WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Attitude of Mathematics Teachers towards ICT Integration

Jennifer R. Gacad [a]

[a] *Saint Mary's University Bayombong 3700, Nueva Vizcaya, Philippines*

A B S T R A C T

The objective of this study is to determine the level of attitude of mathematics teachers towards ICT integration and to determine if there is a significant difference in the level of attitude of mathematics teachers towards ICT integration when grouped by the profile variable. The researcher used descriptive – comparative design for the study. A total of 38 mathematics teachers in Bayombong Nueva Vizcaya were surveyed using a survey questionnaire. The results were treated using the SPSS program particularly Weighted means were computed and analyzed, while T – test for Independent Sample, One – way ANOVA, Scheffe, Brown – Forsythe and Tamhane Test were used to determine and interpret the significance of the variables used in the study. The result shows that mathematics teachers have a positive attitude towards ICT integration. Result shows that sex, teaching experience, daily internet usage have significant difference in the level of attitude of mathematics teachers towards ICT integration. Female teachers have a more positive attitude than male. Mathematics teachers who have teaching experience of 20 and more years have a more positive attitude than those 1-5 years, 6-10 years, and 11-20 years of teaching experience. A mathematics teacher who spends at least an hour of internet usage per day has a more positive attitude than those who do not have daily internet usage. Thus, researchers recommend the Department of Education to organize programs and seminars that aim to educate and motivate teachers to use ICT in the classroom. Promote use of computers and possibly support increase of computer facilities for teacher use.

Keywords: ICT Integration, ICT, Attitude, Teachers, Internet, TPACK

1. Introduction

Mathematics is part of our daily lives hence, it is vital to improve and develop mathematical competency skills. But according to the Trend International Mathematical Science Study Advanced (TIMMS) examined patterns of students' achievement in mathematics and found out that for over 20 years, there were some declines in the students' performances, and no improvements in the countries that have been assessed (Maltese & Tai, 2011). For the second time on an international benchmark, the Math achievement of American students in 2015 fell again, as said in the Program for International Student Assessment (PISA) (Kelly et al., 2013) in the United States. According to Leatham & Peterson, 2010; Ronis, (2008) in Asia, mathematics is considered by many as one of the most critical subjects which leads to students receiving much encouragement to study well. That is why policy makers and various sectors strive to find ways on improving the students' performance in mathematics, especially now that we are currently facing various issues of globalizations in the 21st century in education and facing the digital era. One of the tools in improving Mathematics competence among students is through the integration of Information Communications Technology (ICT) inside the classroom.

Here in the Philippines, mathematics is also considered by the students as one of the most difficult subjects thus leads to poor mathematics proficiency. In 2018, the Philippines joined the Program for International Student Assessment (PISA), and the Trends in International Mathematics and Science Study (TIMSS) in 2019. In the two assessments, the Filipino students were observed with more than 80% of them falling below the average levels of proficiency. According to the study of Bayrak and Bayram (2010), students' achievement increases when a computer assists them in learning, where they study the experimental class manipulations using computer and tested it over the years. This is why the use of ICT inside the mathematics classroom is very important and as the main components of its implementation are the teachers for, they play a vital role in the ICT integration. Most research focused on the student's outcome (e.g., Hennessy, Fung, & Scanlon, 2001; Sinclair & Jackiw, 2005; Smeets, 2005; Witte & Rogge, 2014) but only few have taken focus on the teachers ICT integration and their Technological Pedagogical Content Knowledge (TPACK).

