

Comparative Study on the Influence of Remote Learning in Teaching Mathematics in the Modern World

Nurvin A. Mamalinta

*Master of Arts in Teaching Mathematics Program, Sultan Kudarat State University, Tacurong City,
Sultan Kudarat, Philippines*

Email of Corresponding Author: denurvz1925@gmail.com

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Abstract

This study examined the extent of influence of remote learning modalities (online class, modular method, and blended class) and delivery methods (self-learning, ability to conceptualize mathematics, and academic achievement) on mathematics education among second- to fourth-year nursing students at Sultan Kudarat State University – ACCESS Campus. Anchored on Dewey's Theory of experiential growth through environmental interaction, the research employed a descriptive-correlational quantitative design. Data were gathered from 200 respondents selected through convenience sampling via a five-point Likert-scale questionnaire. Findings showed very high influence for online class (mean 3.43) and blended class (mean 3.52), and high influence for modular method (mean 3.33), yielding an overall remote-learning mean of 3.43. Delivery methods registered moderate influence for self-learning (mean 3.29) and high influence for ability to conceptualize (mean 3.54) and academic achievement (mean 3.50), with an overall mean of 3.44. Pearson correlations indicated low associations for online ($r = 0.40$) and modular ($r = 0.45$) modalities and a moderate positive association for blended class ($r = 0.53$) and overall remote learning ($r = 0.58$) with delivery methods; all relationships were statistically significant and the null hypothesis was rejected. The study concludes that remote learning significantly contributes to the effectiveness of mathematics delivery methods. Recommendations include peer interactions, critical-thinking questions, interactive technologies, enhancement programs, and replication by future researchers. The work aligns with SDG 4 (Quality Education) by strengthening continuous mathematics learning under crisis conditions and with SDG 3 (Good Health and Well-Being) through support for nursing-student competence. It advances educational and institutional sustainability by informing adaptive delivery strategies suited to resource-limited rural campuses.

Keywords: Academic Achievement; Ability to Conceptualize Mathematics; Blended Class; Delivery Methods; Mathematics Education; Modular Method; Online Class; Remote Learning; Self-Learning

1. Introduction

Application of mathematics depends on experience for decisions in many fields of work using mathematical data in calculating finances as well as production of the future in the modern world of academic, business, and government field of activity. The significant shifts in education started in the unprecedented period of the COVID-19 pandemic era which needed to obligate a rapid transition to remote learning environments, creating an unprecedented natural experiment in educational delivery, particularly in mathematics instruction. The traditional classroom setting has been increasingly augmented by digital tools like the dawn of artificial intelligence. Global events, particularly climate change, is increasingly the leading factor to adapt remote learning class. Rising temperatures due to heat waves lead to early dismissal of the class. Predicted heavy rains coming lead to

cancellation of class and shift to remote learning. Ensuring continuity of learning during crisis and also addressing various learning environments and optimizing teaching strategies to improve learning outcomes (Salleh et al., 2023).

Transformed education, shifting teaching methods beyond traditional ones has affected the learning activity of the students from classroom to home or outside the classroom; lack of opportunities in planning, implementation as well as evaluation of learning is another problem caused by a pandemic. It also causes worldwide disruption and losses of math learnings. The challenges of remote learning among mathematics teachers are to develop innovation in outside school setting in learning skills and expertise in mathematics. Developing skill is necessary to continue learning remotely supporting others when it comes to digital technologies.

Remote learning in the new normal is important to all students who lack access to basic education facilities that will offer an opportunity to learn mathematics in their environment most effective to them and improve their learning capability; both online and modular methods can be used. Moreover, it is no longer difficult to access different tools such as Google Slide in teaching mathematics remotely that will enhance learning. Various technologies will be used to facilitate the student-teaching physical separation in terms of online connection. Thus, one ought to look into or ascertain the efficiency of the new normal's educational delivery strategy. It is necessary to investigate or to determine the effectiveness of the delivery method of education in the new normal.

While several researches have examined the influence of remote learning education in urban settings, limited study focuses on how it affects students in rural and remote areas. Furthermore, the instructional delivery method of the effectiveness of mathematics education has evidence of insufficiency, such as synchronous, asynchronous, and hybrid models. Filipino teachers have adopted remote learning methods, including selecting suitable modalities, alternative teaching approaches, and community involvement. New assessment methods like online quizzes and open-book exams evaluate student understanding (Oranggaga, 2022). This project sought to investigate how remote learning affected the effectiveness and efficiency of many delivery strategies for mathematics education in the second year to fourth year nursing students of the College of Health and Sciences of Sultan Kudarat State University – ACCESS Campus. The research will compare student outcomes and teacher experiences across various instructional approaches. This campus is characterized by limited access to technology and educational resources, making it an ideal setting to examine the challenges and opportunities of remote learning in math education.

