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Research Article

The Effectiveness of the Utilization of Blended Learning in High School Mathematics of Lopez East and West Districts: Basis for a Home Learning Plan

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Abstract

The study was designed in order to determine the effectiveness of the utilization of blended learning (BL) in High School mathematics within Lopez District. It specifically identified the teachers' profile, and the effectiveness of the extent of teachers' utilization of BL along the eight dimensions such as pedagogical, technological, interface, management, evaluation, resource support, ethical and institutional dimensions. The study also measured the comparison of the effectiveness of utilizing BL among teachers of different profiles, and how BL affect the learners' academic performance in high school mathematics which led to the development of Home Learning Plan containing the flow of lessons using blended learning. Thus, the study employed the descriptive-evaluative correlational method of research. Based on the findings, there was a very evident extent of effectiveness of the utilization of Blended Learning found. Hence, the effects of using the blended learning to the performance of the student in high school mathematics have been found very effective. Also, there was a significant difference found on the rank orders of the utilization of Blended learning that affect the learners' academic performance in mathematics with computed z-value and equivalent probability associated which is 0.26 and 0.3974 respectively. Implications of the study were discussed and recommendations have been indicated.

Keywords: Blended Learning, Basic Education, Effectiveness of Utilization, Home Learning Plan

Introduction

Technological advances have greatly contributed in the improvements and transformations in education system in the recent years. With the system adapting and embracing the significance and benefits of digital tools, teaching and learning processes have come out from the traditional modalities. Such changes are also part of the reforms in the curriculum as to adapt to the complex needs of the contemporary community.

As the Covid-19 pandemic affected various sectors around the world, the delivery of education has not been exempted to face the challenges. This has led the Department of Education in the Philippines to come up with new learning delivery modalities anchored to cope up with the needs of the new normal setting where as the face-to-face classes are prohibited.

As stipulated, part of the learning continuity plan in time of Covid-19 is the **DepEd Learning Delivery Modalities for school year 2020-2021** which can adopt one or a combination of different distance learning depending on the COVID-19 restrictions and the particular context of the learners in the school or locality. It includes modular which could be printed or digital, online, and blended learning. Such drastic move from traditional face-to-face to distance learning addresses the call to continue the delivery of education despite of the COVID '19 pandemics since it is the right of every learner to receive quality education despite of limitations.

Article XIV of the 1987 Philippine Constitution Section 2 have mandated that the:

The state shall promote and protect the right of all citizens to quality education at all levels and shall take appropriate steps to make such education accessible to all.

Moreover, the teachers being one of the most significant factors in the system also made efforts in streamlining strategies in delivering the curriculum. Opportunities were also provided to further train educators in utilizing pedagogies that are relevant to what the learners need nowadays.

Blended Learning as one of the pedagogies that some educators utilize has been recognized as a pedagogy for innovative teaching and learning. Blended learning is understood as an instructional practice in which the combination of face-to-face and technology facilitated learning is used or simply it is the integration of face-to-face and online instruction (Graham 2013). In addition, Rajkoomar & Raju (2016) quoted that "blended learning has the propensity to

provide more engaging learning experiences while recognizing the potential of ICTs".

In Philippine education, part of the reforms is the implementation of curriculum that is believed to be relevant to the current generation.

The Implementing Guidelines and Regulations (IRR) of the Enhanced Basic Education Act of 2013 or RA 10533 stipulated that:

The curriculum shall be responsive, global, and shall use pedagogical approaches that are constructivist, inquiry-based, reflective, collaborative, and integrative.

With this, stakeholders of the education system took parts in realigning some practices to the guidelines.

Declaration policy of RA 9155 stated that:

The goal of basic education is to provide learners with the skills, knowledge and values they need to become caring, self- reliant, productive and patriotic citizens

The policy generally conforms with the mandate emphasized in Article XIV of the 1987 Philippine Constitution which mentioned that:

The state shall establish, maintain, and support a complete, adequate, and integrated system of education relevant to the needs of the people and society

These were one with the global movement led by UNESCO which is the Education for All (EFA) that targets to attain the learning needs of all learners, youth and adults. Relatively, policy actions involving the Basic Education Sector Reform Agenda (BESRA) strive for an education sector that is efficient to attain the SDG's goal of Education for All.

