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Mathematics Performance Of Senior High School Students In Blended Learning Amidst The Covid-19 Pandemic

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Abstract

This research discusses the correlation between attitude towards Mathematics and blended learning during the Covid 19 pandemic. Difficulty in retaining a particular lesson and poor performance during the pandemic in line with mathematics that the students experienced in acquiring knowledge through an online learning modality. Attitude towards Mathematics in terms of perceived confidence in learning mathematics and usefulness of mathematics and blended learning correlates with mathematics performance in senior high school students and is investigated in this study. The analysis employed the descriptive correlational research design using a survey questionnaire to gather data regarding the profile, attitudes towards blended learning and, mathematics performance of the 948 senior high school students enrolled in senior high schools. The results of this study all point to the fact that Covid-19 somehow contributed to certain effects on the mathematics performance of the senior high school students in the three identified schools. The researchers strongly recommend that the action plans be implemented, monitored, and evaluated to improve the mathematics performance of Grade 11 students in blended learning during the Covid-19 pandemic.

Keywords: Teaching Mathematics, performance, attitude, blended learning, COVID-19 pandemic

I. INTRODUCTION

Mathematics proficiency is the students' capacity to define, utilize, and decipher mathematics in various settings. It incorporates thinking scientifically and using mathematical concepts, methods, truths, and instruments to portray, clarify, and foresee phenomena—numerous school enhancement plans centered on a current guideline on the methodology of the educational programs. However, bringing all students to a higher accomplishment level is more complicated than that, which includes setting up the proper culture to support the students' minds and improve the inclusion and advancement of schools, mainly in time of the pandemic Covid-19.

Sintema's (2020) study reveals that the worldwide crisis of the Covid-19 pandemic has spread globally, making a vast difference in almost all countries and territories. Lockdowns and stay-at-home are plans of action which were put in place as the need arises. This is to flatten the curve and control the disease's transmission. Restriction policy for people or communities to stay where they are and social distancing measures have led to closures of schools, training institutes, and college education establishments. However, there was a paradigm shift in delivering the education system through various distance learning platforms. During the Covid-19 outbreak, the closure of academic ventures left unprecedented impacts on education (teaching-learning process). Teachers are

urged to use online learning platforms during the lockdown, citing the need to adopt new technologies to maintain the teaching-learning process. Students struggled to adopt the latest teaching method known as "e-learning."

The Covid-19 disease's dramatic start has sparked a digital rebellion in the new higher education system, with online lectures, teleconferencing, digital open texts, online exams, and participation on virtual meeting platforms. Distance education has been managed very well without any theory and commented on over 39 years ago. Today, the same can be said about e-learning and Information Communication Technology (ICT) based learning.

In the last decades, online learning practice has achieved momentum, and it will be the primary tool for future education. WhatsApp also played an influential role in higher education as a platform for sharing information about learning. The main issue in shifting to e-learning from conventional understanding is a barrier to adoption, so selecting an e-learning process using different technologies for education and daily routine activities is vital to boost the learners' knowledge.

The online mode of the teaching-learning process is usually prejudiced against poor and disadvantaged students. The closing of schools hampered the education system and the teaching-learning process. Understanding the teaching-learning process during this crisis is imperative to design effective interventions for teaching and learning smoothly. Online education has become the panacea for teaching-learning within the present situation. With these backdrops, the current study aims to spot the impacts of e-learning compared with conventional learning during this lockdown amidst the Covid-19 pandemic.

In the Philippines, the unexpected and rapid application of distance learning—along with the strain and isolation caused by the pandemic, increased profitable hardship, and a sharp rise in racial tension—have all concerted to make a natural home or environment for an animal, plant, or another organism rife with stress and worry for university kids, families, and educators. Along with psychological state and wellness concerns, significant comprehension loss is anticipated. The implementation of distance learning was uneven. The general public said that online education has less exposure to real-time performance. Since the Philippines is a developing country, its information technology infrastructure is not as good as developed countries. More significantly, in rural and remote areas, people facing scarcity of resources are the hurdle for adopting online education in the current scenario. Poor internet connectivity, students' learning estimation, and lack of concentration during online classes are the major problems the teachers and students face.

The lack of basic mathematics skills at the secondary level has been recognized as an issue known as a "Mathematics Problem." Even in poorer countries, it has become a critical concern. Many students struggle to pass mathematics subjects, especially those in line with studying quantitative engineering, science, commerce, and even education. The detailed research is in progress and approved for action; we expect that the retention performance level of all grade school learners will upgrade. Suppose not 100 percent but will eventually make them globally competitive, particularly in Mathematics. Students are expected to learn any idea presented from simple to complex as they construct new ideas based on their previously known knowledge.

This study focuses on students with lower retention levels in holding a lesson during the pandemic caused by the Covid-19. Moreover, this led teachers to carefully arrange and plan their lessons to empower students to handle the essence, take an interest, and be guided to the organized program they will learn. It is within the belief that the researchers conducted a study to discover the students' commitment to mathematical thinking and performance of the Grade 11 senior high school students during this pandemic period of Covid-19.

II. FRAMEWORK

This study is anchored by Ausubel's Subsumption Theory, Mathematical Learning Theory by R.C. Atkinson, and Lev Vygotsky's Social Learning Theory. Figure 1 illustrates the Conceptual Framework of the study showing the relationship among the theories, legal bases, independent and dependent variables of the study and ending with an action plan. The following legal bases also support them, namely the Department of Education (DepEd) Order No. 8, series 2015 [Policy Guidelines on Classroom Evaluation for the K-12 Basic Education Program], and the DepEd Order No. 55, series 2016 [Code Standards on the National Evaluation of the Student Learning for the K-12 Basic Education Program].