The phrase “remote learning” is frequently used in place of the terms “online learning,” “distance learning,” and “electronic e-learning.” If either partner has inadequate internet access, remote learning can be delivered asynchronously, with students and lecturers online at separate times and places, or synchronously, with both parties online at the same time because they are geographically distant from their teachers; students who engage in remote learning require internet-connected electronic devices, including laptops, tablets, desktop computers, and cellphones (Salleh et al., 2023; Nketekete et al., 2021). There are several ways to teach remote learning, ranging from modern digital and internet resources to more traditional take-home materials like books. Online tutors, television, radio, and cell phones are all practical ways to facilitate remote learning (Syahrudin et al., 2021; Muñoz-Najar et al., 2021). Because of the potential advantages—such as increased flexibility, improved experience, personalized learning, and easier access to distance learning resources—university students are urged to pursue remote learning (Kamble et al., 2021).

There were concerns that there are several ways in which learning mathematics outside of the classroom could compromise inquiry-based approaches, especially with regard to mathematics education (Kalogeropoulous et al., 2021). Video technology, particularly instructional movies that may be prepared ahead of time and shared via a weblink, works best when clear explanations are followed by repeated practice. In contrast, inquiry-based approaches to mathematics education require student-centered, mathematically rigorous discussions that draw from students' project-based experiences. Emergency distance teaching is the term used to describe the process of instruction and learning that took place in a distant learning environment as a result of the unanticipated and unplanned COVID-19 outbreak. This was brought on by the crisis-related temporary switch to alternate delivery modalities for education. As a result, it was essential to set up temporary solutions right away in order to continue and enable instruction despite the spatial distance (Murni et al., 2023; Barlovits et al., 2021). Teachers all over the world are rapidly reconstructing their teaching methods, mostly by means of the internet and digital media, in order to develop new teaching strategies and find answers to upcoming issues in order to preserve the teaching and learning process as a whole (Barlovits et al., 2021). The ability to learn remotely, regardless of time or place, has grown more and more important as a result of the worldwide epidemic, which has forced many schools to close and placed various restrictions.

During the pandemic, the quick switch from in-person to fully online instruction presented serious difficulties for both teachers and students. Creating online learning strategies and courses that supported conventional approaches was one of the most difficult parts of creating a positive learning environment and student activities. In online learning courses, it is not necessary for students to be online on the same day and at the same time as the teacher and fellow students; rather, students are in charge of going over the content and doing the assignments at their own pace (Angwaomaodoko, 2024). Since the majority of primary and high school pupils lack internet access, they utilized modules. Students were provided with self-learning modules that covered the fundamental skills for every subject at home (Dargo & Dimas, 2021). Students required assistance in comprehending the self-learning modules, time management, and finding pertinent resources (Insorio & Macandog, 2022). Modular distance

learning has exacerbated students' poor performance; parents expressed displeasure with difficult lessons and the amount of time given to children's work (Soria & Naparan, 2022). Challenges in modular instructional materials included students' approach to comprehending the lesson, credibility problems when completing worksheet tasks, inadequate internet connectivity, and excessive workloads (Oranggaga, 2022).

Online learning techniques and conventional in-person instruction are used in blended learning. In the post-COVID-19 age, it is a very effective substitute and provides a way to maintain the safe distance that the COVID-19 pandemic requires. Flexibility, student motivation, cost effectiveness, individualized learning, and enhanced academic achievement are just a few of the many academic benefits that blended learning provides (Angwaomaodoko, 2024). The Philippines' Department of Education and the Commission on Higher Education adopted a flexible blended learning paradigm; CHED (2020) defines flexible learning as program delivery and learning interventions that consider each learner's particular needs, whether or not technology is used (Nolasco, 2022). Blended learning techniques have the ability to improve relevant learning experiences' efficacy and efficiency (Raouna, 2024). There are two categories of technology used in distance learning: synchronous and asynchronous. Advantages include access flexibility and support for constructivist instructional design; disadvantages include challenges in practical skills, digital literacy gaps, and unequal learning chances (Alabdulaziz & Tayfour, 2023). The hybrid education technique, also known as blended learning, can have a number of effects and advantages when used to teach mathematics in higher education (Ayob & Hamada, 2024). Teachers of online mathematics courses invest time in creating a culture of cooperation through a community of inquiry.

A comparative analysis of students' mathematical performance in online, blended, and in-person instruction during the COVID-19 pandemic showed no discernible difference in the scores of students in the three modalities in basic math to calculus (Natarajan & Sulaimi, 2022). Teachers use WhatsApp and Google Classroom as instructional materials to send assignments; video can be used to record experiments. Students in an online course are taught via the web-based classroom; online learning refers to any instructional approach that uses digital technology. YouTube emerged as a popular means of distributing educational materials. Facebook owns the cross-platform messaging service WhatsApp Messenger, used in instructional WhatsApp Groups.

