

TEACHERS' PERCEPTIONS OF INTEGRATING TECHNOLOGY IN MATHEMATICS CLASSROOM AMONG SCHOOL TEACHERS IN CAGAYAN DE ORO CITY, PHILIPPINES

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ABSTRACT: *The Philippines newly implemented K-12 Curriculum recognizes the use of appropriate tools as an essential component in the teaching and learning of mathematics concepts. Technology integration in mathematics classroom proved to enhance students' performance. This study explored the technology integration practices among public mathematics teachers in the Division of Cagayan de Oro City. Ninety-six (96) public school mathematics of DepEd CDO Division randomly selected took part this study by answering the survey questionnaire on their level of perception on using technology in the classroom. Results reveal that although mathematics teachers had a positive perception on integrating technology in mathematics classroom, they still need to be trained on the use of different technological tools which are effective in improving students' achievement in mathematics. As such, higher education institutions (HEIs) in collaboration with DepEd may design a long term training-workshop on integrating technology in mathematics classroom. Technology must also be integrated in the curriculum to attain the desired results. Research may be conducted on the effectiveness of the program to be implemented most especially the impact of this training to students' mathematics performance and teachers level of TPACK.*

Keywords: technology integration in mathematics, effectiveness of technology integration, perceptions

1. INTRODUCTION

Recently, the daily life of every individual in most aspects was affected by technology. The fast changing developments and advancements in technology generates new opportunities for teaching and learning but most school systems are struggling to keep abreast with these developments [1]. Mathematics is a fundamental skill in many aspects of a student's life. The potential and relevance of using technology in mathematics classroom has been widely accepted and recognized. The use of technology comprised as an indicator of professional standards for mathematics teaching and learning. The National Council of Teachers of Mathematics, for example, in its position statement claims that technology is an essential tool for learning mathematics in the 21st century, and all schools must ensure that all their students have access to technology [2]. Various research studies argued that when technology was effectively and efficiently utilized, it can facilitate processes and procedures of teaching that are fitted to the kind of learners when compared to the conventional teaching approaches [3], [4], [5], and [6]. These researches also suggest that teachers need to continually activate themselves in professional development trainings and workshops to acquire technological knowledge and self-confidence on how to optimize the use of technology to promote learning of mathematical concepts. The traditional mathematics classroom is now changing its landscape, slowly adapting the needs of global learners who were very enthusiastic when working with technology. Prensky referred to these learners as "digital natives". The life of a digital native is surrounded by using different technological tools and in effect they think and process informations which are fundamentally divergent from their forerunners. Moreover, teachers not born in the digital world are referred to as "digital immigrants", should reassess their pedagogical content knowledge to keep abreast with the complex changing technological world. Educators need to modify their pedagogical content knowledge which are consistent with students' current learning capacities and future experiences. Teachers changing the 'how' perspective

means providing a pedagogy that is fitted for the kind of students and changing the 'what' means creating a curriculum that is responsive, future-oriented and engaging for the learners while remaining functional and demanding for the development of the needed skills for today and future generations to come [7]. However there is a big challenge because teachers have limited power to change the curriculum not unless they got promoted in the supervisory position, but they do have the power to teach the curriculum material in an innovative and meaningful ways. Various researches also noted that utilizing the potential of technology helped enhanced students' achievement, attitude and reduced anxiety towards mathematics [8].

Despite the potential contribution of technology in the learning and teaching of mathematical concepts, in reality, some teachers were still hesitant and even negative in using technology in their mathematics classes. This study would provide vital information if mathematics teachers in the region are in compliant with the South East Asian Regional Standards for Mathematics Teachers highlighted that among the professional knowledge which mathematics teachers need to possess was the use of ICT mathematics teaching and learning. Hence, this research investigated the perceptual level among elementary and secondary school mathematics teachers on the use of technology in their respective mathematics classroom.

2. LITERATURE REVIEW

Various research explorations revealed the potential impact of integrating technology in mathematical classes. Technology has become a more efficient enterprise and the need for teacher training and practice may be given attention by school administrators. Icasama surveyed the use of educational technologies in teaching secondary mathematics in Baybay City, Leyte. He found out that various educational technologies can affect the learning performance of the students and do not only lessen the burden of the teacher but also allows the students to see actual objects not just mere

imagination. The present study sought to investigate if mathematics teachers use different technological tools in teaching mathematics and propose appropriate interventions which can be made through professional development workshops that would be spearheaded by the Department of Mathematics Education of University of Science and Technology of Southern Philippines (USTP), Cagayan de Oro City for the benefit of mathematics teachers and the learners across all levels [9].

