Mathematical Statistician and Engineering Applications
ISSN: 2094-0343
2326-9865

Challenges in Teaching Mathematics Concepts: Assessment, Teaching Strategies, and Students' Attitude

Dr. Evelyn A. Amor

Northern Iloilo Polytechnic State College, Ajuy Campus, Ajuy, Iloilo, Philippines
evelynamor0121@gmail.com

Article Info
Page Number: 637 – 643
Publication Issue:
Vol. 71 No. 3s (2022)

Abstract

This study determined the challenges in teaching selected Mathematics Concepts (MC) regarding assessment, teaching strategies, and students' attitudes. The respondents were all mathematics teachers of the NIPSC System. Four hundred randomly selected Mathematics newcomers. A descriptive-associative research design questionnaire undergone a reliability and validity test used. Appropriate statistical tools are used for data treatment. Results revealed a middle-aged, female, married female with long years of teaching experience mathematics teachers, while students, 17 years old or younger, predominantly female and taking up Education, Technology or Criminology programs. A quiz was the highly utilised assessment strategy, and the lecture method is highly utilised in teaching strategy. MC is found excellent and dependent on age and degree program.

Furthermore, assessment strategies were significantly associated with experience, age, education, experience and training, and strategies. Students' attitude is highly significant but differed in campuses but not courses pursued. Mathematics teachers were highly conventional in both assessment and teaching strategies.

Keywords: Mathematics concepts, Assessment, Teaching strategies, Students' Attitude

Article History
Article Received: 22 April 2022
Revised: 10 May 2022
Accepted: 15 June 2022
Publication: 19 July 2022

Introduction

Teaching Mathematics concepts (MC) is not an easy one. Simons (2017) [20] discussed the MC as a knowledge of the mathematics necessity of a special Mathematics relationship. Meaning, prior knowledge is required before introducing a new one. Rose, Meyer, Strangmen, and Rappolt (2002) [17] espoused that setting clear goals for the best methods and material for reaching our objectives and enabling us to establish appropriate criteria for assessing students' success. The teacher's depth of knowledge and experience defined the outcome of the subject matter. Atnafu (2014) [3] amplified that teacher's attitude plays a vital role in teaching Mathematics.

When President Aquino signed the K-12 program in 2013, the college conducted a series of curricular revisions that will tailor fit to be ready for the K-12 graduates to become desirable life-long learners in Commission on Higher Education (CHED) Handbook on Typology (2014) [6] explained that students' experiences from college must gear towards the vision, mission, goals, and objectives.

In this context, that this study determined the challenges in teaching selected MC regarding assessment, teaching strategies, and students' attitudes.

Literature Review

Assessment

Pandey (2015) [15] authentic assessment is not rote learning or passive test-taking but instead focuses on student's analytical skills and the ability to integrate what was learned along with creativity with written and oral skills; Stenmark (2009) [22] skills and concepts learned and explained when it would be appropriate to use these facts and problem-solving skills in their own lives. Lambert and Lines (2000) [11] define assessment as the process of gathering, interpreting, recording and using information about pupil's responses to educational tasks. Martinez (2009) [13] determined the extent to which classroom assessment influences the degree to which teacher achievement ratings correspond with standardised test scores. The Nuffield Foundation (2003) [24] suggested that formative and summative assessment plays a vital role in achieving the purpose of assessment. Formative assessment is conducted periodically and is an ongoing process throughout the academic session. Nonetheless, the summative assessment was conducted at the end of the academic year.

Temur (2007) [23] differentiated instruction empowers teachers to target multiple learning styles through varied themes, adapted content delivery, and assessment options; Williams (2012) [25] differentiated instruction on seventh-grade student performance on standardised Mathematics assessments using a repeated-measures design; and Sloane and Kelly (2003) [21] provided inconclusive assessment results. Notwithstanding,

significant differences between students who received differentiated instruction compared to students who were instructed using traditional lecture-based strategies were inconsistent for each research trial. All learning groups, including special education, economically disadvantaged, English language learners, and gifted, were included in determining if strategies were successful based on specific learning needs. Evidence obtained through classroom observations revealed deficiencies in effective instructional delivery of differentiated strategies as indicated too by Rock et al. (2008) [16], emphasises the need for ongoing, quality professional development and support for educators.

Teaching Strategies

Strategies in Mathematics instructions are varied, and the thrust of choosing the most appropriate rests in the teacher's hands. Alfieri, Brooks, Aldrich, and Tenenbaum (2011) [1] discussed discovery learning; students are confronted with a challenge and left to work out the solution independently. Nevertheless, Castronova (2002) [5] differentiated discovery learning

from traditional learning methods as active in problem-solving activities, emphasising process, failure as a second chance, feedbacking is essential, and strategy satisfies curiosity and promotes individual interests. Utilising modern technology contribute to discovery learning. Moyer, Bolyard & Spikell (2002) [14]; Ross, Hogaboam-Gray, McDougall, and Bruce (2002) [18] use virtual manipulatives – an interactive visual representation of dynamic objects such as computers, tablets, and smartboards that presents opportunities for the construction of Mathematics knowledge. Guerrero et al. (2004) in Davis (2012) [7] confirmed that a well-used technology had positive effects on student's attitudes towards Mathematics. Burns & Hamm (2011) [4] agreed but suggested virtual and concrete manipulatives reinforce MC separately, but a combination of both could achieve the best results.