ICT helps mathematics teachers in many teaching aspects inside the classroom. It can help teachers in bringing new and innovative teaching methods to the students. ICT can also improve teachers' professional development (Ojugo et al., 2015). Rendall (2001) found out that ICT assisted teaching is more effective in improving the skills of students in mathematics arithmetically and logically. The process of problem solving in mathematics involves four steps the first one is understanding the problem, devising a plan or solution, executing the plan and evaluate the solution. By implementing ICT assisted learning in mathematics, it will help students to follow the steps in problem solving easier for it provides visualization of the problems and widens the thinking of the students. By using ICT, teachers can focus on solving critical problems, having flexible teaching strategies, making sense of complex representations, assimilate among mathematical concepts and mathematical meaning, clarifying mathematical concepts, teaching mathematics better and teaching better mathematics prior student's knowledge and skills (Texas, Instrument 2007). According to Karami & Attarn (2013) found that integration

* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000.
E-mail address: author@institute.xxx

of ICT and problem-based learning were very effective in enhancing student teachers' content knowledge and teaching skill. Jabr (2007) found out in his study positive attitude among mathematics teachers towards the use of ICT in the teaching learning process. Hence ICT integration is highly supported by several teachers. As stated by Aydm (2005) Mathematics is basic substance of each technology and technologies support mathematics teaching. The outcome of computer technology on education is superior in mathematics than in any other discipline, it is important for mathematics teachers to use ICT. This is why the researcher conducted the study, as time goes by the ways of effective learning of the students is dynamic, the way they are being taught is very much important and in this digital era, it is very important to use ICT inside the mathematics classroom. Hence, the researcher conducted this study to describe the attitude of Mathematics Teachers towards the use of ICT inside the classroom. Specifically, this study aimed to

1. Determine the level of attitude of mathematics teachers towards ICT integration.
2. Determine if there is a significant difference in the level of attitude of mathematics teachers towards ICT integration when grouped according to, (1) Sex, (2) Participation in an ICT course, (3) Teaching Experience, and (4) Daily Internet Usage.

2. Methodology

The study utilized a quantitative approach and a descriptive-comparative research design. The quantitative results from the data gathered described the attitudes of mathematics teachers towards ICT integration. The study also described if there exists a significant difference between the attitudes of mathematics teachers towards ICT integration and their sex, teaching experience, participation in an ICT course and their daily number of hours of internet usage.

The study employed a purposive sampling method to identify the research respondents, hence the respondents will be all the mathematics teachers in Nueva Vizcaya General Comprehensive High School, Bonfal National High School, Bayombong Central School SPED Center, Bayombong South Elementary School. There are 38 Mathematics teachers in Bayombong Nueva Vizcaya that were given the google form.

The data is normally distributed by Shapiro – Wilk and the researcher used the mean score of level of attitude of mathematics teachers towards ICT integration in answering if there is a significant difference among the study variables. To describe the attitude of Mathematics teachers towards ICT integration, descriptive statistics particularly frequency count and percent distribution was used. To determine if there is a significant difference in the level of attitude of Mathematics teachers towards ICT when grouped by sex the T-test for independent sample was used. To determine if there is a significant difference in the level of attitude of Mathematics teachers towards ICT when grouped by participation in an ICT course, the T-test for independent sample was used. To determine if there is a significant difference in the level of attitude of Mathematics teachers towards ICT when grouped by teaching experience, the Brown-Forsythe – Tamhane was used. To determine if there is a significant difference in the level of attitude of Mathematics teachers towards ICT when grouped by daily internet usage, the One-way ANOVA- Scheffe was used.

3. Results

Objective 1

Determine the level of attitude of mathematics teachers towards ICT integration.

Table 1. Level of Attitudes of Mathematics Teachers towards ICT integration

Level	Frequency	Percent
Highly Positive Attitude	8	21.1
Positive Attitude	25	65.8
Neutral Attitude	5	13.2
Total	38	100.0

Mean: 4.08 (Positive Attitude) Standard deviation: 0.587

Table 1 shows that the mathematics teachers have a “positive attitude” towards ICT integration with an average weighted mean of 4.08. Majority of the respondents have a “positive attitude” with 65.8% (25) followed by “highly positive attitude” with 21.1% (8) of the respondents and 13.2% (5) of them were neither positive nor negative with their attitude or “neutral attitude” towards ICT integration.

Objective 2

Determine if there is a significant difference in the level of attitude of mathematics teachers towards ICT integration when grouped according to, (1) Sex, (2) Participation in an ICT course, (3) Teaching Experience, and (4) Daily Internet Usage.

Independent Sample T - test results in Sex

Table 2. Significant Difference in T – Test based on Sex.