The study was conducted among nursing students at Sultan Kudarat State University – ACCESS Campus in EJC Montilla, City of Tacurong, Sultan Kudarat, an area characterized by limited access to technology and educational resources and composed of diverse students with different cultures and tribes. Filipino teachers have adopted remote learning methods, including selecting suitable modalities, alternative teaching approaches, and community involvement (Oranggaga, 2022). Nationally, the Philippines' Department of Education and the Commission on Higher Education adopted a flexible blended learning paradigm (Nolasco, 2022). Globally, the COVID-19 pandemic forced a rapid transition to remote learning, while climate change—through heat waves and heavy rains—increasingly necessitates remote modalities (Salleh et al., 2023).

This research is based on Dewey's Theory that individuals grow as they engage with the outside world. Through interactions with their environment, people pick up new concepts, ideas, and behaviours that help them develop their own understandings, which they then progressively solidify through education and social interactions. The independent variable is the extent of influence of remote learning in teaching mathematics in terms of online class, modular class, and blended class. The dependent variable is the extent of influence of delivery method in teaching mathematics in terms of self-learning, ability to conceptualize mathematics, and academic achievement.

While several researches have examined the influence of remote learning education in urban settings, limited study focuses on how it affects students in rural and remote areas. Furthermore, the instructional delivery method of the effectiveness of mathematics education has evidence of insufficiency, such as synchronous, asynchronous, and hybrid models. The study addresses these gaps by investigating the influence of remote learning modalities on mathematics education specifically among second- to fourth-year nursing students at a campus with limited technology access, comparing outcomes across online, modular, and blended approaches, and examining relationships with self-learning, conceptualization, and academic achievement.

The study aligns primarily with SDG 4 (Quality Education) by examining how remote, online, modular, and blended modalities can sustain and improve mathematics learning continuity, engagement, and outcomes under crisis conditions. It also supports SDG 3 (Good Health and Well-Being) through its focus on nursing students whose mathematical competence underpins professional preparation in health sciences. SDG 9 (Industry, Innovation and Infrastructure) is relevant through the evaluation of digital tools and delivery innovations that enable education when physical infrastructure is disrupted. SDG 13 (Climate Action) connects to the recognition that climate-driven events (heat waves, heavy rains) increasingly necessitate remote learning adaptations. SDG 17 (Partnerships for the Goals) is reflected in the collaborative roles of teachers, students, administration, and future researchers in refining remote mathematics education.

The research contributes to educational sustainability by identifying effective remote delivery methods that maintain mathematics learning when traditional classrooms are inaccessible. It advances technological and digital sustainability through assessment of online platforms, modular materials, and blended approaches that reduce dependence on continuous physical infrastructure. Socio-economic and institutional sustainability are supported by informing teacher practices, administrative planning, and policy-relevant strategies for resource-limited rural campuses. Public health sustainability is reinforced by strengthening the mathematical foundations of future nurses. Community and cultural sustainability are addressed by examining modalities suited to diverse student

populations in settings with limited technology access, while innovation-oriented findings promote adaptive, resilient educational systems capable of responding to both pandemic and climate disruptions.

2. Material and methods

2.1 Research Design

A descriptive correlational research design was employed. This design makes no attempt to predict future occurrences or establish causal relationships between variables. Rather, its primary goal is to provide an accurate and comprehensive depiction of the data gathered. Descriptive research is fundamental to the scientific process in general and education research in particular. It aids in the description of samples in research projects that seek to pinpoint causal relationships (Hassan, 2024). Large volumes of data about people's experiences, opinions, and attitudes can be effectively gathered through surveys. In this study, the correlational research design was used to examine the relationships between these delivery methods and the influence of math education in the new normal. The research employed a quantitative methodology, specifically a descriptive study. Creswell (2002) stresses that a quantitative approach study is the right method to use in the study with numerical valuation. It is the procedure for compiling the information and data that are available for the investigation and analyzes and interprets the results.

2.2 Locale of the Study

The precise place where the research was carried out is referred to as the study's site. According to Creswell (2014), the locale of a study is a crucial component of the study plan since it serves as the location for data collecting. In this study, the locale was a specific educational institution that has implemented remote learning for mathematics instruction. This study was conducted in EJC Montilla, ACCESS Campus, City of Tacurong, Sultan Kudarat. Selected nursing students who transitioned to remote learning due to the new normal were chosen. The school was chosen based on its implementation of different delivery methods for mathematics instruction in a remote learning environment. The area of research is composed of diverse students with different culture and tribes. The selection of the locale is crucial as it provided the necessary data for the research. It was anticipated that the selected location would provide a thorough grasp of how distant learning affects math education as well as the efficacy and efficiency of various delivery systems for math instruction in the dawn of a new normal. The academic year 2024–2025 was when this study was carried out.

2.3 Respondents of the Study

The target population in this study is a particular group of people from whom information was gathered. This aligns with the concept presented by Traugott (1987), who emphasized the importance of persistence in respondent selection for surveys. The target population for this study was randomly selected second-year college to fourth-year students of the College of Health and Science Nursing of Sultan Kudarat State University ACCESS Campus. The success of the study depends on their comprehension and desire to take part. The respondents for this research were chosen from the aforementioned school, totaling 200 respondents chosen through a convenience sampling method.