Training and Its Importance

Ross et al. (2002) [18] assert teacher training as an imperative component of technology integration. Trained teachers feel more comfortable integrating technology into Mathematics lessons and other subject areas. Harris and Sass (2007) [9] assert that technology would finally deliver benefits to education if schools provided appropriate training to teachers. Hanushek and Wobmann (2003) [8] stressed that educational investment in training is considered an essential strategy for assuring effective implementation of innovations. Lightner, Benander, Kramer, (2008) [12] insights into the mechanisms of knowledge or transfers of learning to the workplace are necessary to capture this elusive concept of learning transfer, particularly the transfer enhancing conditions.

Attributes

Saha (2007) [19] conducted a study on gender, attitude, cognitive style, achievement, cooperative learning strategies with instruction delivered using an Integrated Learning System (ILS). Results revealed all three contributed statistically significant differences in mathematics achievement, and students using ILS for Mathematics instruction performed better on standardised tests and were more positive towards Mathematics. They worked in cooperative groups than when they worked on the same individually. Xin Ma and Jianymin (2004) in Lamar (2014) [10] on Attitude demonstrated casual predominance over attitude across the entire secondary school but not gender. However, in the universal context, sex differences were noted in many countries, with the advantage for males being the largest with positive attitudes in mathematics.

Objectives of the Study

This study aimed to determine Northern Iloilo Polytechnic State College (NIPSC) System teachers' challenges in teaching mathematics, focusing on assessment, teaching strategies and students' attitudes. Specifically, this study answered the following questions:

1. What is the profile of the respondents in terms of teachers, students, and campus location?

2. What strategies are employed by the respondents in terms of teaching and assessment

3. What is the extent of utilisation of the assessment and teaching strategies?

4. What is the students' attitude in the selected Mathematics concepts?
5. Is there a significant relationship between the students' attitude and teachers' profile, students' profile, assessment strategies, teaching strategies?

6. Is there a significant difference between the students' attitudes when grouped according to campus and degree programs?

7. What are the other challenges perceived by the mathematics teachers?

8. What action plan can be proposed based on the findings of the study?

Methodology

The Research Design

The researcher employed a descriptive-associative research design. A researcher-made questionnaire undergone a reliability and validity test used. The questionnaire contains details about the variables defined, such as the assessment, teaching strategy and attitude.

The Respondents of the Study

The study participants were all mathematics teachers of the seven campuses of the NIPSC System, and first-year students enrolled in the second semester school year 2015-2016.

The Instrument and Data Gathering Procedure

The questionnaire was designed to gather information on mathematics teachers and students' profiles; teachers used assessment strategy; on teaching strategy and the student's attitude in Mathematics. The gathered data from the accomplished forms were encoded, summarised, tabulated, processed, analysed, and interpreted. All hypotheses were tested at the .05 level of significance. The obtained means were interpreted and described using the following arbitrary scales.

The extent of Utilisation of Assessment and Teaching Strategies		**Students' attitude on selected Mathematics Concepts.**
Range	**Interpretation**	**Interpretation**
3.26-4.00	Highly Utilised (HU)	Very Good (VG)
2.51-3.25	Utilised (U)	Good (G)
1.76-2.50	Less Utilized (LU)	Fair (F)
1.00-1.75	Not Utilised (NU)	Poor (P)

Results

Conclusions

The age and course of the students influenced their attitude toward some MC. Thus, the null hypothesis is rejected. Also, reject the null hypothesis that there is no relationship between the utilisation of assessment approaches and the experience of the teachers. Teaching strategies are significantly related to age, highest educational qualification, and a number of years in teaching; hence, the null hypothesis is rejected. The assessment strategies of the teachers are correlated with their teaching strategies; thus, the null hypothesis is rejected. Students' attitudes on some MC significantly differed, so the null hypothesis in this regard is likewise rejected.

Recommendations

(1) Despite the relatively high educational qualifications of the mathematics teachers, their rank is relatively low by traditional standards. Thus, they upgrade their rank by going into advanced studies to complete their doctorate degrees and research publications.
(2) Attendance to international seminars may also improve their chance of promotion through NBC 461. However, a high proportion of freshman respondents in teaching is evidence of future Mathematics teachers intensively mentored on the best teaching approaches, not the conventional ones most of the teacher respondents are using.
(3) NIPSC should focus on delivering quality education towards students' life-long learning and enhancing curricular structure on Mathematics gearing towards its vision, mission, and goals and objectives for global competitiveness.
(4) The teachers should take advantage of the optimism of their students in Mathematics by providing higher taxonomy of knowledge, maintaining positive thinking through guidance and counselling.
(5) Young Mathematics teachers should explore alternative teaching strategies to dispel the belief of traditional teachers in the innovative experience of their students.
(6) Frequent collaboration is highly encouraged among Mathematics teachers of the NIPSC system to discuss trends in teaching mathematics and feedbacking for curricular reforms.
(7) Implement the Action plan.