David Ausubels' theory concerns how anyone learns much meaningful information from verbal/textual presentations in a school setting (in contrast to the approaches developed within laboratory experiments). According to Ausubel, representational and combinational processes occur during the acceptance of information. The primary procedure in learning is subsumption, in which new material is interpreted as essential ideas in the prevailing mental framework on a substantive, non-verbatim basis. The study by Briggs (2019) suggests that cognitive schemas represent the remains of all learning memories while forgetting occurrences in the past because precise details get integrated and lose their identity.

Ausubel expressed that anyone could learn much more achievement of a deep understanding of complex ideas through all kinds of superordinate, representational, and combinatorial processes that occur during the reception of information. In contrast to rote memory, a visual organization practice organizer is a tool or cognitive learning aid that helps pupils integrate new information with current knowledge, resulting in "meaningful learning."

Etcuban and Pantinople (2017) explained that when starting the work, the role of teachers and teacher education programs in the essential aspects of defining students with mathematical learning difficulties and effective teaching programs and concepts of what effective teacher means came into the focus.

The study by Eysenck and Keane (2020) explained that the capacity of children's memory improves with age seems to be a straightforward interpretation for the age-related improvement in memory performance. One can compare the mind to a computer with a given number of slots for short-term memory. This view has modifications, but this is the most concrete analogy. Memory development refers to the change of performance with age in individuals storing and retrieving information, such as recalling a sequence of digits replicating life encounters and events at a birthday party. Alternatively, such as remembering to carry out a chore such as what to buy at a grocery store.

Albert (2017) explained that aggression is generally defined as decorum resulting in personal injury and physical destruction. Not all harmful and destructive acts are judged aggressive, however. Whether dangerous behavior will be perceived as hostile depends on subjective judgments of intentions and causality. The greater the ascribing of a work of personal responsibility and inflicting harm on someone, the more likely the behavior will be pronounced as aggressive.

The study of Malatjie and Machaba (2019) suggests that the concept map strategy can play a role in developing learning. It also shows that a learner could create a comprehension of mathematical concepts, operations, and relations of any topics in mathematics if the learner builds new knowledge from the current. For learning to occur in mathematics, there must be a connection between previous mathematical ideas and new concepts.

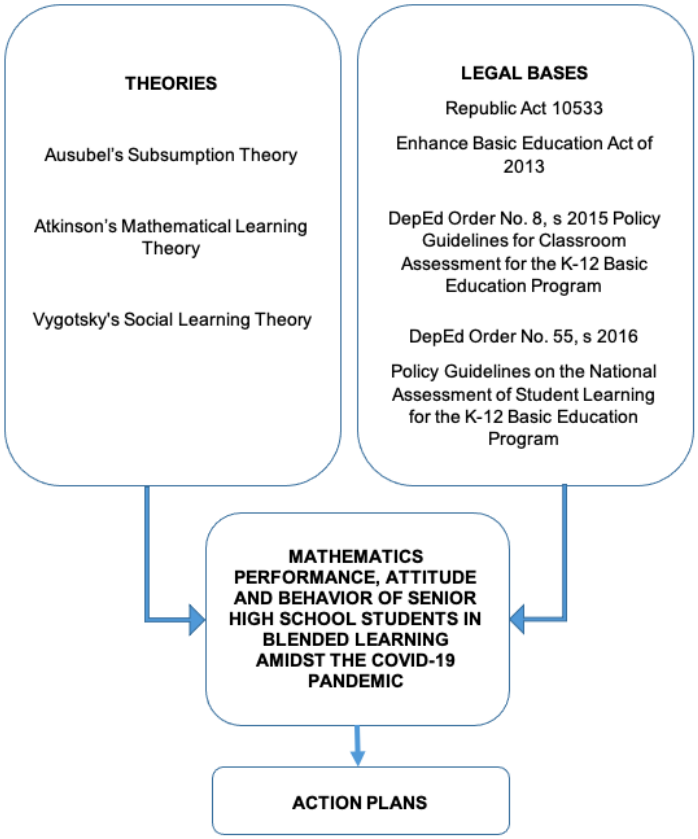

Figure 1. Conceptual framework of the study

Concept mapping is an applicable learning technique that can facilitate learners to retrieve, organize, and relate concepts. However, many types of research have shown that concept mapping could enhance learning performance. They are primarily based on the paper-and-pencil approach. Concept mapping is a valuable instructional strategy that facilitates meaningful learning. Concept mapping is considered an applicable learning technique that can encourage learners to retrieve, organize, and relate concepts. Concept mapping is a valuable instructional strategy that facilitates meaningful learning. Chiou et al. (2017) also commented that a critical arbitrating element of meaningful understanding is the foundation of related concepts or propositions that an individual gains knowledge of based on Ausubel's theory.

Harris and Jones (2017) suggested that the success or failure of any education intervention depends upon the nature, quality, and sustainability of implementation. The evidence from a range of networks of schools in a given populated region that perform well on international evaluation reinforces the message that solid implementation processes are required at the central and local levels.

According to Vygotsky, the child is entirely dependent on other people during the early stages. The sociocultural environment presents the child with various tasks and demands, engaging the child in his world. This stage is referred to as both scientific concepts and activity, which occur on two planes where child knowledge through contacts and interactions with people. Vygotsky felt social learning precedes development. According to Patang and Machmoed (2020), this study aims to provide a benchmark of information on how instructors learn as they engage in collaborative inquiry in which their classrooms become an object of their learning.