2.4 Sample and Sampling Procedure

Bhardwaj (2019) describes sampling as the process of choosing a sample from a broad population for a particular study goal. When surveying a whole population would be too costly and time-consuming, this approach is frequently used. The study target population consisted of nursing students from second year to fourth year. The respondents for this study were selected from this school, totaling 469 respondents chosen through a convenience sampling method where researchers selected participants based on their accessibility and availability.

2.5 Research Instrument

According to Mwita (2022), questionnaires are a common tool for data collection in research. They consist of questions or statements that respondents answer to provide the information needed to achieve the research objectives. The main tool utilized to collect data for this study was a questionnaire. Nursing students in their second through fourth years were given it. The respondents answered the questionnaire using a five-point Likert scale with the following verbal descriptions: 5 for Strongly Agree, 4 for Agree, 3 for Moderate Agree, 2 for Disagree, and 1 for Strongly Disagree.

2.6 Data Gathering Procedure

Considering the study's objectives, a methodical process was employed to get the necessary information. The purpose of this process is to guarantee the correctness and dependability of the information gathered. A legal letter of authorization was acquired to carry out the research. The relevant official at the Dean's office received the letter. The researcher personally handled the distribution and collection of the questionnaires. This direct involvement ensures that the process is carried out effectively and that any questions or concerns from the respondents can be addressed promptly. After the data collection, the responses were analyzed to answer the research inquiries. The analysis considered the influence of remote learning on mathematics education and the

influence of different delivery methods for mathematics in the modern world instruction in the new normal. The systematic data collection procedures included establishing validity and reliability of the research instrument, obtaining approval to carry out the study from the Graduate School, Division, and District, distribution of the questionnaires, and data retrieval.

2.7 Data Analysis Techniques

As Goniwada (2023) explains, data analysis provides valuable insights based on the objectives and questions chosen for a study. It involves a framework consisting of steps, patterns, relationships, and trends in the data. The degree of utilization of remote learning techniques in mathematics instruction during the new normal was objectively measured in this study using descriptive statistics like the mean. A statistical technique that makes it possible to assess opinions or subjective data objectively and provides a foundation for comparison is the mean. The mean was utilized to ascertain the degree of impact that remote learning has on teaching mathematics in the modern world. Furthermore, the association between the applications of remote learning in mathematics education was investigated using correlation analysis. The mean was used to calculate the degree of remote learning modalities on teaching mathematics in the modern world metrics. Mean was also used to determine the extent of influence of delivery method in teaching mathematics in the modern world. To determine the relationship between the extent of remote learning modalities in mathematics education and the influence of delivery method in teaching mathematics in the modern world, Pearson correlation was used.

3. Results and Discussion

3.1 Extent of Influence of Remote Learning Modalities

3.1.1 Online Class

The section mean for online class was 3.43 with a standard deviation of 0.91, interpreted as very high influence. Technical issues such as internet connectivity and software problems recorded the highest mean of 4.11 (SD 0.98). Quality of interaction with instructors followed at 3.62 (SD 0.93), and reduced opportunities for hands-on or practical learning scored 3.58 (SD 0.92). The lowest mean was 2.83 (SD 0.95) for ease of concentration during online classes compared with in-person classes.

The result is in accord with the study of Cai et al. (2023). They found out that technology-rich learning environments (TREs) has a medium to large positive effect on learning outcomes. Also, the result is in harmony with the study of (Yi et al., 2024; Hu, 2024), which states that AI tools can tailor educational content to individual needs, simplifying complex information and enriching learning experiences.

3.1.2 Modular Method

The section mean for modular method was 3.33 with a standard deviation of 0.76, interpreted as high influence. The highest mean of 3.65 (SD 0.93) was obtained for difficulty in asking questions or seeking clarification from teachers. The indicator that modular learning is less engaging compared with in-person or online classes scored 3.70 (SD 0.93), and negative impact on the learning experience scored 3.46 (SD 0.84). The lowest mean of 2.83 (SD 0.84) was recorded for motivation to complete studies compared with traditional classroom learning.

This reveals that the extent of influence of remote learning in teaching mathematics in terms of modular method have high influence. This suggest that there are challenges in using modular method among the respondents in remote learning in teaching mathematics. The result agrees with the study of Gaganao (2023), study showed that while most students were happy with the modular approach, however, there are challenges such as distractions, and reliance on answer keys were noted, suggesting areas for improvement in module design and support mechanism and addressing these factors can enhance the effectiveness of modular learning in Mathematics (Bag-o, Janiola, & Nabor, 2024).