In addition, Sustainable Development Goal is working towards the achievement of equitable and quality primary and secondary education necessary to achieve learning outcomes among learners of diverse backgrounds. It envisions to produce efficient learners possessing technical and vocational skills, competently prepared for employment, and or entrepreneurship.

Following the goals and mandates, Education sectors around world believe that despite of the global crisis caused by the Covid-19 pandemic, education must continue. With this having stated, countries across the globe planned, designed and implemented alternative education procedures to continue delivering effective and efficient education considering the challenges in the new normal.

DepEd clarified that blended learning in the new normal is a learning delivery that combines face-to-face with any or a mix of online distance learning, modular distance learning, and TV/Radio-based instruction which will enable the schools to limit face-to-face learning, ensure social distancing, and decrease the volume of people outside the home at any given time (Llego, 2020).

In a critical review of Oliver and Trigwell as cited in Hranstinski (2019) the term blended learning is characterized as practice which simply requires two or more different kinds of things which could be strategies or pedagogies or types of instructions that can be mixed thus this pedagogy does not necessarily mean the combination of face-to -face and digital teaching only.

Among the many benefits of blended learning, Graham as cited by Rajkoomar & Raju (2016) mentioned the following: facilitation of easier communication and interaction; motivation and metacognition; enhanced course delivery with improvement in cognitive and reflective skills; improved retention and identification of at-risk students; improved pedagogy; increased access and flexibility and increased cost effectiveness. "Blended learning was found to be preferred over the traditional lecture format with students reporting a higher level of class satisfaction"

In mathematics education, blended learning has been materialized through combining the use of technology-generated instructions to the traditional face-to-face teaching. According to Korenova (2014) the combination of e-materials in teaching math subjects are already parts of the trend.

The accessibility of applications not only in computers but also in tablets or smartphones have become even greater. Students now could have easy access to electronic materials such as videos, presentations, electronic worksheets, java applets, e-tests and educational software like GeoGebra. Through such applications, students could learn even outside school or in the comfort of their home. Extension of learning after school could become meaningful with digital

instructions. More so, in teaching high school mathematics, aside from using available applications and software, there are instances in which teachers extend instructions through virtual sources.

The use of blended learning in mathematics education has garnered various results. Some research conducted found the use of BL effective in enhancing learners' performance while others did not attain the same result.

In the New Normal, the researcher will be able to determine how the use of the said pedagogy affects learners' performance. The result would be of significant contribution to aid the challenges being faced by educators on the call to improve learners' performance in mathematics since tests revealed that Filipino learners is one of those with poor performance in the subject. As reported, "Filipinos fared worst among 58 countries in an assessment for mathematics and science for Grade 4 students"

The Philippines scored 297 in math and 249 in science, according to the Trends in International Mathematics and Science Study (TIMSS) 2019. Similarly, the latest PISA results released in 2019 reported that the Philippines scored 353 in mathematics, 357 in science, and 340 in reading. Those scores are considered below the average of participating Organization for Economic Co-operation and Development (OECD) countries.

To address the call on improving learners' performance and recalibrating teaching strategies, the education sector continues to work on possible solutions through various programs and alternative interventions.

In Sto. Niño Ilaya National High School and in other schools, teachers make use of the social media as additional platform in the delivery of learning to learners. Internet sources have become also a great bank of information and additional venue to supplement learning. Despite of some challenges such as poor internet connections and financial factor to access internet, it has been observed how converging digital instructions to the usual traditional discussions encourage learners' involvement in learning.

As the school year 2020-2021 opened, some institutions have already started utilizing modular modalities in combination with online interactions. Even with some difficulties both in the part of the facilitators and learners brought by the limited physical interactions due to the COVID '19 pandemics, some advantages and opportunities of utilizing the said modalities were still seen.

Even during the typical education setting, it has long been observed how the utilization of digital instructions could further make learning more meaningful, engaging and responsive to the type of learners that institutions are handling. Espinosa (2016) stated that with the use of internet, learners can learn even outside the school. And, with the convergence of traditional and modern methods, students get to experience the best of both modalities – learners can be mentored in school and obtain additional lessons through the web or internet.