Furthermore, Luib developed an online classroom for mathematical investigation and modeling using the MSU-IIT online learning environment. This online classroom underwent validation, evaluation and utilization survey. The respondents performed activities which involved making micro lessons and mathematical investigation videos. The findings of the study showed a significant improvement in the respondents understanding of the concepts. The students claimed that their 21st century skills improved after the utilization of the online classroom. The study of Luib is a concrete example of how technology was integrated in mathematics classroom, the present study hoped that this kind of technology integration was also applied or utilized by mathematics teachers in the field because students are more interested and engaged when exposed to learning methodologies where their interest was maximized especially on technology usage [10].

Villamora test the effectiveness of Virtual Geoboard Plus in learning area and perimeter of polygons among Grade 7 students in Philippine Science High School-Central Visayas Campus in Cebu. They concluded that Virtual Geoboard Plus was an effective tool in increasing the students' performance on finding area and perimeter of polygons. Moreover, it provided students a meaningful learning environment for the students enabling them to better grasp the concept of area and perimeter of polygons. His study was directly connected to the present study since Virtual Geoboard Plus is technology based mathematics tool which the present study was interested to study if mathematics teachers are actually utilizing this kind of technological tool in mathematics [11].

Irwin made a study to investigate the effect technology on students' mathematics achievement. Although the findings in the research study failed to show significant differences on students' mathematics achievement, previous research studies revealed that technology can promote a positive effect if proper training and resources would be provided. This study encountered different challenges which can be employed in future research endeavors to emphasize how technology can be integrated in the classroom effectively and efficiently [12]. The findings of this study proved to be very relevant in this present study since it was revealed that when teachers are properly trained and resources are available then integrating technology would be very promising in improving students' achievement which would be the end goal of this study since after the result of this assessment, a professional development workshop would be conducted to exposed and trained mathematics teachers in technology use in their mathematics classes.

In another study conducted by Rosen and Beck-Hill on the use of a technology program which they name as "*Time to Know*". This program is a one-to-one laptop activity that integrates technology into the current mathematics curriculum. They noted that prior studies on technology

integration show that most cases, mathematics teachers utilize technology as a tool alongside with traditional teaching methodologies. The study was conducted in four Dallas, Texas schools where the control groups did not have the program while the experimental groups was exposed to the integration of the program in their classrooms. Findings showed that the experimental classrooms had significant learning gains and reduced unexcused absentees while the control groups also showed academic gains but were not significant [13]. The results of this study showed the improvement of the achievement of students in the experimental group and it really showed that mathematics teachers use technology together with traditional methods which might be the same scenario for mathematics teachers in Cagayan de Oro City, Philippines.

Several studies including the above researches have shown that potential effect of technology in improving students' performance not only in mathematics. However, despite this positive impact of technology in mathematics classroom, many teachers still do not use technology for various reasons such as the issue on availability and access and among others. Hence, this present study made an assessment of the extent of the use of technology by secondary and primary mathematics teachers in the division of Cagayan de Oro City.

3. METHODS

This study was descriptive in nature where survey questionnaires was administered to look into teachers' perception on the integration of technology in their mathematics classes. A focus group discussion (FGD) was conducted to serve as a basis in the analysis of the data using structured questionnaire. This study was conducted in the select schools of the Department of Education (DepEd), Division of Cagayan de Oro City. This city is a highly urbanized city considered to be a premier city of Region X and a gateway for Northern Mindanao, Philippines. The schools were clustered into nine (9) districts namely East I, East II, West I, West II, North I, North II, South, Southwest and Central district. These districts are headed by a District Supervisor who closely monitor and supervise the school heads assigned in their respective districts. There are sixty-nine (69) elementary schools and 44 secondary schools in the division of CDO. Twenty (20) elementary and 76 secondary mathematics teachers from DepEd-CDO Division took part of this study. The sample respondents from these schools were selected at random through systematic random sampling and the respondents were given informed consent to assure that their identity would be kept confidential. The main instruments utilized in this study are the perception questionnaires on the use of technology in the classroom adapted from the study of Ghavifekr & Rosdy [14] and the structured questionnaire used in the (FGD) which underwent face and content validity from experts in the field of mathematics education. The data gathered were analyzed using mean and standard deviation.