3.1.3 Blended Class

The section mean for blended class was 3.52 with a standard deviation of 0.84, interpreted as very high influence. The highest mean of 3.75 (SD 0.83) was recorded for provision of a more flexible schedule. Ease of access to learning resources anytime scored 3.64 (SD 0.82). The lowest mean of 3.27 (SD 0.81) was obtained for the challenge of switching between online and in-person modes. It could be inferred that there is a high influence on blended class platform and it's a more convenient way in teaching mathematics in the modern world. The result is in accord with the study of Nwoke et al. (2017). They assessed the impact of blended e-learning effectively enhanced mathematical achievement of pre-service teachers. Also, Mawardi et al. (2023) found out that there is a revealing large effect of blended learning of the mathematical skills.

3.1.4 Summary of Remote Learning Influence

The overall mean for the extent of influence of remote learning was 3.43 with a standard deviation of 0.84, interpreted as very high influence. Online class registered a mean of 3.43 (SD 0.91), modular class 3.33 (SD 0.76), and blended class 3.52 (SD 0.84). Students experience high levels of engagement and support, enhancing their learning outcomes and satisfaction.

3.2 Extent of Influence of Delivery Methods

3.2.1 Self-Learning

The section mean for self-learning was 3.29 with a standard deviation of 0.87, interpreted as moderate influence. The highest mean of 3.50 (SD 0.90) was recorded for the perception that self-learning is less engaging compared with traditional teacher-led classes. Encouragement to solve problems independently scored 3.48 (SD 0.86). The lowest means of 3.12 (SD 0.84 and 0.95) were obtained for clarity of instructions and confidence in mastering concepts through self-learning. This means that the extent of influence of remote learning in teaching mathematics in the modern world have influence students in terms of self-learning. The result agrees with the study of Galan (2024). He highlighted that instructional delivery methods significantly influenced self-learning in mathematics and demonstrated positive impacts on student engagement and achievement. Further, students have gained attention by having them learn theoretical content independently and engage in practical application during class.

3.2.2 Ability to Conceptualize Mathematics

The section mean for ability to conceptualize mathematics was 3.54 with a standard deviation of 0.83, interpreted as high influence. The highest mean of 3.85 (SD 0.86) was recorded for the use of visual aids enhancing understanding of mathematical relationships. Struggle to break down complex problems without step-by-step guidance scored 3.73 (SD 0.85), and encouragement to think critically about why a formula works scored 3.70 (SD 0.82). This implies that there is high influence when it comes to understanding of mathematical relationships and the whys of formula or process, however, students struggle to break down complex math problems without step-by-step guidance. The result agreed to the study of Gün Sahin et al. (2023), suggesting that brief, focused learning sessions can be effective in teaching mathematical concepts. Students exposed to constructivist strategy showed significantly higher post test scores. This approach emphasizes active learning, where students construct their own understanding, leading to improved, conceptual grasp of mathematical concepts. However, there are students who find difficulty in visualizing and interpreting mathematical problems which is linked to a lacked of familiarity, with various problem representations such as visual, verbal, and symbolic forms (Ferrede, 2024).

3.2.3 Academic Achievements

The section mean for academic achievements was 3.50 with a standard deviation of 0.80, interpreted as high influence. Regular feedback from teachers recorded the highest mean of 3.68 (SD 0.80). Use of technology enhancing performance scored 3.59 (SD 0.89). The lowest mean of 3.23 (SD 0.82) was obtained for feeling less confident in mathematical abilities due to the way the subject is taught. Substantially, a section mean of 3.50 and a standard deviation of 0.80, verbally described as high influence of delivery method in teaching mathematics in terms of academic achievements. In harmony with the study of Meremikwu et al. (2023), integrating modern teaching strategies, including innovative technologies has yielded positive result to enhancing students' mathematical achievement. Tailoring differentiated instructional practices fosters engagement, motivation, and comprehension has proven effective in improving mathematics achievement among students (Vacalares, Elbanbuena & Comon, 2024).

3.2.4 Summary of Delivery Methods

The overall mean for the extent of influence of delivery methods was 3.44 with a standard deviation of 0.83, interpreted as high influence. Self-learning registered a mean of 3.29 (SD 0.87), ability to conceptualize 3.54 (SD 0.83), and academic achievements 3.50 (SD 0.80). The delivery method is highly effective, providing substantial support and engagement.

3.3 Relationships Between Remote Learning Modalities and Delivery Methods

3.3.1 Online Class and Delivery Methods

The Pearson correlation coefficient between the extent of influence of online class and the extent of influence of delivery methods was 0.40, with degrees of freedom 198, t-computed 15.63, and t-critical 1.96, interpreted as low (negative) correlation. The coefficient of determination was 16 percent. The t-computed value exceeded the critical value, leading to rejection of the null hypothesis. The results are in harmony to the study of Madrilejos (2024) found a significant low positive relationship between mathematics academic performance and online learning constructs highlighting the need to optimize online learning for enhanced mathematics academic performance. Also, a meta-analysis on the impact of online learning on mathematics revealed there is a small effect of online learning occurs in problem solving, a moderate effect occurs in learning outcomes, learning achievement, and concept understanding mathematics. This variation shows the different effects of the moderator variable on learning outcomes (Turmuzi & Lu'luilmaknun, 2023).