	N	Mean	Test Statistic
Sex			
Male	16	3.8693	t (36) = -2.140
Female	22	4.1898	p = 0.039

As shown in Table 2, there is a significant difference between the level of attitude of mathematics teachers towards ICT integration and sex, t (36) = -2.140, p = 0.039. This implies that female teachers have a more positive attitude towards ICT integration than the male respondents.

This corroborates with Tezci (2010) who also found that females had more positive attitudes than males towards ICT integration. Similarly, study was also conducted by Mwila (2018) states that the that both male and female teachers had positive attitudes towards integration of ICT in their teaching process. Hence, based on the findings and the support from the related studies, female teachers are generally more inclined or receptive to using technology in education compared to their male counterparts. It is important to ensure that both male and female teachers are well-prepared to integrate ICT into their teaching practices. Encouraging diversity and inclusivity in technology education can help bridge the gender gap.

Independent Sample T - test results in Participation in an ICT course

Table 3. Significant Difference in T – Test based on Participation in an ICT course.

Demographic Profile	N	Mean	Test Statistic
Participation in an ICT course			
With ICT course	14	4.0126	t (36) = -0.413
Without ICT course	24	4.0796	p = 0.682

Table 3 indicates that there is no significant difference between the level of attitude of mathematics teachers towards ICT integration and participation in an ICT course, t (36) = -0.413, p = 0.682. This implies that the level of attitude of the respondents towards ICT integration are the same regardless of their participation in an ICT course.

Brown – Forsythe results in Teaching Experience

Table 4. Significant Difference in Brown - Forsythe based on Teaching Experience

	Statistic	df1	df2	Sig.
Brown-Forsythe	16.087	3	29.222	.000

a. Asymptotically F distributed.

Table 4 shows that there is a significant difference between the level of attitude of mathematics teachers towards ICT integration and teaching experience, p = 0.000.

Table 5. Post Hoc Tamhane Multiple Comparisons

(I) Teaching Experience	(J) Teaching Experience	Mean Difference (I-J)	Std. Error	Sig.
1-5 years	6-10 years	.10883	.15966	.985
	11-20 years	-.13810	.13062	.888
	20 and more years	-.84528*	.10703	.000
6-10 years	1-5 years	-.10883	.15966	.985
	11-20 years	-.24693	.15887	.584
	20 and more years	-.95411*	.14013	.000
11-20 years	1-5 years	.13810	.13062	.888
	6-10 years	.24693	.15887	.584
	20 and more years	-.70718*	.10585	.000
20 and more years	1-5 years	.84528*	.10703	.000
	6-10 years	.95411*	.14013	.000
	11-20 years	.70718*	.10585	.000

*. The mean difference is significant at the 0.05 level.

Table 5 also shows that there is a significant difference when we compare 20 and more years to 1 – 5 years (p = 0.000), 20 and more years to 6 – 10 years (0.000) and 20 and more years to 11 – 20 years (0.000). This implies that the level of attitude of the respondents towards ICT integration are significantly higher to those who have teaching experience of 20 and more years than those 1 – 5 years, 6 – 10 years and 11 – 20 years of teaching experience.

The results also supported by Elsaadani (2013) who also found that those with 20 years or more of teaching experience demonstrate a greater degree of technology integration. The findings also complement with Zhad (2016) who found that there is a significant difference between the level of attitude of mathematics teachers towards ICT integration and teaching experience. Hence, based on the findings and the support from the related studies, mathematics teachers with 20 or more years of teaching experience tend to have a more favourable and positive attitude towards integrating ICT into their teaching methods. This suggests that these experienced teachers may see the value and benefits of using technology in the classroom.

One – way ANOVA results in Daily Internet Usage

Table 6. Significant Difference in One way ANOVA based on Daily Internet Usage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.342	3	1.114	7.442	.001
Within Groups	5.089	34	.150		
Total	8.431	37			

As shown in Table 6, there is a significant difference between the level of attitude of mathematics teachers towards ICT integration and daily internet usage, p = 0.001.