Polly et al. (2017) suggested that the sociocultural theory has become increasingly persuasive in instructional design. There are three subject matter that is correlated with Vygotsky's ideas of sociocultural learning: (1) physical,

cognitive, and psychosocial development and learning originate in social, historical, and cultural interactions, (2) use of psychological tools, particularly language, mediate the development of higher cognitive functions, and (3) assimilating occurs within the Zone of Proximal Development. Adam (2017) also commented that constructivism believes in the personal construction of meaning by the learner through experience and that meaning is influenced by the interaction of prior knowledge and new events. The role of the teacher is an initiator who furnishes information and coordinates activities for learners to discover their learning.

Nasri (2019) presumed that higher education focuses on active learning rather than a passive learning approach. It requires higher education educators to adopt different roles and responsibilities. This study showed that not all research participants have accepted their role as facilitators of learning as they were hesitant to abandon the authority and position.

According to Attard and Holmes (2020) that the effect of the Covid-19 pandemic has positively and negatively affected learners and instructors. Most of the opinions disclosed the disadvantages of education in the pandemic period. During the Covid-19 pandemic, all schools in Thailand have reinforced their efforts to enhance online interactions and motivate students to participate in online learning. Transitioning from classroom to blended instruction demands adjusting to the "new normal."

According to the study by Wilson (2018), it is well established that classroom assessment can substantially impact students' educational success. In contrast, the effects of large-scale assessment are harder to prove.

Fouze and Amit (2017) express that teachers are responsible for learning. These include the growth of curricula and learning strategies based on integrating cultural elements and values and ethnos mathematical games in math instruction. The use of games from the students' culture and cultural values from previous knowledge in this endeavor may contribute significantly to the students' learning process. It helps them better comprehend the study material, elevate their motivation, and ultimately upgrade their achievements in math.

Gonda et al. (2021) suggest that statistical analysis of the data showed that students had a statistically remarkable reduction in hesitating behavior. The movement of educational participation to the online environment within blended learning increases the risk of growing student procrastination because of the Covid-19 pandemic. Great emphasis in the flipped classroom was placed on supporting students outside the classroom. In this part of blended learning, procrastination is a frequent cause of students' failure, not just in mathematics. The efficiency of our proposed inverted class design has been experimentally verified.

In the study by Soesanto and Dirgantoro (2021), they suggested that the Covid-19 pandemic opens the door for researchers to contribute more to online mathematics learning. During the pandemic, the various impact and casualties affect students' performance in learning mathematics. Studies on the affective domains need to be enriched to provide insights to students, educators, or institutions on various practical understandings of mathematics education.

Low-preparation strategies are those instructional techniques that require minimal changes to the classroom structure and routine but can significantly impact learning experiences. They require minimal preparation from the teacher but allow the teacher to modify curriculum and instruction in response to learners' needs. Wan (2017) expresses that proactively adjusting teaching and learning incorporates various classroom organizational, instructional, and assessment approaches and principles.

The self-regulated study contains a constructive outcome on academic results. The conclusions drawn from self-reflection have control over the learner's self-concept. Dignath and Büttner (2018) showed that outcomes of this self-evaluation influence the subsequent anticipation phase, resulting

in the cyclical character of the model. Rodrigues et al. (2019) said that electronic learning (e-learning) could be a broader approach to learning that brings new chances for learning and teaching in many fields of education removed from the typical classroom environment.

According to Patron (2021), teachers' instructional approaches impact students' mathematics performance; as a result, the Learning Continuity Plan is designed to successfully serve the requirements of all learners using a variety of innovative strategies. Modular Distance Learning is one of the learning modes used by the school, in which students use self-learning modules in print or electronic form, with tutors monitoring their progress. In contrast, in online distance learning, learners use various technologies accessed through the internet. Determine the impact of modular distance learning and online distance learning on mathematics performance, the level of mathematics performance of students, and the link between these challenges and problems in using blended learning methods in teaching mathematics and the mathematics capabilities of students in his study.

The study of Capuno et al. (2019) revealed that the students had a positive attitude towards mathematics. At the same time, they had unbiased behavior regarding their self-reliance, happiness, and enthusiasm for mathematics.

Tanujaya et al. (2017), Higher order thinking skills (HOTS) are essential aspects of education. A person's thinking can affect learning ability, speed, and effectiveness. Wherefore, reasoning skills are merged with the learning process—learners who are taught to think and exhibit a beneficial effect on their education. Subia et al. (2020) express that improvement is vital since the students need HOTS to hurdle higher-level tertiary mathematics courses, which, achieving reliable development is essential for boosting gainful performance and economic development in contemporary societies. Popescu et al.'s (2017) study reveals that measuring competitiveness differs depending on the concept used, using specific economic indicators.

Many concerns have been raised in the Philippines' early assumption of the K-12 educational system regarding its implementation, mainly the mismatch between coursework offered in Philippine K-12 educational institutions with industry demands. With such outcomes, it is essential to determine the status of the K-12 educational system in the Philippines. Almerino et al. (2020) said the outcomes would help shed light on the formulation of strategies needed to justify the students' competencies toward the expected outcomes of the K-12 program.

Andrada and Marasigan (2020) said that the SHS students' persistence factors are self-efficacy and social support based on the results gathered. Adu et al. (2017) explained that senior high schools had a high-level functional readiness to administer the SHS program. Perez (2018) concludes that DepEd must focus on providing these resources to schools to enhance the operational preparedness of the SHS program.

Valdez and Dominado (2020) suggested that DepEd Order No. 8, series 2015, Enhanced Basic Education Act of 2013 (Republic Act No. 10533), DepEd embraces the enclosed Policy Guidelines on Classroom Evaluation for the K to 12 Basic Education Program**.** Classroom Assessment is an integral part of the learning development of the school and the classroom.