3.3.2 Modular Method and Delivery Methods

The Pearson correlation coefficient between the extent of influence of modular method and the extent of influence of delivery methods was 0.45, with degrees of freedom 198, t-computed 6.9, and t-critical 1.96, interpreted as low (negative) correlation. The coefficient of determination was 20 percent. The t-computed value exceeded the critical value, leading to rejection of the null hypothesis. The result is in accord with the findings of Meniano and Tan (2022) reveals that students faced significant difficulties in studying mathematics using self-learning modules.

Issues included inability to study independently, difficulty following instructions, and challenges in understanding concepts. A low correlation was also drawn from the findings of Crodua (2023) between modular learning modalities and students' mathematics performance.

3.3.3 Blended Class and Delivery Methods

The Pearson correlation coefficient between the extent of influence of blended class and the extent of influence of delivery methods was 0.53, with degrees of freedom 198, t-computed 8.7, and t-critical 1.96, interpreted as moderate positive (negative) correlation. The coefficient of determination was 28 percent. The t-computed value exceeded the critical value, leading to rejection of the null hypothesis. The findings are in harmony to the study of Indrapangastuti et al. (2021) demonstrated that students' mastery of mathematical ideas is improved by the blended learning paradigm, which is noticeably more successful than the traditional learning model. This indicates that students' mastery of mathematical ideas can be greatly enhanced by the use of integrated learning in mathematics. Further, Karmakar (2024) identified that self-directed blended learning has a positive impact on students' academic achievement.

3.3.4 Overall Remote Learning and Delivery Methods

The Pearson correlation coefficient between the extent of influence of remote learning and the extent of influence of delivery methods was 0.58, with degrees of freedom 198, t-computed 10.01, and t-critical 1.96, interpreted as moderate positive correlation. The coefficient of determination was 33.64 percent. The t-computed value exceeded the critical value, leading to rejection of the null hypothesis. The findings align with the study of Attard and Holmes (2020). According to research, using technology increases students' chances of participating in mathematics education through a variety of channels, offering personalized and differentiated learning strategies, dynamic concept manipulation and visualization, and different ways for students and teachers to communicate and provide feedback. Blended learning increase student-teacher relationships and enhanced learning attitudes, academic performance, and self-study skills (Tong, 2022). Additionally, it can improve kids' academic performance and engagement and set them up for success in the future while cultivating a welcoming and inclusive classroom environment that respects each student's unique learning preferences and requirements (Aguhayon, 2023). Thus, extent of integration of remote learning and effectiveness of delivery methods in mathematics enhances students learning outcomes.

3.4 Enhancement Program

Based on the data drawn from the respondents of the nursing students of SKSU-ACCESS Campus, the findings indicate remote learning have a significant impact on various teaching delivery methods in teaching mathematics. Thus, program enhancements and targeted activities focusing on diverse delivery techniques—such as online class, modular method, and blended class—is a vital tool. The initiatives formulated aim to align with contemporary educational practices and support students in cultivating essential skills for academic success, critical thinking, problem solving, and adaptability in a dynamic learning environment.

4. Conclusion & Recommendations

The study found a high extent of influence of remote learning in teaching mathematics in the modern world, with online class and modular method both interpreted as high influence and blended class as very high influence, resulting in better engagement and understanding through enhanced contact and support as well as strong levels of involvement that improved learning outcomes and satisfaction. The extent of influence of delivery methods was high for ability to conceptualize mathematics and academic achievement, indicating these approaches are highly effective in providing substantial support and engagement, while self-learning was moderate and fairly effective in supporting a balanced approach. Overall, the extent of remote learning in terms of online, modular, and blended class showed a moderately positive correlation with and significantly contributed to the effectiveness of the method of delivery of mathematics education.

Teachers should apply peer-to-peer interactions through group discussions and develop content according to students' preferences to improve concentration levels, use questions that encourage critical thinking and analysis to enhance motivation, and adopt interactive technologies such as AI enhancement programs to transform teaching and learning processes into a dynamic and competitive technology-driven world in light of the moderately positive correlation between remote learning and delivery methods. Schools should conduct the attached enhancement programs for additional topics related to other courses, and future researchers should repeat the work in their own contexts to further validate the extent of influence of remote learning and delivery methods in teaching mathematics in the modern world.

5. Compliance with ethical standards

A formal letter of authorization was secured and submitted to the Dean's office of the College of Health and Sciences prior to data collection. Approval to conduct the study was obtained from the Graduate School, the

Division, and the district. The researcher personally distributed and retrieved the questionnaires, ensuring proper administration and allowing immediate clarification of any participant concerns. Validity and reliability of the research instrument were established before its use. These steps—institutional authorization, multi-level approval, personal handling of the questionnaires, and prior validation of the tool—constituted the ethical and administrative safeguards observed throughout the research involving second- to fourth-year nursing students in academic year 2024–2025.