The challenges in delivering lessons during the new normal as educators try to cope up with the call to go beyond face-to-face teaching without compromising the expected quality of learning to be delivered to the learners together with the experiential advantages of utilizing digitalized instructions have motivated the researcher to conduct the study on blended learning believing that sooner even without the limitations on face-to-face interactions, the utilization of blended learning could still make advantages to the learners who will find challenges in physically attending regular classes. With the conduct of the study, the researcher will also be able to determine how the extent of utilizing BL influence learners' performance in mathematics.

In addition, as what Rajkoomar & Raju (2016) stated, understanding why a particular strategy works makes the process of teaching- learning more meaningful. Thus, knowing more about the opportunities and limitations of utilizing blended learning specifically in teaching high school mathematics through the conduct of this study could give input to enhance mathematics teachers' capabilities in delivering learning to the learners in the 21st century and in developing home learning plan and materials that would make mathematics learning process more efficient and meaningful to learners.

Research Questions

This study determined the effectiveness of the utilization of Blended Learning in High School Mathematics of Lopez East and West Districts: Basis for a Home Learning Plan for School Year 2020-2021. Specifically, it sought answers to the following questions:

1. To what extent does the utilization of Blended learning effective along:
   1.1. pedagogical;

1.2. technological;
1.3. interface;
1.4. evaluation;
1.5. management;
1.6. resource support;
1.7. ethical; and
1.8. institutional?

2. How significant is the difference in the rank orders of the extent of effectiveness of the utilization of Blended Learning between East and West Districts?
3. How does the utilization of Blended Learning differs due to teachers' demographic profile?
4. How does the utilization of Blended Learning affect the learners' academic performance in High School Mathematics?
5. How significant is the difference in the rank orders of the utilization of blended learning that affect the learners' academic performance between the two groups of respondents?

Literature Review

High School Program

Through Republic Act 10533 or the Enhanced Basic Education Act of 2013, the Philippines committed to introduce a new K-12 school curriculum. As stipulated, Junior (JHS) and Senior High School (SHS) Programs are essential components of the Philippine compulsory Basic Education.

Embarking on the educational reform has been made for the Philippines to align its education system with most other systems around the world and to increase national competitiveness. The government believed that K-12 program will equip the Filipino learners with the necessary competencies in order to perform productive roles in the society (Patrinos & Al-Samarrai, 2016).

Furthermore, Junior High School refers to Grade 7 to 10 while Senior High School refers to the last two years of the K to 12 Program covering the Grade 11 and 12. The additional two years in High School is believed to help prepare learners to be globally competitive individuals. It is a stage in which learners are to choose a specific track and strand related to the course that they want to pursue in college or to the line of work or job they plan to take. The program also prepares learners to be entrepreneurs. SHS program is design not only to produce graduates that will pursue higher education but also graduates who will be willing to gain skills needed in work or job or to put up a business.

As mentioned, completing Senior High School will lead the learners to higher education, employment, entrepreneurship and middle- level skills development. "By establishing an effective SHS curriculum, the Department of Education and its stake holders are ensuring that the learners benefit from an education system suited for the 21st century, are prepared for what they want to be after high school and are equipped with the knowledge and skills to pursue better lives for themselves, their families, and communities"

Mathematics Education and Learners' Performance

With the world's complexity and changing nature due to the presence of technology which is in continuous development, the demand for skills in mathematics is greatly essential. (Burghes, 2011). In an article posted in Question Paper (2020), it has been stated that since ancient times mathematics has greatly contributed in achieving aims of education.

"Mathematical literacy is a crucial attribute of individuals. This includes basic computational skills, quantitative reasoning, spatial ability etc. (International Commission on Mathematics Instruction, n.d.).

Relatively, UNESCO (2014) cited that mathematics should be taught during basic education. It is the said stage when the learners should start understanding the goal of mathematics education. Hence, mathematics should be seen as a discipline that could be applied in concrete situations in life more than just simply a subject to complete.

As part of the SHS curriculum, the value of mathematics goes beyond the classroom and the school and therefore must be learned comprehensively and with much depth (K to 12 Curriculum Guide Mathematics, 2016).

However, Belmonte (2017) emphasized that learners' performance in mathematics in the Philippines is already an issue even in the past which needs to be given attention. Researches and achievement tests revealed that there is a serious need to improve learners' performance in the subject. Likewise, Patena & Dinglasan (2013) mentioned that more college students were observed to be unprepared in learning mathematics. The authors also added that the low understanding level and discouraging achievements of the learners in Mathematics has become a cause of great concern among educators. In connection, Peteros

et al (2020) in a study stated that students have moderate level of self-concept towards learning Mathematics.