Classroom assessment informs the learners and their parents and guardians of their progress (Suurtamm et al., 2016). According to Reyes and David (2020), DepEd adopts the attached guidelines on the National Assessment of Student Learning for the K to 12 Basic Education Program based on DepEd Order No. 55, series 2016.

Balagtas et al. (2019) express that the national evaluation of student learning is integral to DepEd's assessment framework. Opening active, interactive communication channels enhances the learning process. Learning is assessed based not only on results but also on function and self-evaluation. This learning process should be as efficient as feasible using a mobile device or smartphone. Blended learning is the

correct alternative and explication in the current Covid-19 pandemic. The approach is to combine traditional learning patterns with online multimedia-based information technology. Constraints and obstacles that exist in the learning environment deserve attention. In addition to technical factors related to technological mastery and access constraints, the preparation of problem-based materials equipped with cases and problem-solving guides, coupled with active, interactive communication media channels, is believed to improve student learning activities.

The study of Padillo et al. (2021) revealed that professional development programs for teachers had accomplished mastery in educational planning, instructional delivery, knowledge of the topic, bond with students, and classroom management. In contrast, professional development activities were known to have little help for the teachers. It was also learned that there is no significant relationship between the learning competencies and professional development activities.

Arulmoly and Branavan (2017) study revealed that highly motivated students perform better academically than lowly motivated students. A better transfer of learning of mathematics proficiency on the part of the teacher, combined with students' interest in the subject and the show of positive behavior as earlier pointed out. They are suitable motivating components that, when combined, are assumed to result in better mathematics accomplishment.

Arends et al. (2017) suggest that how teachers interact with learners features a significant difference in their performance. The facilitation of student interaction by the teacher is equally essential. The influence of teacher collaboration and its effects on learner performance is instructive. The proper support and implementation could lead to better learner performance in Mathematics.

Ejoh (2020) study revealed a positive influence on mathematics students' motivation, attitude, and achievement when technology is embedded in classroom instruction. Awofala et al. (2020) explained that an extensive literature review aligned with this study's findings of the positive influence teachers' higher technology use had on students' motivation, attitudes, and achievement.

Without the required prerequisites, such as resources, adequate teacher competencies, and favorable legislation, the spiral progression technique causes more harm than good. The spiral is cut due to widespread student promotion, which the authorities impose indirectly. Promoting pupils without the necessary remedial lessons to catch up and grasp the topic undermines the Spiral Progression Approach's promise. Making restorative sessions for slow learners more appealing to both teachers and students may help pupils master critical concepts for the next level.

III. OBJECTIVES OF THE STUDY

This study determined the mathematics performance, attitude toward Mathematics and blended learning of Grade 11 senior high school students' during the Covid-19 pandemic as the basis for the action plans. Specifically, it determined the: 1) profile of the respondents in terms of age and gender, track and strand enrolled, final grade in Grade 10 mathematics, and type of school graduated; 2) mathematics performance of the respondents in functions and relations, exponential functions, and simple and compound interests; 3) level of the attitude of the respondents in terms of perceived confidence in learning mathematics, and usefulness of mathematics; 4) respondents' attitudes towards blended learning; 5) significance of the relationship between their level of attitude towards mathematics and blended learning and the mathematics performance; and the 6) significance of the difference in the level of attitude towards mathematics, and blended learning when grouped by the profile of the respondents.

IV. METHODOLOGY

The study utilized the descriptive correlational-comparative research design using a survey questionnaire. Also, it gathered data regarding the respondents' profile in terms of age and gender, track and

strand enrolled, final grade in Grade 10 mathematics, type of school graduated, mathematics performance, attitude towards mathematics and blended learning of the senior high school students.

The study was conducted at Mactan National High School (700, 73.84%), Lapulapu City, Philippines, Ponciano L. Padin National High School (66, 6.96%), Bohol, Philippines, and Saint Francis Academy (182, 19.20%), Balamban, Cebu, Philippines. The respondents are selected based on stratified sampling, where the sample is drawn from the stratified, mainly the student in Grade 11. The researchers selected them as respondents of this study since; they are the students with excessive absences, children who are primarily repeaters, children with records usually below the MPS set by DepEd, who need attention below the community even in the school.

The researchers adopted two types of questionnaires: survey questionnaires and Mathematics performance exam on selected topics in General Mathematics. The survey questionnaire has three parts. The initial part is the profile of the participants. At the same time, the second part is the level of attitudes toward math taken from the Fennema-Sherman Mathematics Attitudes Scales. The third part, attitudes towards blended learning, is taken from the Journal of Education and Human Development-Six Subscales of Blended Learning Survey.

In the profile of the respondents, the questionnaire was answered by placing a checkmark on the circle provided. The attitudes towards the Mathematics Scale, which consists of two parts, B.1 and B.2, was answered by checking the indicators provided, namely Strongly Disagree, Disagree, Agree, and Strongly Agree. The third questionnaire, which is the students' attitude towards blended learning consisting of one part only, was answered by putting a checkmark on the indicators provided on the right side, namely: Strongly Disagree, Disagree, Agree, and Strongly Agree. The researchers gathered data in line with the level of attitudes towards mathematics; the respondents answered a 33-item questionnaire with four corresponding choices by placing a checkmark on the boxes corresponding to their responses.

The last questionnaire, the Mathematical Test Performance, is composed only of one part answerable in one hour. The respondents selected the letter of the correct answer to each question implied by encircling the letter of the correct answer in the choices provided (with the permission to use from the owner to copy and revise some content of the tool.) The data gathering procedures are based on the correlation-comparative method. In addition, the researchers used descriptive and inferential statistical treatments.

