendo I, II, and III districts was the high cost of necessary technology, which many students could not afford. In response, the study recommends that school administrators implement school-based in-service training (INSET) to support newly hired and less experienced teachers in mastering various teaching methodologies, especially blended learning.

Keywords: *blended learning approach, level of use, approaches in mathematics*

Introduction

Classrooms serve as spaces where students and teachers engage in the process of learning, exploring different concepts, sharing ideas, and collaborating on various topics. Teachers, in particular, interact with students to monitor their progress, offer support, and utilize both digital and non-digital resources to enhance the teaching and learning of Mathematics.

The COVID-19 pandemic, which began in March 2020, significantly disrupted educational systems worldwide, limiting opportunities for students at all levels. These disruptions were particularly devastating for marginalized groups, including students from lower-income families, those with disabilities, and students in developing nations. The pandemic's direct health impacts, as well as its indirect effects—such as reduced family income, food insecurity, increased domestic violence, and other societal challenges—further exacerbated the situation. According to the OECD (2020) and the United Nations (2020), the pandemic affected over 1.7 billion learners globally, including 99% of students in low- and middle-income countries.

As schools closed and face-to-face learning became impossible, teachers and students were forced to adapt to virtual learning or rely on phone-based communication. In this context, educators were left to reflect on their teaching methods and grapple with the challenge of ensuring equitable education during such an unprecedented crisis.

Education, as a lifelong human need, is vital for individual development. Without education, individuals face significant challenges in personal and professional growth. The goal of mathematics education is to help students reach their highest potential, though the reality is that many students struggle to fully engage with the content. This highlights the critical importance of making mathematics both accessible and relevant to daily life (Novriani & Surya, 2017). Quality education provides students with hope, opportunities, and the knowledge needed to improve their lives (Surya et al., 2017).

The educational system is intricately tied to the broader societal structure. Schools, as foundational societal institutions, are responsible for passing down knowledge and preparing future generations to contribute to the collective well-being. When societal events, like a health crisis, disrupt normal functioning, schools must adapt quickly. The ongoing health crisis has profoundly altered the way society operates, and education has had to evolve rapidly, especially through the implementation of distance learning (DL). In response to this unprecedented change, it is essential to understand how schools, particularly mathematics teachers, have managed this transition. This study seeks to examine the reactions of mathematics teachers in the face of this sudden shift, focusing on their experiences and strategies for navigating distance learning during the pandemic.

Research Questions

This study determined the Blended Learning Approach used by teachers amidst the COVID-19 pandemic in Oquendo Districts in the Division of Calbayog City, Samar. Specifically, this answered the following:

1. What is the profile of the teacher-respondents in terms of:
    1.1 age;
    1.2 gender;

1.3 highest educational attainment; and
1.4 number of years of teaching experience?

2. What is the level of the knowledge, skills, and attitude of Mathematics teachers in blended learning amidst the COVID-19 pandemic?
3. What is the extent of the use of the Blended Learning Approach by Mathematics teachers?
4. Is there a significant relationship between the profile of the respondents and their level of knowledge, skills, and attitude in blended learning amidst Covid-19 pandemic?
5. Is there a significant relationship between the profile of the respondents and their extent in using blended learning approach?
6. Is there a significant relationship between the knowledge, skills, and attitude of Mathematics teachers and the extent of their use of the blended learning Approach?
7. What are the challenges encountered by the Mathematics teachers in adopting a blended learning approach?
8. What is a possible intervention to improve the use of the blended learning approach?

Methodology

Research Design

This study determined the Blended Learning Approach used by teachers amidst covid-19 in selected districts in the Division of Calbayog City. The descriptive, evaluative, correlation and development method of research was employed in this study. The descriptive method identified the teacher-respondents profile along their age, gender, grade level taught, subjects handled; educational attainment and years of teaching experience.

