ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 6| June 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

MATHEMATICS READY: BRIDGING PROGRAM TO EQUIP THE NON-STEM FIRST YEAR STUDENTS ENROLLED IN MATHEMATICS MAJORED PROGRAMS

Melba O. Jamon, Rufino T. Segura, Jr., Marty John E. Pinuela, Alan N. Muñoz, Catherine A. Yap, Nestor L. Gicaraya
Iloilo Science and Technology University, Iloilo City, Philippines

Article DOI: https://doi.org/10.36713/epra30446
DOI No: 10.36713/epra30446

ABSTRACT

The Philippines Commission on Higher Education (CHED) allows all students who completed Grade 12 to enroll in college, regardless of their senior high school track. Despite this inclusive policy, a considerable gap in academic preparedness has arisen, especially impacting non-STEM graduates who are entering mathematics-intensive programs in higher education. This research explores the effectiveness of the math bridging program to enhance the mathematics proficiency of non-STEM students. The study involved 25 non-STEM students enrolled in the BS Mathematics program, who initially displayed a moderate understanding of mathematics topics, as evidenced by the aptitude test score of 16.6 from a 55-item test. Over four months, meeting twice a week, students participated in a hands-on, face to face sessions that focused on reinforcing fundamental concepts and problem-solving techniques. A significant improvement in post-test scores was observed, confirmed by a Wilcoxon signed-rank test, indicating the effectiveness of the intervention. This result could be attributed to the effectiveness of the bridging program. Qualitative feedback from semi-structured interviews provided additional insights, with students reporting increased confidence and understanding. This study validates the use of targeted bridging program as a successful strategy for improving mathematics proficiency among non-STEM students.

KEYWORDS: *STEM, non-STEM, BS Mathematics*

INTRODUCTION

The K to 12 Basic Education Curriculum was implemented to develop students' essential competencies, including communication skills, critical thinking, moral judgment, and environmental awareness (Fajarini, et al, 2016). A key component of this curriculum is the Senior High School (SHS) program, which provides two years of specialized education across various tracks: STEM (Science, Technology, Engineering, and Mathematics), Technical Vocational and Livelihood (TVL), HUMMS, General Academics, Sports, and Design and Arts (Temelo, 2013). The Commission on Higher Education (CHED) Memorandum Order No. 105, Series of 2017, enables all Grade 12 graduates to pursue college education regardless of their chosen senior high school track.

Despite this inclusive policy, a significant academic preparedness gap has emerged, particularly affecting non-STEM graduates pursuing mathematics-intensive programs in higher education. This challenge is notably evident at Iloilo Science and Technology University (ISAT U), where the BS Mathematics program, though designed primarily for STEM graduates, admits numerous non-STEM students to meet enrollment requirements. These students face considerable difficulties in their initial years due to inadequate mathematical foundation (Hodora, 2013). This preparedness gap not only affects their academic performance but also impacts their potential for college persistence and future career prospects. As emphasized by Nobel laureate Paul Romer, mathematical competency is crucial for technological and economic advancement, highlighting the need for improved mathematical education infrastructure, including teacher training, updated textbooks, and enhanced classroom facilities.

To address this, there is a pressing need for specialized instructional interventions that can accommodate diverse learning styles while providing individualized learning experiences. To effectively transition non-STEM students into STEM-related programs in college, several programs are conducted. One, is offering bridging courses that focus on foundational skills in mathematics and science can help build confidence and competence among these students (Miller & Heller, 2018). Additionally, mentorship programs that connect non-STEM students with STEM professionals can provide guidance, support, and insight into the various pathways available within STEM fields (Baker et al., 2019). Incorporating hands-on learning experiences, such as internships or project-based learning, can also increase engagement and demonstrate the practical applications of STEM knowledge (National Science Board, 2018). Furthermore, fostering an inclusive learning environment that recognizes and values diverse backgrounds can encourage non-STEM students to pursue their interests in STEM disciplines without fear of inadequacy (Wang & Degol, 2017). By integrating these strategies, educational institutions can create a supportive

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 6| June 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

framework that empowers non-STEM students to successfully transition into STEM programs.

This study proposes to develop and implement an instructional material specifically designed to bridge the mathematical competency gap for non-STEM senior high school graduates entering university-level mathematics programs. The proposed intervention will focus on strengthening student preparation through targeted competency building and enhancing mathematics readiness and fundamental skills. Through a modular approach, the program aims to improve students' chances of success in college admission tests and subsequent coursework while providing individualized learning experiences. This bridging program is expected to contribute to higher college persistence and degree completion rates among non-STEM graduates, ultimately enhancing their academic success and career prospects in mathematics-related fields. This initiative is particularly significant for institutions, where addressing the mathematical preparedness of non-STEM students is crucial for maintaining program quality while meeting enrollment objectives.