Meanwhile Ganal & Guiab (2014) agreed that Filipino learners' performance in lessons requiring higher order thinking skills is below what is expected of them although it has been noted that in terms of knowledge acquisition the learners showed better performance. Similarly, Patena & Dinglasan (2013) found that students really find it difficult to deal with numbers especially evaluating concepts in mathematics.

It is believed that a range of factors affecting the quality of performance of learners could be considered (Waters & Marzano as cited in Patena & Dinglasan, 2013).

Among the various factors correlated to learners' performance in the mathematics, Baruah (2010) revealed that mathematics performances of schools are positively correlated with the performances of learners in other subjects.

More so, Zakaria, et al (2010) stated that learners' perception on the subject is one among the factors leading the decline in mathematics achievement in schools. Also, many learners consider the subject as a difficult and boring. Similarly, Rameli & Kosnin (2016), found that challenges and performances of the learners in mathematics have greatly been influenced by negative perception, low self-regulation, lack of support from parents, nature of the subject, assessment pressure and teachers' behavior and practices.

Furthermore, research findings revealed that teacher quality influenced learners' performance. Tata (2013) found out that inadequate qualified teachers is one of the factors that leads to poor performance in mathematics. Meanwhile, Belhu (2017) mentioned that of the many factors that affect learning mathematics, teachers' instructional strategies and methods are the most influential. Thus, in achieving better learner performance in the subject, improving teachers' strategies in delivering the contents must be considered.

Teaching strategies have direct or indirect influence to learners' learning. Thus, it is imperative that teachers consider the learners' preferred delivery.

Blended Learning in the Teaching-learning Process

Blended Learning (BL) is one of the pedagogies recognized for innovative teaching and learning. According to Huang (2008) "Blended learning takes many forms. BL could be treated as an instructional strategy, which is developed in a networked environment. Such strategy is usually supported by virtual learning environments (VLEs), which are a computer-based standardized learning system and are used to sustain content delivery of online learning as well as to promote online communication between an instructor and learners".

"BL is a modern educational strategy that has replaced e-learning gradually in most educational institutions" (Oweis, 2018). Garrison and Kanuka (as cited in Oweis, 2018) explained that BL is a term pertaining to the attempts of teachers to incorporate technology into the traditional classroom setting, given the efficiency of the convergence of the two instructional strategies. In addition, one of the purposes of using BL is interactive learning when teacher's role in a traditional classroom is used in combination with virtual interaction. "The technology applied in BL is often intended to generate optimal performances by students". Linking technology in delivering instruction to the usual in-class interactions, the use of blended learning urges practitioners to consider digital technology and information communication technologies (ICTs).

Utilization of Blended Learning have garnered advantages among advocates, researchers and education practitioners. It was found that learners prefer blended learning over the traditional lecture format.

Graham as cited in Rajkoomar & Raju (2016) stated that some of the benefits of blended learning for higher education institutions include: facilitation of easier communication and interaction; motivation and metacognition; enhanced course delivery with improvement in cognitive and reflective skills; improved retention and identification among at risk students; improved pedagogy; increased access and flexibility and increased cost effectiveness while Yukawa in the same study characterized BL as practice that supports active engagement and collaborative learning. Similarly, Nouby & Alkhazali (2017) mentioned of the following benefits of utilizing BL: increase in the level of active learning strategies; the learner becomes the center of the learning process; emphasis on peer-to-peer learning; flexibility in meeting individual differences and learning styles; mentoring of individual learners; possibility of social interaction and easy communication with distant experts, mentors, professionals, or peers; increased access and convenience to instructional materials; reduced learning costs; and opportunity to use

technology tools and applications in the process of design, implementation and utilization of instructional materials.