The evaluative method of research on the other hand investigated the level of knowledge, skills, and attitudes of Mathematics teachers in Blended Learning; the extent of use of Blended Learning Approach; and the challenges encountered in adopting Blended Learning Approach.

Moreover, the correlation method determines if there is a significant relationship between the knowledge, skills, and attitude of Mathematics teachers and extent of their use of Blended Learning Approach. And lastly, the possible intervention to improve the use of Blended Learning Approach will form part of the development method of this study.

Respondents

This study was conducted in three school districts in Oquendo, Division of Calbayog City—Oquendo I, Oquendo II, and Oquendo III. These schools utilized different educational modalities, including modular and virtual learning, and were located in areas with varying levels of internet connectivity. Given these conditions, the location was ideal for examining the implementation of the Blended Learning Approach during the COVID-19 pandemic.

The respondents of this study were selected through a purposive sampling method, a non-probability sampling technique that involves selecting participants based on specific characteristics relevant to the study's objectives. A total of 36 respondents participated, consisting of 14 males and 22 females from both junior and senior high schools across the three school districts in Oquendo.

Procedure

The proposal and its objectives were presented to the selected schools that agreed to participate in the study. The researcher followed a series of chronological steps in gathering data. First, written permission was prepared and submitted to the adviser to review and make necessary corrections to the survey questionnaire. Once finalized, permission was secured from the office of the superintendent to approve the distribution of the survey questionnaires. After obtaining approval, the researcher sought permission from the school heads in the chosen school districts. The survey questionnaire was then administered and supervised, ensuring that responses were collected from the intended participants. Data collection was conducted using Google Forms, a tool within Google Drive, and the responses were downloaded in Excel format for processing. Finally, the data were transcribed into the format of the selected statistical program, interpreted, and analyzed to generate findings, conclusions, and recommendations.

Data Analysis

To make data tabulation easy and convenient, statistical computation and accurate analysis of the data gathered frequency counts, percentage, and mean score were used.

To test if there is a significant relationship between the knowledge, skills, and attitude of Mathematics teachers and the extent of their use of Blended Learning Approach Analysis of Variance (ANOVA) was used.

Ethical Considerations

The school principal or school heads and the teacher's participants were asked for formal permission to conduct the research. Before conducting a survey, the researcher presented the letter to the respondents signed by the school principal and the researcher informed the respondents that their statement would be used only for research reasons. To preserve data confidentiality, participant's name was

optional. Respondents were likewise required to sign a permission form and vocally indicate whether they want to continue or withdraw from the activity prior to the conduct of survey. In other words, this study was conducted in accordance with ethical and official norms.

The researcher guarantees that the study was done in a way that safeguards the rights and well-being of participants while still contributing to scientific knowledge by carefully balancing potential advantages and risks. This guarantees that participants understand the research and may freely choose to participate. The researcher has given the respondents enough time to decide and ask questions before participating.

Results and Discussion

This section focuses on the presentation, analysis, and interpretation of the data gathered on the blended learning approach amidst COVID 19 of high school Mathematics teachers of Oquendo I, II, and III Districts, Division of Calbayog City.

Profile of the Respondents

Table 1 presents the profile of the respondents in terms of age.

Table 1. *Frequency Distribution of Respondents in Terms of Age*

Age	*F*	*%*
41 – 50	7	19.44
31 – 40	10	27.78
21 – 30	19	52.78
Total	36	100.0

As shown in table 2, out of thirty-six (36) respondents, nineteen (19) or 52.78% are 21-30 years old, ten (10) or 27.78% are 31-40 years old, and, seven (7) or 19.44% are 41-50 years old. Majority of the respondents are within 21-30 years old. This finding suggests that most of the teachers in Oquendo I, II and III Districts are at their early adult stage and who are at an appropriate and expected working age.

Table 2. *Frequency Distribution of Teacher-Respondents in Terms of Gender*

Gender	*F*	*%*
Male	14	38.89
Female	22	61.11
Total	36	100.0

As shown in table 2, out of thirty-six (36) respondents, twenty-two (22) or 61.11% are females; while, fourteen (14) or 38.89% are males. The findings tell that most of the teachers in Oquendo I, II and III Districts are females. This only proves that teaching is a female-dominated profession.