For the mathematics questionnaire, the instrument sought the level of performance of the respondents in terms of three different selected topics in General Mathematics namely, functions and relations, exponential functions, and simple and compound interests.

For the profiling of the respondents, the instruments expressly sought the demographic profile of the respondents for the study, including age, gender, track, strand, final grade in Grade 10 Mathematics, and type of school graduated. The age of the respondents is one of the essential characteristics in understanding their views about the specific problems, and considerable age indicates the level of maturity of individuals of the same age becomes more critical in examining the response. The respondents answered by checking the corresponding blocks. As they read the following sentences, the researcher will know whether they agreed or disagreed. The respondents answered twelve items in learning mathematics by checking the appropriate box corresponding to the four options. The same goes in answering the perceived usefulness of mathematics. The respondents answered the 12-item questions by also checking the appropriate box.

During the research administration, the researchers prioritized seeking parents' consent and consent from minors. Also, those who belonged to the legal age were informed about the details of the said study. The researchers have adequately discussed

the rationale for answering the test questionnaires by giving clear instructions. To ensure uniformity in the test administration, the researchers administered the examination to the respondents one week after the third grading period. The researchers retrieved the survey test questionnaires, and the interview results. During the survey, ethical standards were observed. Accordingly, the data privacy act was respected and practiced.

The gathered data were statistically treated using descriptive statistics (frequency, mean, standard deviation, weighted mean) and inferential statistics (Chi-square test of independence, ANOVA).

V. RESULTS AND DISCUSSIONS

The results of the respondents' profile in terms of age and gender, track and strand enrolled in, final grade in Grade 10 mathematics, type of school graduated are given in Table 1. The mathematics performance of the respondents is also presented in Table 1. The level of the attitude of the respondents in terms of perceived confidence in learning mathematics, and usefulness of mathematics are shown in Tables 2 and 3. The respondents' attitude towards blended learning is presented in Table 4. Further, the significance of the relationship between the mathematics performance and the level of attitude towards mathematics, and blended learning are exhibited in Tables 5 and 6, respectively. Finally, the significance of the difference in the level of attitude towards mathematics, and blended learning when grouped by the profile of the respondents are depicted in Tables 7 and 8, respectively.

Profile of the respondents

The results of the respondents' profile in terms of age and gender, track and strand enrolled in, final grade in Grade 10 mathematics, type of school graduated are given in Table 1.

Table 1. Profile of the respondents

Variable	Frequency	Percentage
Age [in years]		
15	1	0.11
16 - 17	700	73.84
18 - 19	213	22.47
20 and above	34	3.59
Mean: 17.29 SD: 1.07		
Gender		
Female	527	55.59
Male	421	44.41
Track Enrolled		
Academic	691	72.89
TVL	257	27.11
Strand		
ABM	162	17.09
Cookery	27	2.85
Dressmaking	24	2.53
AIM	46	4.85
SPAS	19	2.00
GAS	193	20.36
HUMMUS	136	14.35
ICT-CSS	36	3.80
STEM	203	21.41
Tourism	102	10.76
Final Grade in Grade 10 Mathematics		

75 – 79 [Fairly Satisfactory]	110	11.60
80 – 84 [Satisfactory]	225	23.73
85 – 89 [Very Satisfactory]	352	37.13
90 – 100 [Outstanding]	261	27.53
Mean: 86.05 SD: 4.87		
F. Type of School		
Private	191	20.15
Public	757	79.85

It is shown in Table 1 that the mean age of the respondents is 17.29 with a standard deviation of 1.07. Likewise, the modal age of the respondents is between 16 to 17, which has 700 respondents, about 73.84 percent. The data implies that students mainly belong to a adolescent age group in the three school respondents.

Regarding gender, Table 1 shows that most respondents are female, which is 527 respondents (55.59%), over the males with 421 (44.41%) respondents. The data implies that students enrolled in the three school respondents are primarily females who are into blended learning modality during the pandemic. Traditional didactic teaching and online learning have been updated and gradually superseded by blended learning as the digital era has progressed.

Lin et al. (2016) discovered that male students and high-ability students were more motivated in a blended learning setting. After experiencing blended learning, students gave excellent feedback on the Moodle learning platform for mathematics.

Also, Table 1 shows that most respondents are enrolled in the academic track comprising 691 respondents (72.89%) and enrolled in TVL, with 257 respondents (27.11%). The data implies that more students opted to enroll in the academic track in the three school respondents while a lesser number of students enrolled in the TVL track.

Moreover, Table 1 also shows that the mean final grade in mathematics is 86.05 and interpreted as Very Satisfactory with a standard deviation of 4.87, indicating that the grades are quite spread out. Likewise, the modal final grade attained by the respondents is between 85 to 89 (Very Satisfactory), which has 352 respondents (37.13%). The data implies that most students have Very Satisfactory final grades during their Grade 10 mathematics in the three school respondents, while only a few belonged to the lowest grade attained.

Also, in terms of the type of school graduated, most of the respondents came from public high schools, with 757 respondents (79.85%).

According to Attard and Holmes (2020) that the effect of the Covid-19 pandemic has positively and negatively affected learners and instructors. Most of the opinions disclosed the disadvantages of education in the pandemic period.

Perceived confidence in learning Mathematics

The perceived confidence in learning mathematics was also determined. Weighted means and standard deviations were computed. Table 2 shows the results of this.