REFERENCES

- Aguhayon, H. G., Tingson, R. D., & Pentang, J. T. (2023). Addressing students' learning gaps in mathematics through differentiated instruction. *International Journal of Educational Management and Development Studies*, 4(1), 69–87. <https://doi.org/10.53378/352967>
- Alabdulaziz, M. S., & Tayfour, M. F. (2023). Distance learning in mathematics education: Advantages, disadvantages, and challenges. *Journal of Mathematics Education*.
- Angwaomaodoko, E. A. (2024). Online and blended learning modalities in higher education. *Journal of Educational Technology*.
- Attard, C., & Holmes, K. (2020). An exploration of teacher and student perceptions of blended learning in four secondary mathematics classrooms. *Mathematics Education Research Journal*, 34(4), 719–740. <https://doi.org/10.1007/s13394-020-00359-2>
- Ayob, H. H., & Hamada, T. I. (2024). Teaching mathematics in an EFL context at higher education; before, during and after the COVID-19 pandemic: A comparative study. *Journal of Applied Research in Higher Education*, 16(5), 2262–2272. <https://doi.org/10.1108/JARHE-05-2023-0186>
- Bag-o, R., Janiola, F., & Nabor, J. (2024). Modular learning in mathematics: Challenges and improvements. *Philippine Journal of Education*.
- Barlovits, S., Jablonski, S., Lázaro, C., Ludwig, M., & Recio, T. (2021). Teaching from a Distance—Math Lessons during COVID-19 in Germany and Spain. *Education Sciences*, 11(8), Article 406. <https://doi.org/10.3390/educsci11080406>
- Bhardwaj, P. (2019). Types of sampling in research. *Journal of the Practice of Cardiovascular Sciences*, 5(3), 157–163. https://doi.org/10.4103/jpcs.jpcs_62_19
- Cai, Z., Gui, Y., Mao, P., Wang, Z., Hao, X., Fan, X., & Tai, R. H. (2023). The effect of feedback on academic achievement in technology-rich learning environments (TREs): A meta-analytic review. *Educational Research Review*, 39, Article 100521. <https://doi.org/10.1016/j.edurev.2023.100521>
- Commission on Higher Education. (2020). Guidelines on the implementation of flexible learning (CHED Memorandum Order No. 4, series of 2020). Commission on Higher Education, Republic of the Philippines.
- Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson Education.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
- Crodua, J. (2023). Modular learning modalities and mathematics performance. *Philippine Educational Research Journal*.
- Dargo, J., & Dimas, M. (2021). Self-learning modules in distance education. *Journal of Educational Studies*.
- Ferreder, A., Mihrka, A. A., Ayele, M. A., & Arara, A. A. (2024). Enhancing students' conceptual understanding and problem-solving skills in learning trigonometry through contextual-based mathematical modeling instruction. *International Journal of Secondary Education*, 12(4). <https://doi.org/10.11648/j.ijsedu.20241204.15>
- Gaganao, R. (2023). Student experiences with modular mathematics instruction. *Philippine Journal of Mathematics Education*.
- Galan, J. (2024). Instructional delivery methods and self-learning in mathematics. *Journal of Mathematics Teaching*.
- Goniwada, S. R. (2023). *Introduction to datafication: Implement datafication using AI and ML algorithms*. Springer.
- Gün Sahin, Z., & Kırmızıgül, H. G. (2023). Teaching mathematics through micro-learning in the context of conceptual and procedural knowledge. *International Journal of Psychology and Educational Studies*, 10(1), 241–260. <https://doi.org/10.52380/ijpes.2023.10.1.1009>
- Hassan, M. (2024). Descriptive research in education. *Research Methods in Education*.
- Hu, S. (2024). The effect of artificial intelligence-assisted personalized learning on student learning outcomes: A meta-analysis based on 31 empirical research papers. *Science Insights Education Frontiers*. <https://doi.org/10.15354/sief.24.re395>
- Indrapangastuti, D., Surjono, H. D., Sugiman, & Yanto, B. E. (2021). Effectiveness of the blended learning model to improve students' achievement of mathematical concepts. *Journal of Education and e-Learning Research*, 8(4), 423–430. <https://doi.org/10.20448/journal.509.2021.84.423.430>
- Insorio, A., & Macandog, D. (2022). Challenges in self-learning modules. *Philippine Journal of Education*.