Table 3 presents the profile of the teacher-respondents in terms of grade level taught.

Table 3. *Frequency Distribution of Respondents in Terms of Grade Level Taught*

Grade Level	*F*	*%*
JHS	29	80.56
SHS	7	19.44
Total	36	100.00

As shown in Table 3, out of thirty-six (36) respondents, twenty-nine (29) or 80.56% are teaching in junior high school; while, only seven (7) or 19.44% are teaching senior high school. The findings tell that most of the teachers in Oquendo I, II and III Districts are teaching in the junior high school. The result goes to show that most of the math teachers are in the junior high school based on the fact that junior high school is more populated than senior high school; thus, more math teachers are hired in the junior high school than in the senior high school.

Table 4 presents the profile of the teacher-respondents in terms subject taught.

Table 4. *Frequency Distribution of Respondents in Terms of Subject/s Taught*

SUBJECT	*F*	*%*
Mathematics	36	100.0
Total	36	100.00

Table 4 shows that all respondents, thirty-six (36) or 100% of the math teachers in Oquendo Districts I, II, and III are teaching math subjects which is their major or specialization.

Table 5 presents the profile of the teacher-respondents in terms their highest educational attainment.

Table 5. *Frequency Distribution of Respondents in Terms of Their Highest Educational Attainmentt*

Highest Educational Attainment	*F*	*%*
Doctorate (With Units)	1	2.78
Master's Degree Graduate	5	13.89
Master's Degree (With Units)	28	77.78
Bachelor's Degree Graduate	2	5.56
Total	36	100.0

Based on the findings, out of thirty-six (36) respondents, twenty-eight (28) or 77.78% earned units in master's degree; five (5) or 13.89% are master's degree graduates; two (2) or 5.56% are bachelor's degree graduate; and, only one (1) or 2.78% earned a doctorate degree. The findings indicate that majority of the math teachers in Oquendo Districts I, II and III earned units in master's degree leading towards a master's degree. This means further that the math teachers are still on the stage of pursuing higher education as a requisite for professional growth and development.

Table 6 presents the profile of the respondents in terms of number of years in teaching experience.

Table 6. *Frequency Distribution of Respondents in Terms of Number of Years in Teaching Experience*

Number of Years	*F*	*%*
21 – 25	3	8.33
16 – 20	4	11.11
11 – 15	3	8.33
6 – 10	9	25.00
1 – 5	17	47.22
Total	36	100.0

Based on the findings, out of thirty-six (36) respondents, seventeen (17) or 47.72% had been teaching for 1-5 years; nine (9) or 25.00% taught for 6-10 years; four (4) or 11.11% taught for 16-20 years; and, only three (3) or 8.33% taught for 15-20 years and 21-25 years, respectively. The findings tell that majority of the math teachers in Oquendo Districts I, II and III had been teaching for 1-5 years which is an indication that they are still new in the field of teaching and had a little experience.

Table 7 presents the profile of the respondents in terms of level of knowledge, skills and attitude of mathematics teachers in blended learning amidst COVID-19.