Table 2. Perceived confidence in learning mathematics

#	Indicators	Mean	StDev	Interpretation
1.	I am positive that I can learn mathematics.	3.09	0.6461	Moderately Confident
2.	Generally, I have felt confident about attempting mathematics.	2.85	0.5897	Moderately Confident
3.	Even though I study, math seems unusually hard for me for other reasons.	2.84	0.7525	Moderately Confident

4.	I can get good grades in mathematics.	2.80	0.6408	Moderately Confident
5.	I am not the kind of student to do well in math.	2.72	0.7355	Moderately Confident
6.	Most subjects I can handle o.k., but I have a knack for flubbing up math.	2.70	0.7733	Moderately Confident
7.	I do not think I could perform advanced mathematics.	2.66	0.7285	Moderately Confident
8.	I am no good at math.	2.62	0.7680	Moderately Confident
9.	I am confident I could do advanced work in mathematics.	2.56	0.7060	Moderately Confident
10.	I think I could handle more challenging mathematics.	2.46	0.7350	Confident
11.	Math has been my worst subject.	2.39	0.9252	Confident
12.	I have a lot of confidence in mathematics.	2.38	0.7895	Confident
	Aggregate Mean:	**2.67**		**Moderately Confident**

Mean Range: 1.00-1.74 Not Confident; 1.75-2.49 Confident; 2.50-3.24 Moderately Confident; 3.25-4.00 Very Confident

Table 2 shows the respondents were Moderately Confident in learning Mathematics with an aggregate mean of 2.67. Specifically, the indicator "I am positive that I can learn mathematics" got the highest mean of 3.09 (Moderately Confident) with a standard deviation of 0.6461. While the indicator, I have a lot of confidence in mathematics, got the lowest mean of 2.38 (Confident) with a standard deviation of 0.7895. The table implies that the students have positive attitudes towards learning mathematics. This can be achieved by providing the students with the quality of teaching by the subject teacher in as much as providing them with plenty of example problems solved with a variety of topics.

COVID-19 pandemic has caused severe and sudden changes in learning (Heng & Sol, 2021; Wang & Zhao, 2020). In response, the educational system has done possible measurements to provide quality education for the students. On top of those innovations is the implementation of online instructions as a teaching and learning modality; however, technology and the internet are concerned in the country's reality. Different stakeholders face different issues and challenges, like the teachers and the students (Assunção Flores & Gago, 2020). Thus, it is appropriate to know and understand their readiness and attitude as significant references in creating relevant policies in continuing education.

Perceived usefulness of Mathematics

The perceived usefulness of mathematics was also determined. Table 3 shows the results of the perceived usefulness of mathematics to the respondents.

Table 3. Perceived usefulness of mathematics of the respondents

#	Indicators	Mean	StDev	Interpretation
1.	Understanding mathematics will help me earn a living.	3.26	0.6461	Very Useful
2.	I will need mathematics for my future work.	3.20	0.5897	Moderately Useful
3.	I study mathematics because I know how beneficial it is.	3.20	0.7060	Moderately Useful
4.	Mathematics is a worthwhile and necessary subject.	3.06	0.7350	Moderately Useful

5.	I will utilize mathematics in many ways as an adult.	3.03	0.7895	Moderately Useful
6.	I will need a firm understanding of mathematics for my future work.	2.84	0.6408	Moderately Useful
7.	I hope to have little use for mathematics when I get out of school.	2.55	0.9252	Moderately Useful
8.	As an adult, I perceive mathematics as a topic that I will rarely utilize.	2.53	0.7355	Moderately Useful
9.	Mathematics is not essential to my life.	2.16	0.7680	Useful
10.	I do not have to do well in mathematics in high school in my adult life.	2.13	0.7733	Useful
11.	Mathematics will not be necessary to me in my life's work.	2.12	0.7285	Useful
12.	Taking mathematics is a waste of time.	1.90	0.7525	Useful
	Aggregate Mean:	**2.67**		**Moderately Useful**

Mean range: 1.00-1.74 Not Useful; 1.75-2.49 Useful; 2.50-3.24 Moderately Useful; 3.25-4.00 Very Useful

The results revealed in Table 3 shows the senior high school students perceived Mathematics as Moderately Useful, obtaining an aggregate mean of 2.67. Specifically, the indicator, "Understanding mathematics will help me earn a living", got the highest mean of 3.26 (Very Useful) with a standard deviation of 0.6461. While the indicator, "Taking mathematics is a waste of time", got the lowest mean of 1.90 (Useful) with a standard deviation of 0.7525. The result implies that the students have confidence in learning mathematics and that knowing the subject will help them earn a living. Salingay and Tan (2018) confirm this finding by stating that students exhibit good attitudes toward mathematics and recognize its importance in their daily lives. Andamon and Tan (2018) discovered that students' attitudes about mathematics significantly impact their math performance. This means that the better one's attitude toward mathematics, the better one's mathematical performance. The study of Capuno et al. (2019) revealed that the students had a positive attitude towards mathematics. At the same time, they had unbiased behavior regarding their self-reliance, happiness, and enthusiasm for mathematics.

Level of attitude of the respondents towards blended learning

This research also determined the attitude of the respondents towards blended learning. The results are given in Table 4.