OBJECTIVES

This study was guided by the following objectives:

1. To determine the performance of the non-STEM graduates in the BS Mathematics program competencies;
2. To implement the bridging program to enhance the mathematics competencies of the non-STEM graduates enrolled in the BS Mathematics program;
3. To determine the significant effect of the bridging program for the enhancement of the mathematics competencies of the non-STEM graduates enrolled in the BS Mathematics program;

RESEARCH METHODOLOGY

Research Design

A pre-experimental research design in the form of One-Group Pretest-Posttest Design was used in this study. This design includes only one group and conducts pre-test and post-test on it. The pre-test will tell how the group was before they were put under treatment. Whereas post-test determines the changes in the group after the treatment (Voxco, 2023).

Participants

The participants for this study were selected through a purposive sampling method, focusing on students who are enrolled in the BS Mathematics program S.Y. 2023-2024 and are non-STEM high school graduates. This selection criterion was essential to ensure that the participants represented the target group most likely to benefit from the bridging program. It will be implemented in a 4-month duration of the bridging program, held twice weekly. The purposive sampling technique allowed the study to concentrate on students who were at a similar starting point in their calculus knowledge, providing a more homogeneous sample for analyzing the impact of the program.

In addition, students who expressed interest in participating and who fit the study's criteria were also considered. This approach ensured that the sample was not only relevant but also motivated, as participants voluntarily agreed to be part of the study.

Once identified, the selected participants were invited to join the study and were briefed on its purpose, procedures, and the confidentiality of their data. Informed consent was obtained from each participant, ensuring that they were fully aware of their role in the study and the use of their data. By using this carefully structured selection process, the study was able to gather a group of 25 participants who were ideally suited to provide meaningful insights into the effectiveness of the bridging program.

Data Collection Techniques

The data collection techniques involved administering standardized tests before and after the bridging program to measure students' mathematics proficiency. The test included a 55-item multiple-choice questions. Proctoring was maintained to ensure fairness, and anonymity was preserved to encourage honest participation. Data from both tests were carefully scored, recorded, and stored securely, with a double-entry system employed to minimize errors. The same test was administered for a direct comparison of pretest and posttest results, ensuring a reliable evaluation of the bridging program's impact on students' learning.

A focus group interview was conducted to gain deeper insights into students' experiences with the bridging program classes designed to support those new to calculus. This method was chosen to foster a collaborative environment where participants could openly discuss their challenges, successes, and perceptions of the bridging program. By bringing together a diverse group of students, the focus group allowed for a rich exchange of ideas and experiences, highlighting common difficulties in grasping calculus concepts and the strategies that helped them succeed. The group dynamic also enabled participants to reflect on their learning processes and provided the researcher with a comprehensive understanding of how the bridging program contributed to their academic progress. This qualitative approach was instrumental in identifying key themes and areas for improvement, ultimately informing recommendations for enhancing the bridging program's effectiveness.

Instrument

This study utilized an adopted instrument from the study of Jamon (2021). The instrument for pretest is intended to determine the attainability of the students among STEM students' mathematics competencies. The pretest served as a baseline measure of students' initial understanding. By administering this test before the bridging program, the study was able to gauge the students' prior knowledge and identify any existing gaps or misconceptions. The same instrument is used for the posttest. The posttest was administered after the completion of the bridging program to assess the learning gains made by the students. By comparing the pretest and posttest results, the study aimed to determine the extent to which the bridging program improved students' understanding of calculus concepts.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 6| June 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

Another research instrument utilized for this study was a semi-structured interview guide. This instrument was designed by the researchers to gather in-depth insights into students' experiences with the bridging program classes, particularly focusing on those who had no prior exposure to the subject. The instrument functioned as a guide for the interviewer, facilitating a smoother flow of the conversation. The interview guide was adapted from existing frameworks used in educational research, ensuring relevance and reliability while also allowing for flexibility in probing specific areas of interest.

Data Analysis and Validity

The data analysis in this research was carefully ensured through the selection of appropriate statistical tests and rigorous methodological procedures. The Wilcoxon Signed-Rank Test and the Mann-Whitney U Test were chosen due to their robustness in handling non-parametric data and their suitability for the specific research questions being addressed.

Wilcoxon Signed-Rank Test was employed to compare the pre-test and post-test scores of the non-STEM students who participated in the calculus bridging program. Since the participants are purposively chosen, this non-parametric statistical test was suited due to its suitability for analyzing paired data, particularly when the assumptions of normality are not met. By comparing the students' scores before and after the intervention, the Wilcoxon Signed-Rank Test provided a robust method for determining whether the bridging program led to a statistically significant improvement in their understanding of the mathematical concepts.