Nevertheless, the use of blended learning also has limitations. According to Dance-Schissel (n.d.) Blended learning more or less requires students and teachers to have computer, tablet, or laptop which for some is expensive and challenging to provide. In relation, it is also necessary that both teachers and students have adequate competence in utilizing technological devices to be used in the instruction. And, technological issues and concerns such as internet connectivity and the like. Likewise, IvyPanda (2013) in an article stated that "the use of technology in teaching mathematics requires major changes to teaching practices. In most cases, the teacher will be required to adopt new teaching methods in order to exploit the technology resources available. Teaching mathematics with technology necessitates a significant change in the operation of teachers who have been teaching the subject using traditional methods, and who were themselves taught in traditional mathematics classrooms"

Tshabalala, Ndeya-Ndereya & Van der Merwe (2014) after investigating the perceptions of faculty members on Blended learning have found the various challenges relative to the said approach. The authors revealed that some teachers believe on the potential of BL in making the teaching and learning flexible which could give learners opportunity to learn independently. It also offers opportunities for networked learning and accessibility to both teachers and students. On the other hand, respondents also perceived blended learning as difficult to execute in classroom environment due to the absence of institutional policies on the use of blended learning, lack of ICT training/knowledge (e.g., technophobia), poor confidence to engage in blended learning approach, and limited access to computer laboratories. Hence, these were perceived to be hindrances in the implementation of blended learning.

Home Learning Plan

Exemplar can simply mean a model, ideal or pattern to be copied or imitated or something typical or representative of an example (Newlyn, 2013).

In Houston Independent School District News Blog (2013) the site shared that one of the practices of teachers is utilizing exemplar lessons as model of effective instructional planning where modifications to meet the needs of the learners could be made. The said practice gained positive feedback from teachers indicating that teachers are excited to have models for future planning. New teachers also appreciate the specific direction relative to the content available through the exemplar lessons.

Moreno & Ortegano-Layne (2007) discussed in a study that in teacher-education, the use of visual classroom learning plan is encouraged to promote the application of theory into practice. As added, the study revealed that format is essential factor to determine the effectiveness of a specific classroom exemplar as pedagogical tool.

Methodology

Research Design

The study employed descriptive-evaluative-correlational method to primarily gather responses from the teacher's respondents. Salaria (2012) stressed that descriptive research primarily dwelled on gathering information about the prevailing conditions or situations for the purpose of description and interpretation. This type of research method is not basically tabulating facts but includes proper analyses, interpretation, comparisons and evaluate the differences. It focused not only with the individual characteristics but rather with the whole sample thereof. Furthermore, the central tenet of this design is to study frequencies, averages and other statistical calculations. Moreover, survey research is a specific type of field study that deals with the collection of data from a sample of elements drawn from a well-defined population through the use of a questionnaire (Visser Frosnick & Lavrakas, 2007).

Sampling Technique

This research employed purposive method as sampling technique. Calmorin & Calmorin (2007) explained purposive as selecting individuals according to the purposes of the researcher as his control. Hence, the respondents are selected because he/she is a good representative from the entire population. However, the research chose as many respondents to secure that the outcomes from a single test are not coincidence.

In this study, purposive sampling was utilized because the researcher specifically aimed to acquire responses from the junior and senior high school mathematics teachers in high schools of Lopez East and West Districts.

The researcher used total enumeration in identifying the high school mathematics teachers as respondents. There were fifty-four (54) respondents for this undertaking. The first group was composed of twenty-two (22) senior high school mathematics teachers and thirty-two (32) junior high school mathematics teachers.

All comprising high school of Lopez East and West Districts were included in the respondents' selection.

The Respondents of the Study

In this study, a total of fifty-four (54) respondents were identified. They were divided into twenty-two (22) senior high school mathematics teachers and thirty-two (32) junior high school mathematics teachers.

These were taken from the fourteen (14) high schools in Lopez East and West Districts of Lopez, Quezon. All are currently active DepEd personnel during the school year 2020-2021.

Instrument Used

The researcher utilized set of researcher-made questionnaires. They were shown to her adviser for corrections, suggestions and recommendations. Series of validation processes were made before the questionnaires were given to the respondents.

Study Procedure

The researcher dwelled in different stages to attain the needed data. It includes the phases from the preparation to the data gathering and analysis phases.

Essential contents for the survey questionnaire were identified. Related literature and studies aid the researcher in completing and developing the main instrument for the validation and modification, with the assistance of the research experts.

After the development and validation course of the instrument, the researcher started to identify the respondents. All high school mathematics teachers from Lopez East and West Districts. Respondents were requested to answer the survey questionnaire.