Table 4. Respondents' attitudes towards blended learning

#	Indicators	Mean	StDev	Interpretation
1.	Face-to-face learning, in my opinion, is more effective than internet learning.	3.28	0.8271	Strongly agree
2.	I respect opinions and information provided by others in online communities.	3.05	0.7242	Agree
3.	Completing exercises online is difficult.	2.86	0.6244	Agree
4.	I would like unlimited access to lecture materials.	2.84	0.7678	Agree
5.	Technology must be utilized in the classroom, in my opinion.	2.79	0.7616	Agree
6.	I find it very difficult to study online.	2.79	0.8301	Agree
7.	I would love lecture time in the classroom to be reduced.	2.73	0.7989	Agree

8.	Understanding the instructions of online exercises is easy.	2.69	0.7506	Agree
9.	In an online environment, I am more prone to miss assignment deadlines.	2.69	0.7745	Agree
10.	I can express myself online through my writing.	2.62	0.8326	Agree
11.	I'd like to communicate with my lecturer via the internet.	2.61	0.7792	Agree
12.	In order to complete assignments, I can work well with a virtual team.	2.61	0.8205	Agree
13.	I am assured of my ability to use Web technologies to share information with others.	2.61	0.7932	Agree
14.	I do not oppose having my lessons online.	2.59	0.7423	Agree
15.	I can communicate effectively with others using online technologies (e.g., email, chat, discussion board.)	2.53	0.8336	Agree
16.	Online learning helps me be more responsible for my studies.	2.49	0.8748	Disagree
17.	I love online learning as it provides richer instructional content.	2.41	0.6905	Disagree
18.	Online learning encourages me to prepare well for my studies.	2.39	0.8123	Disagree
19.	When I study online, I am more organized.	2.38	0.7977	Disagree
20.	I would love to have my classes online rather than in the classroom.	2.10	0.8202	Disagree
	Aggregate Mean :	**2.65**		**Agree**

Mean Range: 1.00-1.74 Strongly disagree; 1.75-2.49 Disagree; 2.50-3.24 Agree; 3.25-4.00 Strongly agree

Table 4 shows that the indicator, "Face-to-face learning, in my opinion, is more effective than internet learning", got the highest mean of 3.28 (Strongly Agree) with a standard deviation of 0.8271. While the indicator, "I would love to have my classes online rather than in the classroom", got the lowest mean of 2.10 (Disagree) with a standard deviation of 0.8202. The result shows that the students prefer face-to-face classes to blended learning, which DepEd mandated for all public national high schools as a learning modality to handle classes amidst the Covid-19 pandemic. The study of Mali and Lim (2021) revealed that students prefer face-to-face classes despite some limitations in the learning modality. Ejoh (2020) study revealed a positive influence on mathematics students' motivation, attitude, and achievement when technology is embedded in classroom instruction. Awofala et al. (2020) explained that an extensive literature review aligned with this study's findings of the positive influence teachers' higher technology use had on students' motivation, attitudes, and achievement.

Significance of the relationship between mathematics performance and level of attitude towards mathematics

In order to determine the significance of the relationship between the level of attitude towards mathematics and the mathematics performance of the students, the Chi-square test of independence was used at an $\alpha = 0.05$ level of significance. Table 5 exemplifies the results of the test.

Table 5. Significance of the relationship between the level of attitude towards mathematics and mathematics performance

Variables	Computed Chi-square	df	Critical Value	Decision	Significance
Functions and Relations					
Confidence in Learning Mathematics	14.796	12	21.026	Ho accepted	Not significant
Usefulness of Mathematics	22.470	12	21.026	Ho rejected	Significant
Overall Mathematics Attitude	12.204	12	21.026	Ho accepted	Not significant
Exponential Functions					
Confidence in Learning Mathematics	17.579	12	21.026	Ho accepted	Not significant
Usefulness of Mathematics	34.559	12	21.026	Ho rejected	Significant
Overall Mathematics Attitude	24.906	12	21.026	Ho rejected	Significant
Simple and Compound Interests					
Confidence in Learning Mathematics	13.760	12	21.026	Ho accepted	Not significant
Usefulness of Mathematics	7.889	12	21.026	Ho accepted	Not significant
Overall Mathematics Attitude	8.323	12	21.026	Ho accepted	Not significant
Overall Mathematics Performance					
Confidence in Learning Mathematics	9.982	12	21.026	Ho accepted	Not significant
Usefulness of Mathematics	15.781	12	21.026	Ho accepted	Not significant
Overall Mathematics Attitude	15.498	12	21.026	Ho accepted	Not significant

The data in Table 5 reveals a significant relationship between perceived usefulness of mathematics and mathematics performance in functions and relations; that is, the computed Chi-square value of 22.470 is significantly greater than the critical value of 21.026 at a df of 12. Also, Table 5 reveals a significant relationship between the perceived usefulness of mathematics and the mathematics performance in exponential functions and relations with a computed Chi-square of 34.559 which is greater than the critical value of 21.026. Finally, the overall mathematics attitude had a significant relationship to the mathematics performance in exponential functions with a computed Chi-square value of 24.906 which is greater than the critical value of 21.026 with a df = 12 and at an $\alpha = 0.05$.

In the study by Soesanto and Dirgantoro (2021), they suggested that the Covid-19 pandemic opens the door for researchers to contribute more to online mathematics learning. During the pandemic, the various impact and casualties affect students' performance in learning mathematics.

Significance of the relationship between level of attitude towards blended learning and mathematics performance

The study hypothesized that the profile of the respondents has no significant relationships with the level of attitude towards blended learning. The Chi-square was used to test this hypothesis $\alpha = 0.05$ level of significance. Table 6 presents the results.

Table 6. Significance of the relationship between attitudes towards blended learning and mathematics performance

Paired Variables	Computed Chi-square	df	Critical Value	Decision	Significance
Attitudes Towards Blended Learning and mathematics performance in					
Functions and Relations	23.860	12	21.026	Ho rejected	Significant
Exponential Functions	27.330	12	21.026	Ho rejected	Significant
Simple and Compound Interests	17.621	12	21.026	Ho accepted	Not significant
Overall Mathematics Performance	7.801	12	21.026	Ho accepted	Not significant

Table 6 reveals a significant relationship between the attitudes towards blended learning and the mathematics performance in Functions and Relations and Exponential Functions. The computed Chi-square values of these variables are significantly higher than the critical values at a df of 12. The data imply that the attitudes towards blended learning correlate with the students' mathematics performance. Aldalalah et al. (2019) found out that Mathematics learning facilitated blended learning improves cognitive and metacognitive skills of high students.