4. RESULTS AND FINDINGS

The level of mathematics teachers' perception on the use of technology in the classroom was shown in the following table:

Table 1. Teachers’ Perception on Using Technology in the Classroom

| STATEMENTS | Mean | SD | Remarks |
|---|-------------|--------------|----------|
| I feel confident learning new computer skills. | 3.79 | 0.408 | SA |
| I find it easier to teach by using technology | 3.52 | 0.543 | SA |
| I am aware of the great opportunities that technology offers for effective teaching. | 3.70 | 0.484 | SA |
| I think that technology supported teaching makes learning more effective. | 3.64 | 0.484 | SA |
| The use of technology helps teachers to improve teaching with more updated materials. | 3.76 | 0.453 | SA |
| I think the use of technology improves the quality of teaching. | 3.61 | 0.550 | SA |
| I think the use of technology helps to prepare teaching resources and materials. | 3.77 | 0.447 | SA |
| The use of technology enables the students’ to be more active and engaging in the lesson. | 3.66 | 0.559 | SA |
| I have more time to cater to students’ need if technology is used in teaching. | 3.52 | 0.580 | SA |
| I can still have an effective teaching without the use of technology. | 3.18 | 0.562 | SA |
| I think the use of technology in teaching is a waste of time. | 1.72 | 0.764 | D |
| I am confident that my students’ learn best without the help of technology. | 2.31 | 0.786 | D |
| The classroom management is out of control if technology is used in teaching. | 1.89 | 0.766 | D |
| Students’ pay less attention when technology is used in teaching. | 1.89 | 0.738 | D |
| Students’ makes no effort for their lesson if technology is used in teaching. | 1.97 | 0.774 | D |
| OVERALL | 3.06 | 0.593 | P |

| Mean Level | Verbal Description |
|-------------|---|
| 3.51 – 4.00 | Strongly Agree (SA) /Highly Positive (HP) |
| 2.51 – 3.50 | Agree (A)/Positive (P) |
| 1.51 – 2.50 | Disagree (D)/Negative (N) |
| 1.00 – 1.50 | Strongly Disagree (SD)/Very Negative (VN) |

Overall, both elementary and secondary mathematics teachers revealed to have a positive perception on the use of technology in the classroom based from the overall mean of 3.06 and standard deviation of 0.593. This means that primary and secondary mathematics teachers are open in using technology in their respective classroom. Specifically, they are positive and confident in learning new computer skills and the use of technology helps them to prepare teaching resources and materials. However, they argued that the use of technology in teaching is never a waste of time, can make class management out of control and they do not believe that students may not pay less attention when using technology. As a matter of fact Murphy noted that using technology in the classroom can ignite and enhance students’ level of engagement and motivation to learning, promote better teacher-student interaction, support student collaboration, assist in the accuracy of mathematical

computation and address students negative perception of mathematics while allowing deeper understanding of the mathematical concepts [15]. Further, this is also true because according to results of the study of Ghavifekr and Rosdy [14] that ICT integration help teachers to attain good classroom management because students are now well-behaved and attentive. Moreover, their study proved that students learn more effectively with the use of ICT as lesson designed are more engaging and interesting. Indeed, the use of technology in mathematics classroom was never a waste of time according to the teacher-respondents. Mathematics teachers can employ different strategies to benefit the potential impact of technology. According to Hughes, in using technology in mathematics, students can develop simulations of the stock market or owning a business to apply mathematical skills while also understanding the role of mathematics in day-to-day life of every individual. Also, web-based virtual manipulatives can allow students to comprehend abstract mathematical concepts more concretely and would promote variety of student solutions in any given mathematical tasks. In data-collection hardware, spreadsheets and visualization tools, it can allow student explorations of the number concepts and its operations as well as patterns and mathematical problem-solving using data that children have access and can be collected by themselves. The available technological tools not only in mathematics when integrated and utilized with appropriate innovation through the creative genius of the teacher can facilitate optimum learning in a more hands-on, stimulating and effective instruction which can be the potential future of education with technology in the third world countries like the Philippines [16].

CONCLUDING STATEMENTS

The current DepEd curriculum in the Philippines recognizes the use of appropriate tools as an essential component in mathematics teaching and learning concepts. These tools may include manipulative tools, measuring devices, calculators and computers, smartphones and tablets and the internet. These tools provided to students can develop active engagement and connections in learning mathematics and deepen their mathematical thinking. Hence, integrating technology in mathematics classroom should be driven by the needs of the students but not to be regarded as substitute for students’ understanding of quantitative concepts and relationships. Teachers also need to be prudent and extra cautious when integrating technology in the classroom. Although, the level of teachers’ perception was positive nonetheless these teachers are wanting of trainings on how to use and integrate these different and other emerging technologies in their classes. As such, higher education institutions (HEIs) in collaboration with DepEd may design long term training-workshops on integrating technology in mathematics classroom. Technology must also be integrated in the curriculum to attain the desired results and issues on budget allocation for the use of technology in the classroom need to be studied by school administrators and education officials so that teachers would be encouraged and motivated to employ these useful technological tools in mathematics which in effect may improve student and school performance. Finally, further research endeavors may be conducted on the effectiveness of the program to be implemented most especially the impact of the technology integration training to

students' mathematics performance and teacher's level of technological pedagogical and content knowledge (TPACK).

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