References

[1] Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? Journal of Educational Psychology, 103(1), 1–18.
[2] Andrini, V.S. (2016). The Effectiveness of Inquiry Learning Method to Enhance Students' Learning Outcome: A Theoretical and Empirical Review. Journal of Education and Practice, 7(3), 38-42.
[3] Atnafu, M. (2014). Secondary School Mathematics Teachers' Attitude in Teaching Mathematics. International Electronic Journal of Mathematics Education, 9(1), 57-72.

[4] Burns, B.A., & Hamm, E.M. (2011). A comparison of concrete and virtual manipulative use in third- and fourth-grade mathematics. School Science and Mathematics, 111(6), 256-261. doi: 10.1111/j.1949-8594.2011.00086.

[5] Castronova, J. (2002). "Discovery Learning for the 21st Century: What is it and How Does it Compare to Traditional Learning in Effectiveness in the 21st Century?" Retrieved from https://www.academia.edu/10871733/

[6] Commission on Higher Education (2014). Handbook on Typology, Outcomes-Based Education, and Institutional Sustainability Assessment. Retrieved from http://www.ched.gov.ph/

[7] Davis, K. C., (2012). The Effects of Technology Instruction on The Academic Achievement of Fifth Grade Students. Unpublished Dissertation, Liberty University, Lynchburg, Virginia. Retrieved from https://core.ac.uk/download/pdf/58824579.pdf.

[8] Hanushek, E. A. and Wößmann, L. (2010). Education and Economic Growth. In: Penelope Peterson, Eva Baker, Barry McGaw, (Editors), International Encyclopedia of Education. Volume 2, pp. 245-252. Oxford: Elsevier.

[9] Harris, D.N. and Sass, T.R. (2007). Teacher Training, Teacher Quality, and Student Achievement. National Centre for Analysis of Longitudinal Data in Education Research. Retrieved from https://files.eric.ed.gov/fulltext/ED509656.pdf.

[10] Lamar, R. (2014). Attitude of Higher Secondary Students in Shillong towards Mathematics. Journal of Humanities and Social Science, 19(3), 42-45.

[11] Lambert, D., & Lines, D. (2000). Understanding Assessment. London: Routledge Falmer. Retrieved from https://www.scirp.org/

[12] Lightner, R., Benander, R., Kramer, E.F. (2008). Faculty and Student Attitudes about Transfer of Learning. InSight: A Journal of Scholarly Teaching, Volume 3, 58-66

[13] Martinez, J.F., Stecher, B., & Borko, H. (2009). Educational Assessment, 14(2), 78-102.

[14] Moyer, P.S., Bolyard, J. J., & Spikell, M. A. (2002). What are virtual manipulatives? Teaching Children Mathematics, 8, 372-377.

[15] Pandey, T. (1990). Authentic Mathematics Assessment. Practical Assessment Research and Evaluation, 2(1). Retrieved from https://scholarworks.umass.edu/pare/vol2/iss1/1

[16] Rock, M. L., Gregg, M., Ellis, E., & Gable, R.A. (2008). REACH: A Framework for differentiating classroom instruction. Preventing School Failure, 52(2), 31-47.

[17] Rose, D. H., Meyer, A., Strangman, N., and Rappolt, G. (2002). Teaching every student in the digital age: universal design for learning. Alexandria, VA: Association for Supervision and Curriculum Development, [2002] ©2002.

[18] Ross, J.A., Hogaboam-Gray, A., McDougall, D., & Bruce, C. (2002) The Contribution of Technology to the Implementation of Mathematics Education Reform: Case Studies of Grade 1–3 Teaching. Journal of Educational Computing Research 26(1), 87-104.

[19] Saha, S. (2007) A study of Gender Attitude to Mathematics, Cognitive style and achievement in mathematics". Experiments in Education 35:61-67.

[20] Simon, M.A. (2017). What is a mathematical concept? Retrieved from www.martysimon.org.

[21] Sloane, F.C., & Kelly, A.E. (2003). Issues in high-stakes testing programs. Theory Into Practice, 42(1), 13-17.

[22] Stenmark, J.K. (1994). Assessment alternatives in mathematics: an overview of assessment techniques that promote learning. Berkeley: EQUALS and the California Mathematics Council. Retrieved from https://www.semanticscholar.org/

[23] Temur, O.D. (2007). The effects of teaching activities prepared according to the Multiple Intelligences Theory on mathematics achievements and permanence of information learned by 4th-grade students. International Journal of Environmental & Science Education, 2(4), 86-91.

[24] The Nuffield Foundation (2003). The role of teachers in the assessment of learning. Retrieved from www.assessment-reform-group.org

[25] Williams, K.G. (2012). The effect of differentiated instruction on standard assessment performance of students in the middle school mathematics classroom, Unpublished dissertation, University of Liberty. Retrieved from https://digitalcommons.liberty.edu/doctoral/573/