Table 7. *Level of Knowledge, Skills, and Attitude of Mathematics Teachers*

Indicators	*Weighted Mean*	*Interpretation*
1. Blended learning is the combination of traditional and virtual learning.	5.00	Very High
2. I have computer skills and digital literacy skills to function effectively in applying blended learning: a. I can upload and download files b. I can record video/audio c. I can create slides, docs, spreadsheets, etc. d. I can design a webpage e. I can use Moodle/Edmodo f. I can use media effectively	4.81	Very High
3. I am open to mixing traditional and virtual ways of teaching.	4.92	Very High
4. Blended learning redefines the role of a teacher into a facilitator.	4.81	Very High
5. I have netiquette skills that I apply and teach to students in communicating online: a. Careful with personal/others' posts b. Kind, considerate c. Cite references d. Concise and clear e. Appropriate language f. Understand ethics in info sharing	4.83	Very High
6. I think integrating technology is a must in teaching the new generation of learners.	5.00	Very High
7. Blended learning enhances interaction between teachers and students.	2.50	Low
8. I set specific, workable, and reasonable deadlines in submitting outputs.	4.14	High
9. I am able to communicate effectively with my students online.	2.14	Low
10. Blended learning promotes responsibility for learning and increases student engagement.	4.61	Very High
11. I promote collaboration via group activities, discussions, and debates online.	3.14	Average

12. I am comfortable using gadgets, computers, and other technologies.	3.14	Average
13. Blended learning offers flexibility in teaching and makes learning accessible anywhere.	2.08	Low
14. I provide personalized guidance and reminders throughout the class.	2.19	Low
15. I believe students benefit from being able to access material anytime.	4.78	Very High
16. Blended learning offers time flexibility because learning is available anytime.	3.19	Average
17. I prepare students for blended learning by setting expectations and familiarity with platforms.	2.92	Average
18. I think the online environment helps students communicate more with each other.	3.00	Average
19. Learning becomes personalized for students through blended learning.	2.39	Low
20. I create differentiated instruction, activities, and assessments online.	3.42	High
21. I am willing to undergo training to improve blended learning application.	4.78	Very High
22. Blended learning is applicable in instruction, assessment, recording, and monitoring.	4.81	Very High
23. I integrate technology meaningfully: a. Provide printouts b. Give soft copies c. Use slides, Prezi, etc. d. Show pictures/videos e. Design creative tech-based activities f. Connect students with external learners in real-time	3.44	High
24. I think online learning increases student motivation.	3.33	Average
25. Blended learning promotes digital literacy among students.	4.11	High
26. I adjust when technological problems arise during a lesson.	3.11	Average
27. Blended learning offers more opportunities to personalize/customize learning for diverse students.	4.31	Very High
28. Flipped classroom (study at home, activities in class) is one type of blended learning.	4.47	Very High
29. I can "flip" the class.	2.28	Low
30. I respect my students' privacy, opinions, and rights online.	4.81	Very High
Grand Total	3.75	High

Legend: 4.20–5.00 – Very High (VH); 3.40–4.19 – High (H); 2.60–3.39 – Average (A); 1.80–2.59 – Low (L); 1.00–1.70 – Very Low (VL)

Based on the data, the math teachers in Oquendo I, II and III Districts had a "high" level of knowledge, skills and attitude towards mathematics as a subject. This is because it is their chosen field of specialization. Specifically, the respondents had a "very high" perception on statements that: "blended learning is the combination of traditional and virtual learning" and "I think of integrating technology is a must in teaching the new generations of learners" (5.00), respectively; "I am open to mixing traditional and virtual ways of teaching" (4.92); "BL redefines the role of a teacher into a facilitator" (4.81); "I have netiquette skills that I apply and teach to students in communicating online" (4.83) "I respect my students' privacy, opinion, and rights in online interactions" (4.81); "BL offers more opportunities in personalizing or customizing learning for diverse students" (4.81); "BL is applicable in instructions, assessment, recording and monitoring student progress" (4.81); "I am willing to undergo training in order to learn more and better apply the BL approach " (4.78); "I believe that the students benefit more when they have flexibility in learning like being able to access the material anytime" (4.78); "BL promotes responsibly for learning and increase students engagement in learning" (4.61); and. "One type of BL is flipped classroom where the material is studied at home and activities, drills and practice that are otherwise given as assignments are done at the classroom" (4.47).

Moreover, the math teachers are "high" on statements such as "BL promotes digital literacy to students" (4.11); "I create differentiated instruction, activities and assessment online" (3.42); and "I set specific, workable, and reasonable deadlines in submitting outputs" (4.14); and " I integrate technology meaningfully" (3.14).