Table 7. Post Hoc Scheffe Multiple Comparisons

(I) Daily Internet Usage	(J) Daily Internet Usage	Mean Difference (I-J)	Std. Error	Sig.
Almost never	1-2 hours	-.88286*	.20156	.001
	3-4 hours	-.87919*	.20359	.002
	5-7 hours	-.85825*	.23427	.009
1-2 hours	Almost never	.88286*	.20156	.001
	3-4 hours	.00366	.14901	1.000
	5-7 hours	.02460	.18878	.999
3-4 hours	Almost never	.87919*	.20359	.002
	1-2 hours	-.00366	.14901	1.000
	5-7 hours	.02094	.19094	1.000
5-7 hours	Almost never	.85825*	.23427	.009
	1-2 hours	-.02460	.18878	.999
	3-4 hours	-.02094	.19094	1.000

*. The mean difference is significant at the 0.05 level.

Table 7 also shows that there is a significant difference when we compare almost never to 1 -2 hours (p = 0.001), almost never to 3 – 4 hours (p = 0.002), and almost never to 5 – 7 hours (p = 0.009). This implies that the level of attitude of mathematics teachers towards ICT integration are significantly higher to those who have daily internet usage of 1 – 2 hours, 3 – 4 hours, and 5 – 7 hours than those who do not have daily internet usage.

This corroborates with Hafifah et al. (2020) who also found that the more duration teachers use the internet, the more ICT literacy they acquire. Teachers with excellent ICT skills mostly access the internet more than 7 hours a day, 3-4 hours a day for teachers who are good at ICT, 1-2 hours a day for adequate teachers, and less than 1 hour for teachers who are poor in ICT literacy. Similarly, a study was also conducted by Akturk (2015) states that duration of daily internet use was the strongest predictor of attitudes towards technology. Hence, based on the findings and the support from the related studies, mathematics teachers who use the internet daily for at least an hour likely have a higher level of digital literacy and comfort with technology. This implies that comfort with technology might be associated with a more positive attitude towards integrating technology, such as ICT tools, into their teaching practices.

Summary of Findings

1. Majority of the respondents have a “positive attitude” with 65.8% (25) followed by “highly positive attitude” with 21.1% (8) of the respondents and 13.2% (5) of them were neither positive nor negative with their attitude or “neutral attitude” towards ICT integration.
2. There was a significant difference between the level of attitude of mathematics teachers towards ICT integration and Sex, since the p values of these variables are less than 0.05.
3. There was no significant difference between the level of attitude of mathematics teachers towards ICT integration and Participation in an ICT course, since the p values of these variables are greater than 0.05.
4. There was a significant difference between the level of attitude of mathematics teachers towards ICT integration and Teaching Experience, since the p values of these variables are less than 0.05.
5. There was a significant difference between the level of attitude of mathematics teachers towards ICT integration and Daily Internet Usage, since the p values of these variables are less than 0.05.

Conclusions

Based on the significant findings of the study, the following conclusions were drawn:

1. All identified demographic profiles of the respondents are significant to the level of attitude of mathematics teachers towards ICT integration except for participation in an ICT course.

2. Female teachers have a more positive attitude towards ICT integration than the male respondents.
3. Mathematics teachers who have teaching experience of 20 and more years have a more positive attitude towards ICT integration than those 1 – 5 years, 6 – 10 years and 11 – 20 years of teaching experience.
4. Mathematics teachers who spend at least an hour of internet usage per day have a more positive attitude than those who do not have daily internet usage.

Recommendations

In the light of this study, the researcher recommends the following:

Future researcher. The researchers recommend to the future researcher to conduct similar studies using other instruments to have more comprehensive concepts.

Mathematics Teachers. The researcher recommends to the Mathematics Teachers to increase their involvement using ICT when teaching to achieve a positive attitude.

School Administrator. The researchers recommend to the School Administrator, to provide seminars and programs that aims to motivate not only female teachers but more on male teachers to integrate ICT inside the classroom.

Department of Education. The researcher recommends DEPED to organize programs and seminars that aim to educate and motivate teachers to use ICT in the classroom. Promote use of computers and possibly support increase of computer facilities for teacher use.