Furthermore, the data collection process was meticulously designed to minimize biases, with consistent testing conditions and standardized assessment tools used across all participants. These measures contributed to the overall validity of the study, ensuring that the conclusions drawn are both reliable and applicable to the target population.

RESULTS AND DISCCUSIONS

In a preliminary assessment among 25 non-STEM students, the average score on the pre-test exam was 16.6 out of a 55-item test. This mean score suggests a moderate level of understanding of the material tested, indicating that while some students may have a foundational grasp, others might require additional support.

Over the course of two months, the researchers conducted a series of hands-on face to face sessions designed to bolster the calculus proficiency of 25 non-STEM students who initially demonstrated a moderate understanding of the material. In a 4-month duration of the bridging program, held twice weekly, focused on reinforcing fundamental concepts, problem-solving techniques, and fostering a deeper understanding of calculus principles. The classes incorporated a mix of lecture-based instruction, collaborative problem-solving, and individual practice exercises tailored to address the specific gaps in students' knowledge. The structured approach and consistent engagement aimed to improve students' confidence and performance, setting a solid foundation for their future studies in calculus-related subjects. Table 1 lists the mathematics topics to be included in the Math bridging program.

Table 1
Bridging Program Mathematics Topics

Topic No.	Description
1	Computing the center of a circle given the expanded form
2	Find the equation of a circle given the center and point on a circle
3	Find the equation of a circle given vertex and focus
4	Find the standard equation of an ellipse given the vertices
5	Finding the center of an ellipse given the equation
6	Find the equation of the hyperbola given the vertices
7	Finding equation of a parabola.
8	Finding equation of a circle
9	Finding next term of infinite sequence
10	nth term of Arithmetic Sequence
11	Arithmetic series
12	Application problem of arithmetic sequence
13	Binomial expansion
14	Quadrant location of radian measure
15	Radian to point in a unit circle
16	Co-terminal angle
17	Reference angle
18	Area of a sector

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 6| June 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

19	Angular velocity
20	Solution of trigonometric equations
21	Simplifying trigonometric expressions
22	Special trigonometric identities
23	Value of trigonometric functions
24	Period of a trigonometric equation
25	Value of trigonometric functions
26	Rectangular to Polar Coordinate
27	Polar to Rectangular
28	Value of the limit
29	Fundamental Theorems on limits
30	Value of a limit
32	Evaluating continuous function
33	Solving for the first derivative
34	Solving for the second derivative
35	Solving for the third derivative
36	Solving for the fourth derivative
37	Solving for the area bounded by the functions
38	Evaluating definite integral

As presented in Table 2, the results of the Wilcoxon signed-rank test were conducted to compare the pre-test and post-test scores of 25 non-STEM students. This comparison aims to evaluate the effectiveness of the bridging program. The Wilcoxon signed-rank test is particularly suitable for assessing differences in paired non-parametric data (USQ Pressbooks, 2024). The analysis yielded a p-value of 0.028, which is significant at the 0.05 alpha level. This finding indicates a notable improvement in the students' performance, thereby confirming the effectiveness of the intervention. The significant difference in scores provides robust evidence that the bridging program successfully enhanced students' mathematics competency, thus validating the implementation strategy. Research indicates that bridging programs can significantly improve academic outcomes, including retention and performance in STEM fields (Bradford et al., 2021).

Table 2
Wilcoxon Signed-Rank Test Results on the Comparison of the Pretest and Posttest Scores

	Mean	Mean difference	p
Pretest	16.6	-3.00	0.028
Posttest	19.2		

To gain deeper insights into the students' experiences and perceptions of the program, semi-structured interviews through a focus-group discussion were conducted with a subset of participants. These interviews allowed students to share their thoughts on the challenges they faced, the effectiveness of the teaching methods, and the overall impact of the bridging program on their understanding of calculus. One student noted, *"Ang bridging [program] nakabulig gid sa amon sir about sa mga integral, [na-learn namon paano] mag derivatives, mas naka-bulig kay sa calculus namun my knowledge na kami paano na siya kuhaon (The bridging program really helped us about integrals, how to do derivatives, it helped us more because in calculus we already have some knowledge how to do it)".* Another student also emphasized that *"Helpful gid siya [bridging program] kay siyempre natagaan kmi knowledge about sa calculus kag kung panu na siya. So, my initial knowledge na kami antis magkuha sang mga subject [Math courses] (The bridging program is really helpful because of course it gave us an overview knowledge about calculus and how it is. So, we already have initial knowledge before we take different Math courses)".*

This qualitative data provided valuable context to the quantitative findings, highlighting the personal and educational benefits perceived by the students, and further reinforcing the effectiveness of the bridging program. When they are asked what improvements can they suggest for future bridging program. They expressed a desire for more time to be allocated to the bridging program so they could fully engage in the activities and benefit for additional lecture sessions.