The math teachers are "average" in terms of "I think online learning increases motivation of students" (3.33); "BL offers time flexibility because learning becomes available anytime " (3.19); "I promote collaboration by designing group activities, and facilitating discussion and debates online" and I am comfortable using gadgets, computers and other technologies used for learning" (3.14), respectively; "I adjust when technological problems arise during a lesson" (3.11); "I think that the online environment helps students communicate more with each other" (3.00); and, "I prepare students for blended learning by setting clear expectations and gaining familiarity for the platforms being used" (2.92).

The math teachers perceived themselves as "low" on statements such as "BL enhances interaction between teachers and students" (2.50); "Learning becomes personalized for students through BL" (2.39); "I can "flip" the class" (2.28); "I provide personalized instructions, announcement, reminder and advance information to properly guide the students for the whole duration of the class and after class" (2.19); "BL offers flexibility in teaching and learning environment for learning to be accessible anywhere" (2.08) and " I am able to communicate effectively with my students online" (2.14).

Table 8 shows data on the extent of use of blended learning by the mathematics teachers.

Table 8. *Extent of Use of Blended Learning by the Mathematics Teachers*

Indicators of Level of Knowledge, Skills, and Attitude in Mathematics	*Weighted Mean*	*Interpretation*
1. I give soft copies of handout to students for them to study before the lesson or as supplements after the lesson	5.00	Very strong
2. I give soft copies of the material or slide presentation used	3.61	Strong
3. I create Powerpoint presentation, Prezi, Slides and other similar programs to represent information on the lesson	2.22	Weak
4. I present pictures, videos, and audio clips to class	4.39	Very strong
5. I design activities, wherein students represent a new product, synthesize information, or create a vlog using technology	3.89	Strong
6. I utilize technology to network my students to other learners or resource persons from other places and have them interact in real time	2.08	Weak
7. I flip the lesson wherein I make the students learn the content through videos, articles, and reading assignments at home then perform experiments, drills, practices and other activities during classroom time.	3.19	Moderate
8. I utilize virtual learning environments (VLE)	2.72	Moderate
9. I utilize technology mediated-instruction tools (TMI)	2.17	Weak
10. I use webpages and links related to Mathematics and present them to the class	1.72	Negligible
11. I use SMS and messaging apps to disseminate information related to homework and activities	2.97	Moderate
12. I give assessments using Google Forms and similar online assessment tools	1.44	Negligible
13. I use BL approach in remediation like giving practice drills on educational websites for students to work on	1.42	Negligible
14. I use the social media in various ways in integrating technology in teaching	2.72	Moderate
15. I use online discussion forums to discuss the lesson with the students	2.19	Weak
Grand Total	2.78	Moderate

Legend: 4.20–5.00 – Very Strong (VS); 3.40–4.19 – Strong (S); 2.60–3.39 – Moderate (M); 1.80–2.59 – Weak (W); 1.00–1.79 – Negligible (N)

Based on the data, it revealed that generally, the math teacher's extent of use of blended learning approach is "moderate". Specifically, the respondents perceived themselves as "very strong" on statements such as "I give soft copies of handout to students for them to study before the lesson or as supplements after the lesson" (5.00) and "I present pictures, videos, and audio clips to class" (4.39). The respondents were "strong" on statements such as "I design activities, wherein students represent a new product, synthesize information, or create a vlog using technology" (3.89) and "I give soft copies of the material or slide presentation used" (3.61).

The math teachers perceived themselves as "moderate" on statements such as "I flip the lesson wherein I make the students learn the content through videos, articles, and reading assignments at home then perform experiments, drills, practices and other activities during classroom time" (3.19); "I use SMS and messaging apps to disseminate information related to homework and activities" (2.97); "I utilize virtual learning environments (VLE)" and "I use the social media in various ways in integrating technology in teaching" (2.72), respectively.