It was followed by the distribution of the copies of questionnaire. The researcher allotted two-week for the completion of the instrument. Retrieval was done after its completion.

After the retrieval of the questionnaire, data were consolidated. Data were presented through textual, graphical and tabular forms.

Results and Discussion

This section comprises the presentation, analysis, and interpretation of data gathered by the researcher from the Survey Questionnaire (SQ). The outline follows the sequence of investigation stated in the statement of the problem.

Summary of the Teachers' Extent of Utilization of Blended Learning

Table 1 show the summary of the teachers' extent of utilization of blended learning along its eight dimensions. Weighted mean and rank orders were also tabulated.

The overall computed weighted mean was 3.50, verbally described as very evident (VE). Among the eight dimensions of BL, the following ranked first to third respectively: Ethical (3.70), Institutional (3.68) and Interface (3.60). The said indicators were all very evidently utilized by the respondents. On the other hand, Technological (3.32), Resource Support (3.31) and Evaluation (3.27) were the last three in the rank. These indicators were just evidently utilized.

The summarized findings revealed that generally, SHS teachers has higher extent of evidence of utilization of blended learning in teaching mathematics particularly following ethical considerations, institutional support and interface. However, aspects such as technological, resource support and evaluation could still be improved or heighten its utilization since these indicators were just averagely utilized.

Table 1. *Summary of the Teachers' Extent of Utilization of Blended Learning*

Indicators	*Lopez West*			*Lopez East*			*Average*		
Dimensions	*Wx*	*Rank*	*Int*	*Wx*	*Rank*	*Int*	*Wx*	*Rank*	*Int*
1. Pedagogical	3.44	5.5	E	3.71	3	VE	3.58	4	VE
2. Technological	3.42	7	E	3.23	6	E	3.32	6	E
3. Interface	3.34	8	E	3.87	1	VE	3.60	3	VE
4. Evaluation	3.46	3	E	3.09	8	E	3.27	8	E
5. Management	3.45	4	E	3.44	5	E	3.45	5	E
6. Resource Support	3.44	5.5	E	3.17	7	E	3.31	7	E
7. Ethical	3.71	1	VE	3.69	4	VE	3.70	1	VE
8. Institutional	3.65	2	VE	3.72	2	VE	3.68	2	VE
Average	3.50		VE	3.49		E	3.50		VE

The Test of Significant difference on the rank

orders of the Teachers' Utilization of Blended Learning between East and West Districts

Table 2 presents the Wilcoxon Mann-Whitney U test results on the significant difference on the rank orders of the utilization of blended learning in Lopez West and East districts along Khan's theorized eight (8) dimensions.

The results revealed the computed z-values with p values along: pedagogical 1.02 (0.003); technological 5.89 ($p<0.05$); interface 0.04 ($p<0.05$); evaluation 0.89 ($p<0.05$); and resource support 0.98 ($p<0.05$) which are all less than 0.05 alpha.

Table 2. *The test of Significant Difference on the Rank Orders of the Teachers' Utilization of Blended Learning between East and West Districts along the Eight (8) Dimensions*

Indicators	*Pedagogical*	*Technological*	*Interface*	*Evaluation*	*Management*	*Resource Support*	*Ethical*	*Institutional*
Summation of the Rank of the West	172	92	126	100	71	143	91	108
Summation of the Rank of the East	81	44	45	36	65	68	80	103
Number of Samples of the Bigger Group	11	8	9	8	8	10	9	10
Number of Samples of the smaller Group	11	8	9	8	8	10	9	10
Total Number of cases	22	16	18	16	16	20	18	20
Computed z-	1.02	5.89	0.04	0.89	3.94	0.98	3.13	3.63
Probability Associated with z	0.1539	<0.0001	0.4840	0.1867	<0.0001	0.1635	0.0009	<0.0001

Hence, the hypothesis was rejected therefore there was a significant difference in the rank orders of the extent of utilization of blended learning between Lopez West and Lopez East districts along these dimensions.

On the other hand, there were no significant differences found in the extent of utilization of blended learning between the two districts along management 3.94 ($p>0.05$); ethical 3.13 ($p>0.05$); and institutional 3.63 ($p>0.05$) dimensions.