- Kalogeropoulos, P., Roche, A., Russo, J., Vats, S., & Russo, T. (2021). Learning mathematics from home during COVID-19: Insights from two inquiry-focussed primary schools. *Eurasia Journal of Mathematics, Science and Technology Education*, 17(5), Article em1957. <https://doi.org/10.29333/ejmste/10830>
- Kamble, A., Gauba, R., Desai, S., & Golhar, D. (2021). Learners' perception of the transition to instructor-led online learning environments: Facilitators and barriers during the COVID-19 pandemic. *The International Review of Research in Open and Distributed Learning*, 22(1), 199–215. <https://doi.org/10.19173/irrodl.v22i1.4971>
- Karmakar, S. (2024). Self-directed blended learning and academic achievement. *Journal of Blended Learning*.
- Madrilejos, R. (2024). Online learning constructs and mathematics performance. *Philippine Journal of Educational Research*.
- Mawardi, A., Budiningsih, C., & Sugiman, S. (2023). Blended learning effects on mathematical skills. *Journal of Mathematics Education*.
- Meniano, K. R. C., & Tan, R. G. (2022). Challenges in studying mathematics using self-learning modules during the COVID-19 pandemic. *American Journal of Educational Research*, 10(4), 182–187. <https://doi.org/10.12691/education-10-4-2>
- Meremikwu, A., Ekwueme, C. O., & Opoh, D. A. (2023). Modern teaching strategies and mathematics academic achievement among junior secondary school students in post-COVID-19 era in Calabar education zone, Cross River State, Nigeria. *Global Journal of Educational Research*, 22(1), 1–9. <https://doi.org/10.4314/gjedr.v22i1.1>
- Muñoz-Najar, A., Gilberto, A., Hasan, A., Cobo, C., Azevedo, J. P., & Akmal, M. (2021). Remote learning during the global school lockdown: Multi-country lessons. World Bank. <https://documents1.worldbank.org/curated/en/484811628835265239/pdf/Interactive-Document.pdf>
- Murni, M., Yeni, M., Saleh, M., & Daud, M. (2023). Difficulties of teaching mathematics with distance learning application systems in high schools. *Universal Journal of Educational Research*, 2(4), 315–324.
- Mwita, K. M. (2022). Factors to consider when choosing data collection methods. *International Journal of Research in Business and Social Science*, 11(5), 532–538. <https://doi.org/10.20525/ijrbs.v11i5.1842>
- Natarajan, S., & Sulaimi, A. (2022). Comparative study of mathematical performance across teaching modes. *Journal of Mathematics Education*.
- Nketekete, M., & Mojalefa, M. L. (2021). Exploring open and distance learning reform at the National University of Lesotho: A managerial perspective. *The International Review of Research in Open and Distributed Learning*, 22(4), 41–52. <https://doi.org/10.19173/irrodl.v22i4.6283>
- Nolasco, L. (2022). Flexible blended learning in the Philippines. *CHED Policy Review*.
- Nwoke, B. I., Emenyonu, A. O., & Ihekaire, U. R. (2017). Effect of blended e-learning on pre-service teachers' achievement in mathematics: A case for sustainable teacher education. *European Journal of Education Studies*, 3(10). <https://doi.org/10.5281/zenodo.1038397>
- Oranggaga, S. D. (2022). Challenges and prospects in teaching grammar using the modular distance learning in Marawi City, Philippines. *International Journal of Linguistics Studies*, 2(1), 40–44. <https://doi.org/10.32996/ijls.2022.2.1.5>
- Raouna, K. (2024). Blended learning efficacy and student engagement. *Educational Technology Review*.
- Salleh, M. I. M., Alias, N. A., Ariffin, S., Ibrahim, Z., Ramli, A. R., & Aliman, S. (2023). The sudden transition to remote learning in response to COVID-19: Lessons from Malaysia. *Humanities and Social Sciences Communications*, 10, Article 254. <https://doi.org/10.1057/s41599-023-01751-6>
- Soria, J., & Naparan, G. (2022). Modular distance learning and student performance. *Philippine Journal of Education*.
- Syahrudin, S., Yaakob, M. F. M., Rasyad, A., Widodo, A. W., Sukendro, S., Suwardi, S., Lani, A., Sari, L. P., Mansur, M., Razali, R., & Syam, A. (2021). Students' acceptance to distance learning during Covid-19: The role of geographical areas among Indonesian sports science students. *Heliyon*, 7(9), Article e08043. <https://doi.org/10.1016/j.heliyon.2021.e08043>
- Tong, D. H., Uyen, B. P., & Ngan, L. K. (2022). The effectiveness of blended learning on students' academic achievement, self-study skills, and learning attitudes: A quasi-experimental study in teaching the conventions for coordinates in the plane. *Heliyon*, 8(12), Article e12657. <https://doi.org/10.1016/j.heliyon.2022.e12657>
- Traugott, M. W. (1987). The importance of persistence in respondent selection for preelection surveys. *Public Opinion Quarterly*, 51(1), 48–57. <https://doi.org/10.1086/269013>
- Turmuzi, M., & Lu'luilmaknun, U. (2023). Meta-analysis of online learning effects on mathematics. *Journal of Mathematics Education*.
- Vacalares, J., Elbanbuena, C., & Comon, J. (2024). Differentiated instructional practices and mathematics achievement. *Philippine Journal of Education*.
- Yi, H., Liu, T., & Lan, G. (2024). The effectiveness of AI on K-12 students' mathematics learning: A systematic review and meta-analysis. *International Journal of Science and Mathematics Education*, 23, 1105–1126. <https://doi.org/10.1007/s10763-024-10499-7>