Valdez and Dominado (2020) suggested that DepEd Order No. 8, series 2015, Enhanced Basic Education Act of 2013 (Republic Act No. 10533), DepEd embraces the enclosed Policy Guidelines on Classroom Evaluation for the K to 12 Basic Education Program**.** Classroom Assessment is an integral part of the learning development of the school and the classroom.

Significance of the difference between level of attitude towards mathematics and profile

In order to test the significance of the difference between the level of attitude towards mathematics and the profile variables namely age, gender, track, strand, final grade in mathematics and type of school, the Analysis of Variance was used. Table 7 shows the results and reveals that when grouped by its gender, track and strand, final grade in Grade 10 mathematics, and type of school [public or private], the perceived level of attitudes towards the mathematics of the Grade 11 senior high school students differ from each other for the following all profile variables except age. Gender, track, strand, final grade in Grade 10 Math and type of school significantly differed in the level of attitude towards Mathematics since the computed p-values are lesser than p = 0.05. The data imply that the students' attitudes towards mathematics vary when grouped by these variables: gender, track, and strand, final grade in Grade 10 mathematics, type of schools.

Table 7. Significance of the difference in the level of attitude toward mathematics when grouped by its profile

Paired Variables	Computed F-Value	P-Value	Decision	Significance
Level of Attitude Towards Mathematics and Profile Variables				
Age	0.83	0.593	Ho accepted	Not significant
Gender	4.02	0.045	Ho rejected	Significant
Track	8.66	0.003	Ho rejected	Significant

Strand	5.78	0.000	Ho rejected	Significant
Final Grade in Grade 10 Math	3.38	0.000	Ho rejected	Significant
Type of Schools	104.21	0.000	Ho rejected	Significant

Several studies have been done on the learning environment, and the findings have shown a consistent relationship between the classroom environment and students' cognitive and affective outcomes (Radovan & Makovec, 2015; Yerdelen, 2013; Maat & Zakaria, 2010).

The teacher's factor plays a vital role in affecting students' attitudes towards mathematics. The students seek teachers' understanding of their capability in learning mathematics (Bishara, 2021; Todd Brown, 2005). Good mathematics teachers should have the criteria, including engaging students in learning mathematics and having profound mathematical understanding.

Significance of the difference between level of attitude towards blended learning and profile

The Analysis of Variance was used in order to test the significance of the difference between the level of attitude towards blended learning and the profile variables namely age, gender, track, strand, final grade in mathematics and type of school. Table 8 shows the results and reveals that when grouped by its gender, track and strand, final grade in Grade 10 mathematics, and type of school [public or private], the perceived level of attitudes towards the mathematics of the Grade 11 senior high school students differ from each other since the computed p-values are lesser than 0.05. The data imply that the students' attitudes towards mathematics vary when grouped by these variables: gender, track, and strand, final grade in Grade 10 mathematics, type of schools.

Table 8. Significance of the difference in the level of attitude toward blended learning when grouped by its profile

Paired Variables	Computed F-Value	P-Value	Decision	Significance
Level of Attitude Towards Blended Learning and Profile Variables				
Age	2.49	0.008	Ho rejected	Significant
Gender	1.59	0.207	Ho accepted	Not significant
Track	1.23	0.267	Ho accepted	Not significant
Strand	15.01	0.000	Ho rejected	Significant
Final Grade in Grade 10 Math	4.10	0.000	Ho rejected	Significant
Type of Schools	186.49	0.000	Ho rejected	Significant

Table 8 reveals that when grouped by age, strand, final grade in Grade 10 mathematics, and type of schools [public or private], the perceived attitudes towards blended learning of Grade 11 senior high school students significantly differ for the variables age, strand, final grade in Grade 10 Math and type of school. Gender and track enrolled in by the students did not have a significant difference in the level of attitude toward blended learning. This means that both male and female have the same level of attitude toward blended learning. The same goes for the track the student enrolled in as

well as. Research shows that students' attitude toward blended learning has significant differences when grouped by age, strand enrolled, final grade in Grade 10 mathematics, and the type of schools the students graduated in the senior high school (Aksan, 2021; Salayo et al., 2020).

VI. CONCLUSION

This study concludes that COVID-19 affected the mathematics performance of the Grade 11 senior high school students in the three identified senior high schools. This expected trend is generally affected by the loss of contact of the Grade 11 students with their teachers, and they prefer to have a face-to-face interaction with them. Thus, engaging students in blended learning somehow hurts students' learning in mathematics, and preparing them for examinations will possibly affect their performance in general. The mathematics performance reveals that most struggle to pass the three topics examination. The results also emphasize that when grouped by their profile, the students have positive attitudes towards blended learning and differ only in the type of schools the students are enrolled in during the COVID-19 pandemic.

VII. RECOMMENDATIONS

The researchers strongly recommend that the action plans be implemented, monitored, and evaluated to improve the mathematics performance of Grade 11 students amid the COVID-19 pandemic.

Disclosure statement

The authors reported no potential conflict of interest.

Statements and Declarations

All authors have completed and presented this study in the College Research Center of Cebu Technological University for Disclosure of Potential Conflicts of Interest. The College Research Center supports the publication of this research article. No other disclosures were reported.

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