Generally, in the pedagogical, technological, interface, evaluation, and resource support, the respondents from west and east districts ranked the given indicators differently which infers that the two district have different extents of utilization of BL along such dimensions.

The Test of Significant difference on the extent of utilization of Blended Learning among teacher respondents due to their Demographic Profile

Table 3 shown the test of significant difference on th extent of utilization of blended learning among teacher's respondents who are compared according to demographic profile.

Table 3. *The Test of Significant differences in the Teachers' extent of utilization of Blended Learning due to their demographic profile*

Indicators	*Sex*	*Rank Position*	*Length of Service*	*Highest Educational Attainment*
Number of groups compared	2	4	4	3
Means being compared	3.65 3.39	3.49 3.79 3.07 3.43	3.37 3.66 3.60 3.29	3.40 3.52 3.43
Computed value	0.89	1.62	0.34	0.08
Critical value	1.674	1.674	1.674	1.674
Degree of Freedom	53	53	53	53

With the use of t-test, the extent of utilization of BL of male math teachers was compared to female. The results revealed that there was no significant difference being found. Such conclusion was supported by the computed t-value that is 0.89 which is less than the critical value of 1.674 at degree of freedom 53, using 0.05 level of significance. Therefore, it more likely the male and female teachers have similar extent of utilization of BL.

The result reverses the findings of El-Amandi, et al (2019) stating the differences between male and female teachers. The author stated that "female teachers provided better delivery during theory classes, whereas male teachers demonstrated better performance in laboratory-based classes in science subjects."

Furthermore, through analysis of variance in finding the significant difference when teachers are grouped according to rank or position, length of service and highest educational attainment, there were also no significant differences found on the teachers' extent of utilization of BL.

The result was supported by the respective computed f-values such as 1.62, 0.34, and 0.08 which are all less than the f-critical value of 1. 725 at degree of freedom that is equal to 20. Thus, the null hypotheses were all accepted.

Results generally confirm that sex, rank, length of service as teacher and educational attainment are not associated with the teacher's extent of BL utilization.

Effects of Utilization of Blended Learning on the Learners' Performance in Mathematics

Table 4 presents the weighted mean and rank orders on how the utilization of Blended Learning affect the learners' performance in high school mathematics. It is composed of 10 indicators. Each indicator has computed weighted mean and ranked accordingly.

The tabulated results showed that the overall average was 3.51, verbally interpreted as very evident (VE). This infers that impacts of using the blended learning to the performance of the learners in high school mathematics have been found effective to the learners' performance in mathematics.

To specify, BL develops innovative learning in Mathematics (3.64) ranked the highest with very evident (VE). It also enhances learners' focus to study (3.61) in the sense that learners have to learn independently or by themselves most of the time. Also, it provides meaningful learning experience (3.57).

Table 4. *Effects of Utilization of Blended Learning on the Learners' Performance in High School Mathematics*

Effects of Utilization of Blended Learning in Learners' Performance in SHS mathematics	*Lopez West*			*Lopez East*			*Average*		
Indicators	*Wx*	*Rank*	*Int*	*Wx*	*Rank*	*Int*	*Wx*	*Rank*	*Int*
1. Develops innovative learning in Mathematics.	3.44	1	E	3.83	2	VE	3.64	1	VE
2. Engages learners to do the learning tasks.	3.19	8.5	E	3.67	6	VE	3.43	6.5	E
3. Provides easier communication and interaction.	3.39	2.5	E	3.67	6	VE	3.53	4	VE
4. Improve cognitive (critical thinking) and reflective skills.	3.25	5.5	E	3.67	6	VE	3.46	5	E
5. Improves ICT skills.	3.14	10	E	3.67	6	VE	3.41	8	E
6. Enhances retention.	3.19	8.5	E	3.50	9.5	VE	3.35	10	E
7. Enhances learners' focus to study.	3.39	2.5	E	3.83	2	VE	3.61	2	VE
8. Learners learn at the comfort of their home.	3.19	8	E	3.67	6	VE	3.43	6.5	E
9. Provides meaningful learning experience.	3.31	5.5	E	3.83	2	VE	3.57	3	VE
10. Higher level of class satisfaction.	3.25	7	E	3.50	9.5	VE	3.38	9	E
Average	3.33		E	3.68		VE		3.51	VE

However, enhances retention (3.34) and higher level of class satisfaction (3.38) ranked the among the effects. These indicators were just evidently (E) manifested.