Acknowledgements

This research would not have been possible without the invaluable support and resources provided by the Department of Science and Technology in my academic aspirations.

References

Akturk, A. O., Izci, K., Caliskan, G., & Sahin, I. (2015). Analyzing Preservice Teachers' Attitudes towards Technology. Online Submission, 9(12), 3960-3966.

Aydın, E. (2005). The use of computers in mathematics education: A paradigm shift from "computer assisted instruction" towards "student programing." The Turkish Online Journal of Educational Technology – TOJET, 4(2), 1-8.

Bayrak, B. K., & Bayram, H. (2010). The effect of computer aided teaching method on the students' academic achievement in the science and technology course. *Procedia-Social and Behavioral Sciences*, *9*, 235-238.

Elsaadani, M. A. (2013). Exploring the relationship between teaching staff'age and their attitude towards information and communications technologies (ICT). *International Journal of Instruction*, *6*(1).

Hafifah, G. N., & Sulistyo, G. H. (2020). TEACHERS'ICT LITERACY AND ICT INTEGRATION IN ELT IN THE INDONESIAN HIGHER EDUCATION SETTING. Turkish Online Journal of Distance Education, 21(3), 186-198.

Hennessy, S., Fung, P., & Scanlon, E. (2001). The role of the graphic calculator in mediating graphing activity International Journal of Mathematics for Education in Science and Technology, 32(2), 267-290.

Jabr, W. J. (2007). The effect of using a computer on the seventh grade students' achievement in mathematics and their teachers attitudes towards using it as a learning mean. Unpublished master dissertation, University of Jordan.

Karami, M., Karami, Z., & Attaran, M. (2013). Integrating problem-based learning with ICT for developing trainee teachers' content knowledge and teaching skill. International Journal of Education and Development uses Information and Communication Technology (IJEDICT), 9 (1), 36-49.

Kelly, D., Nord, C. W., Jenkins, F., Chan, J. Y., & Kastberg, D. (2013). Performance of US 15-year-old students in mathematics, science, and reading literacy in an international context. First Look at PISA 2012. NCES 2014-024. National Bureau of Economic Research

Leatham, K. R., & Peterson, B. E. (2010). Secondary mathematics cooperating teachers' perceptions of the purpose of student teaching. Journal of Mathematics Teacher Education, 13(2), 99-119.

Maltese, A. V., & Tai, R. H. (2011). Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among US students. Science education, 95(5), 877-907.

Mwila, P. (2018). Assessing the Attitudes of Secondary School Teachers towards the Integration of ICT in the Teaching Process in Kilimanjaro, Tanzania. International Journal of Education and Development using Information and Communication Technology, 14(3), 223-238.

Ojugo, A. A., Osika, Iyawa, I. J. B. & Yeroken, R. O. (2015). Information and Communication Technology (ICT) Integration into Science, Technology, Engineering and Mathematic (Stem) in Nigeria.

Rendall, L.T. (2001). The effectiveness of computer-based instruction program: A comparative study. Unpublished doctoral dissertation, Temple University.

Ronis, D. L. (2008). Problem-based learning for math & science: Integrating inquiry and the internet. Corwin Press.

Sinclair, N., & Jackiw, N. (2005). Understanding and projecting ICT trends in mathematics education. Teaching secondary mathematics with ICT, 235-251.

Smeets, E. (2005). Does ICT contribute powerful learning environments in primary education? . Computer & Education, 44, 345-355.

Texas Instruments (2007). Why should a teacher use technology in his or her mathematics classroom?

Tezci, E. (2010). Attitudes and knowledge level of teachers in ICT use: The case of Turkish teachers. Journal of human sciences, 7(2), 19-44.

Witte, K. D., & Rogge, N. (2014). Does ICT matter for effectiveness and efficiency in mathematics education? Computer & Education, 75, 173-184.

Zyad, H. (2016). Integrating Computers in the Classroom: Barriers and Teachers' Attitudes. International Journal of Instruction, 9(1), 65-78.