CONCLUSIONS AND RECOMMENDATIONS

The Philippines Commission on Higher Education (CHED) permits all Grade 12 graduates to enroll in college, regardless of their senior high school track. However, this inclusive policy has led to a significant gap in academic

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 6| June 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

preparedness, particularly affecting non-STEM graduates entering mathematics-intensive programs in higher education.

The bridging program proved to be a highly effective intervention for improving the mathematics proficiency of non-STEM students. The significant gains observed in the pre-test and post-test scores, along with the qualitative feedback from students, underscore the success of the targeted instructional approach. Despite initial challenges, the students demonstrated notable progress in their understanding of key concepts, which was reflected in their improved performance. The absence of a significant difference in the Calculus final grades between STEM and non-STEM students further emphasizes the efficacy of the bridging program in leveling the playing field. These findings validate the implementation of such bridging program as a valuable tool for enhancing academic outcomes in challenging math subjects.

It is recommended that the university or college should offer a math bridging program to non-STEM graduates who are enrolled in a math programs like engineering, mathematics teaching, computer science, and the likes. Additionally, regular assessments and feedback should be incorporated to continuously adapt the instruction to meet students' needs, ensuring sustained academic success in challenging subjects.

REFERENCES

1. *Bradford, B. C., Oswald, F. L., & others. (2021). A Meta-analysis of University STEM Summer Bridge Program Effectiveness. CBE – Life Sciences Education, 20(2), ar20. https://doi.org/10.1187/cbe.20-03-0046*
2. *Elrod, E., & Park, J. Y. (n.d.). A comparison of students' quantitative reasoning skills in STEM and Non-STEM math pathways. Digital Commons @ University of South Florida. https://digitalcommons.usf.edu/numeracy/vol13/iss2/art3/*
3. *Fajarini, A., Soetjipto, B., & Hanurawan, F. (2016). Developing A Social Studies Module by Using Problem Based Learning (PBL) With Scaffolding for the Seventh Grade Students in A Junior High School in Malang, Indonesia. https://www.semanticscholar.org/paper/Developing-A-Social-Studies-Module-by-Using-P-Based-Fajarini-Soetjipto/3d928f45388d2ae7ac14d4d8249ed91d22c0e2c8*
4. *Hena, LJ (1997) "Developing Models for Teacher Education students in Basic Math 1". Unpublished Doctoral Dissertation, University of Eastern Philippines, Catarman, Northern Samar.*
5. *Hodora, M.(2013). Improving Students' College Math Readiness: A Review of the Evidence on Postsecondary Intervention and Reforms. Center For Analysis Analysis of Postsecondary Education and Employment (CAPSEE). Community College Research Center. Teachers College Columbia University.*
6. *Jamon (2020). Development of Instructional Module to Bridge the Gap for Non-Stem K To 12 Graduates Enrolled in Mathematics Related Courses. Doctoral Dissertation. West Visayas State University.*
7. *Magno, C & Piosan, T., (2016) Assessment Schemes in the Senior High School in the Philippine Basic Education. Educational Measurement and Evaluation Review (2016), Vol. 7*
8. *Navarro, M., (1999) "Development & Validation of a Proposed Work Text in Advanced Engineering Mathematics" Unpublished Doctoral Dissertation, Centro Escolar University, Mendiola Manila.*
9. *Sejpal, K.(2013). K to 12 Toolkit, Resource Guide for Teacher Educators, School Administrators, and Teachers. Southeast Asian Ministers of Education Organization (SEAMEO) and Regional Center for Educational Innovation and Training (INNOTECH), (2012) Vol.2. Issue:2 February 2013(IJRE) ISSN: 2320=091X pp.170*
10. *Temelo, D.R.F. (2013). Development of Training Design and Materials To Enhance The Grade VII Mathematics Teachers Competencies. (Unpublished dissertation). West Visayas State University, Iloilo City.*
11. *USQ Pressbooks. (2024). Wilcoxon Sign-Rank Test – Statistics for Research Students. Retrieved from https://usq.pressbooks.pub/statisticsforresearchstudents/chapter/paired-samples-wilcoxon-sign-rank-test/*
12. *VoxCo (2023). Descriptive Research Design. - References – Scientific Research Publishing*