The findings could be attributed by the problems on accessibility to resources and other economic and social factors.

Plitnichenko (2020) stated that gadgets shortage and crashing systems were dilemma that some students are facing. Not all students could have access easily to technological means needed in the e-learning. In addition, Estrada (2021) share on rappler that "with big population of students to accommodate, particularly in public schools, it is a challenge for teachers to provide equal and undivided attention. Reaching out to all of students due to economic and social factors were also a hinder the efficient delivery of learning.

The Significant difference on the rank orders of the Utilization of Blended Learning that Affect the learners' academic performance between the two groups of the respondents

This part discusses the comparison on the rank orders regarding the effects of the utilization of BL on the academic performance of the high school learners in mathematics.

Table 5. *The test of Significant Difference on the Rank Orders of the Utilization of Blended Learning affect the learners' academic performance in mathematics*

Indicators	*Utilization of BL that affect the academic performance of learners in mathematics*
Summation of the Rank of the West	152
Summation of the Rank of the East	58
Number of Samples of the Bigger Group	10
Number of Samples of the smaller Group	10
Total Number of cases	20
Computed z-	0.26
Probability Associated with z	0.3974
Decision on Null Hypothesis	Rejected
Interpretation	Significant

Table 5 presents the Wilcoxon Mann-Whitney U test results on the significant difference on the rank orders of the utilization of blended learning that affects the learners' academic performance in mathematics

The results revealed the computed z-value with equivalent probability associated which is 0.26 ($p<0.05$). This led the researcher to reject the null hypothesis.

Hence, the result revealed that there was statistically significant difference on the rank order of the utilization of blended learning that affects the learners; performance in mathematics between Lopes West and Lopez East districts. It implies that the two groups compared have more likely experience the effects of utilizing BL differently.

Conclusion

Based on the findings the following conclusions were drawn: (1) High School Mathematics teachers in Lopez District were female dominated. Most of them

were still in the beginning stage of service in DepEd but have taken already units in graduate studies as part of professional development therefore majority have advance undertakings on the pedagogies and strategies in teaching. (2) The pedagogical, interface, ethical and institutional utilization of blended learning in both districts is apparently manifested by the said teachers as compared to other dimensions. Teachers more evidently utilized educational process that leads to knowledge gain, systematic flow of activities which led to efficient attainment of the Most Essential Learning Competencies. Being strict to following ethical standards, and teachers have provided education for all students regardless of status and backgrounds despite of the pandemic with the aid and supports from respective institutions/ schools. (3) Lopez West and East districts differ in utilizing the pedagogical, technological, interface, evaluation, and resource support aspects of blended learning. The technical and resources availability and support in each district were factors to have contributed to the said difference. (4) The teachers' demographic profiles are not factors associated to their extent of utilization of blended learning. Hence, regardless of sex, rank or position, length of service and highest educational attainment, teachers could utilize efficiently the said strategy provided with the support, facilities, technology and pedagogical competencies. (5) The use of blended learning has effectively contributed to the academic performance of the learners in high school mathematics. (6) The two groups compared have more likely experience the effects of utilizing BL on the academic performance of the learners in mathematics, differently. (7) Utilization of Home Learning Plan with blended modality has been proposed.

With the findings and conclusions, the following are recommended: (1) Since the indicated profile of the respondents do not contribute to the significant difference on the utilization of blended learning among teachers, other variable profile could still be tested as to widen the study findings. This may include much thorough assessments of teachers' technical skills, attitudes and competencies. (2) Resource and technological supports could further be improved in both districts particularly in the East district. (3) Administrative officials and school heads should continue their support to school activities and teachers' endeavors since it has contributed to teachers' greater extent of utilization of blended learning which has contributed to positive learners' performance. (4) Teachers may continue following ethical standards in doing their duties particularly in the delivery of learning. (5) The Home Learning Plan as output of the study should be shared to teachers and other authorities as to have them guide how blended learning in the time pandemic is utilized. (6) Schools may continue to uphold its partnership with stakeholders in the community as they contributed in the implementation of blended modality. (7) Future researchers may have further studies on blended learning in other subjects and grade level as to compare the result of the study.

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