The math teachers perceived themselves "weak" in terms of "I create Powerpoint presentation, Prezi, Slides and other similar programs to represent information on the lesson" (2.22); "I use online discussion forums to discuss the lesson with the students" (2.19); "I utilize technology mediated-instruction tools (TMI)" (2.17); and, "I utilize technology to network my students to other learners or resource persons from other places and have them interact in real time" (2.08).

Finally, the math teachers considered themselves as "negligible" in terms of "I use webpages and links related to Mathematics and present them to the class" (1.72); "I give assessments using Google Forms and similar online assessment tools" (1.44); and "I use BL approach in remediation like giving practice drills on educational websites for students to work on" (1.42).

Table 9. *Analysis of Variance to Test the Relationship Between Profile of the Respondents and Their Level of Knowledge, Skills, and Attitude in Blended Learning Amidst COVID 19*

	Sum of Squares	*Df*	*Mean Square*	*F-Value*	*Significance Value*	*Interpretation*
Regression	5.775	6	3.993	7.223	0.0411	Significant
Residual	67.549	29	5.006			
Total	73.324	35				

Table 9 shows the analysis of variance to test the relationship between the profile of the respondents and their level of knowledge, skills, and attitude in blended learning amidst COVID-19 pandemic. Generally, the analysis revealed that the conceptual model is significant with an F-value of 7.223 and significance value of 0.0411, thus, the null hypothesis is rejected. The result of this study is also related to the study conducted by Saboowala and Manghirmalani-Mishra (2020). The results also showed the effect of interaction

varies across the teachers' qualifications, study management, and classroom environment. This means that the profile of the respondents, in general, significantly affected their level of knowledge, skills and attitude in blended learning.

Table 10. *Test of Relationship Between Profile of the Respondents and Their Level of Knowledge, Skills, and Attitude in Blended Learning Amidst COVID 19*

Independent Variables	*B*	*Significance Value*	*Interpretation*
Age	-0.504	0.021	Significant
Gender	0.099	0.192	Not Significant
Grade Level Taught	0.108	0.233	Not Significant
Subjects Taught	0.009	0.994	Not Significant
Highest Educational Attainment	0.575	0.033	Significant
Number of Years in Teaching Experience	-0.477	0.042	Significant

In particular, among the profile aspects of the respondents, it is the age (β=-0.504 α=0.021), highest educational attainment (β=0.575, α=0.033), and the number of years in teaching experience (β=-0.477, α=0.042), which came out to be significant predictors on the level of knowledge, skills and attitude towards blended learning.

On the other hand, gender (β=0.099, α=0.192), grade level taught (β=0.108, α=0.233) and subjects taught (β=0.009, α=0.994) are proven to have no significant relationship with the teacher's level of knowledge, skills and attitude towards blended learning.

Table 11. *Analysis of Variance to Test the Relationship Between Profile of the Respondents and Their Extent in Using Blended Learning Approach*

	Sum of Squares	*Df*	*Mean Square*	*F-Value*	*Significance Value*	*Interpretation*
Regression	5.667	6	4.399	7.001	0.046	Significant
Residual	61.033	29	6.882			
Total	66.700	35				

Table 11 shows the analysis of variance to test the relationship between the profile of the respondents and the extent of using blended learning approach. Generally, the analysis revealed that the conceptual model is significant with an F-value of 7.001 and significance value of 0.046, thus, the null hypothesis is rejected. This means that the profile of the respondents, in general, significantly affected the teacher's extent of use of blended learning.

Not much different of this finding from the study conducted by Saboowala and Manghirmalani-Mishra (2020). They studied the interaction impact of both gender and teachers who used online learning practices or did not have an attitude towards blended learning under the COVID-19 pandemic. Online learning, the flexibility of learning, the management of study, classroom learning, and online interaction were all studied during the pandemic of COVID-19. Also, the interaction between the effects of the highest educational qualification of teachers who used one of the practices of online learning or have not an attitude towards blended learning was considered under the COVID-19 pandemic.

Table 12. *Test of Relationship Between Profile of the Respondents and Their Extent in Using Blended Learning Approach*

Independent Variables	*B*	*Significance Value*	*Interpretation*
Age	-0.477	0.031	Significant
Gender	0.112	0.312	Not Significant
Grade Level Taught	0.68	0.355	Not Significant
Subjects Taught	0.018	0.947	Not Significant
Highest Educational Attainment	0.597	0.038	Significant
Number of Years in Teaching Experience	-0.489	0.029	Significant

In particular, among the profile aspects of the respondents, it is the age (β=-0.477 α=0.031), highest educational attainment (β=0.597, α=0.038), and the number of years in teaching experience (β=-0.489, α=0.029), which came out to be significant predictors on the extent of use of blended learning approach.

On the other hand, gender (β=0.112, α=0.312), grade level taught (β=0.68, α=0.355) and subjects taught (β=0.018, α=0.947) are proven to have no significant relationship with the teacher's extent of use of blended learning approach.

Table 13. *Test of Relationship Between the Level of Knowledge, Skills, and Attitude of Mathematics Teachers and Extent of Their Use of Blended Learning Approach*

Independent Variables	*B*	*Significance Value*	*Interpretation*
Mathematics' Teachers Extent of Use on Blended Learning Approach	0.655	0.022	Significant

Table 13 shows the analysis of variance to test the relationship between the level of knowledge, skills and attitude of math teachers and the extent of their use of blended learning approach. Generally, the analysis revealed that the conceptual model is significant with

B=0.655 and significance value of 0.022, thus, the null hypothesis is rejected. This means that the level of knowledge, skills and attitude of the respondents is significantly related with the teacher's extent of use of blended learning approach. Thus, a math teacher who is knowledgeable, skills and with right attitude highly utilize blended approach during the covid-19 pandemic.

It cannot be denied that the success of e-learning depends on the strength of the interaction between teachers and learners (Arghode et al., 2018). In line with this, learners' willingness and activeness in carrying out online learning is directly proportional to the willingness and innovation of teachers in providing variety in e-learning (Dwivedi et al., 2019). The enthusiasm for learners' learning determined by the ease of supporting software and the teachers competence in mastering the teaching platform. On the other hand, learners' characteristics and needs in the learning process remain the main things that must be considered to create a good atmosphere of interaction during the teaching and learning process.

Blended learning is a suitable learning system that could be practiced both days of the pandemic as well as for the sustainability of learning in the future with the support of infrastructure sis as the internet, gadget and e-learning platform is adequate (Alqahtani & Rajkhan, 2020). Blended learning is a solution in responding to the challenges amid technological advances and pandemic condition.

Table 14 presents data on the challenges encountered by the teachers using blended learning approach amidst the COVID-19 pandemic.

Table 14. *Challenges Encountered by Teachers Using Blended Learning Approach Amidst COVID–19 Pandemic*

	Challenges Encountered by Teachers in Using Blended Learning Approach Amidst COVID 19 Pandemic	*F*	*Rank*
1.	Technology required is expensive and cannot be afforded by the students	36	*1*
2.	Lack of infrastructure or facilities to address the demands of reliable hardware, easy to use software and high network connection	33	*2*
3.	Slow and unreliable internet connection	30	*3*
4.	Students find difficulty in utilizing technology	29	*4*
5.	Frequent occurrence of technological issues	28	*5*
6.	Teachers having trouble adapting content for blended learning	26	*6*
7.	Inadequate training of teachers in utilizing technology	25	*7*
8.	There is decreased motivation for students	24	*8*
9.	There is a weakened interpersonal relationship between the teacher and the students	21	*9*
10.	Blended learning consumes more time for each lesson	20	*3*

The data revealed that the major challenge encountered by the teachers is "technology required is expensive and cannot be afforded by the students" perceived by 36 respondents which ranked first; 33 respondents perceived "lack of infrastructure or facilities to address the demands of reliable hardware, easy to use software and high network connection" as their problem which ranked as second; 30 respondents encountered problems on "slow and unreliable internet connection" which ranked as third; 29 respondents perceived "students find difficulty in utilizing technology" which ranked as fourth; 28 respondents perceived "frequent occurrence of technological issues" as their challenge which ranked fifth; 26 respondents perceived "teachers having trouble adapting content for blended learning" as their problem which ranked as sixth; 25 respondents perceived "inadequate training of teachers in utilizing technology" as their challenge which ranked as seventh; 24 respondents perceived "there is decreased motivation for students" as their problems which ranked as eight; 21 respondents perceived 'there is a weakened interpersonal relationship between the teacher and the students" as their challenge which ranked as ninth; and, 20 respondents perceived "blended learning consumes more time for each lesson" as their challenged which ranked as tenth. It could be deduced from the findings that the leading problem encountered by the teachers in Oquendo I, II, and III Districts is that students cannot afford to use technology while the least problem encountered by the teachers is that the blended learning consumes more time for each lesson. It points to the fact that not all students have technologies and gadgets at home such as computer, laptops and mobile phones which are essential in their learning. On the other hand, reproduction of modules which includes photocopying, sorting, distribution and retrieval is an assumed responsibility of the teachers during the new normal, thus, becomes a least problem by the teachers.

Conclusions

Based on the findings of the study, several conclusions were drawn. The teachers in Oquendo I, II, and III Districts are predominantly young females who teach in junior high school, specialize in mathematics, have earned units in a master's degree, and have only been in the profession for a short period. They are highly knowledgeable and skilled and possess a positive attitude toward the blended learning approach, indicating that they are well-educated in this methodology. This makes blended learning an appropriate teaching strategy in the new normal. However, despite their competence, math teachers perceive their use of the blended learning approach as moderate due to existing challenges. Although it is the preferred method of the Department of Education (DepEd), some teachers may employ other instructional strategies not identified in this study. Furthermore, teachers' profiles—specifically age, highest educational attainment, and years of teaching experience—significantly impact their knowledge, skills, and attitude toward blended learning. Younger teachers, those who have earned units in a master's degree, and those with fewer years of experience tend to demonstrate higher levels of knowledge, skills, and positive attitudes toward blended learning. Similarly, these profile factors also influence the extent to which teachers use the blended learning approach. Younger teachers who have pursued graduate studies and have fewer years

of experience are more likely to integrate blended learning into their teaching. Moreover, teachers with higher knowledge, skills, and a positive attitude toward blended learning tend to have a moderate level of implementation. Lastly, one of the major challenges teachers face is the affordability of technology for students. Many students do not own personal gadgets, which are essential for supporting home-based learning, further limiting the full adoption of blended learning in the community.

Based on the conclusions drawn from the study, the following recommendations are proposed. School administrators and educational policymakers should provide continuous professional development programs focusing on enhancing teachers' knowledge, skills, and attitudes toward blended learning. These programs should be tailored to address the specific needs of teachers, particularly those with less experience, to ensure their effective implementation of this approach. Additionally, schools should explore alternative instructional strategies that complement blended learning, ensuring that teachers have diverse and adaptable methodologies to cater to students' varied learning needs.

To address the moderate utilization of blended learning, it is recommended that educational institutions invest in infrastructure and resources that support seamless technology integration. Providing teachers with adequate training, technical support, and access to updated digital tools can enhance their confidence and efficiency in employing blended learning. Moreover, stakeholders should collaborate to create initiatives that improve students' access to technology, such as providing subsidized gadgets or establishing community learning hubs with internet access.

Future researchers may explore the long-term effects of blended learning on student performance, engagement, and retention rates, particularly in mathematics. Studies may also examine the effectiveness of different blended learning models and their impact on various teaching disciplines. Additionally, further research could investigate strategies to overcome technological and financial barriers to ensure inclusive and equitable education for all students.

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