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THE MEDIATING EFFECT OF TEACHER SUPPORT ON THE RELATIONSHIP BETWEEN TECHNOLOGY INTEGRATION AND LEARNING ATTITUDES OF MATHEMATICS EDUCATION STUDENTS IN LEARNING MATHEMATICS

Sarah Mae A. Licomes[1], Elealeh S. Timosa, MAEd[2]

[1]Student Researcher, Institute of Teacher Education, Kapalong College of Agriculture, Sciences and Technology, Kapalong,

[2]Instructor, Kapalong College of Agriculture, Sciences and Technology, Kapalong, Philippines

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ABSTRACT

The research examines how teacher support mediate the relationship between technology integration and learning attitudes of mathematics education students in learning mathematics. The quantitative, no experimental investigation uses descriptive-correlational and mediation analyses. Using stratified random sampling with proportionate allocation and Slovin's algorithm with 0.05 margin of error, 150 randomly chosen mathematics education students answered the questionnaires on the three variables. Results indicated is at a high level, technology integration and learning attitudes, as well as high level of teacher support. Results also showed a significant relationship between technology integration, teacher support, and learning attitudes of mathematics education students. The findings also reveal that teacher support partially mediated technology integration and learning attitudes. This study shows that technology integration of mathematics education students is linked to learning attitudes in mathematics, so teachers should consider other factors that affect learning attitudes rather than just how students perceive their technology integration. They should examine different teacher support for students. Teachers should additionally consider students' academic support, interpersonal support and emotional support which partially moderate or considerably alter the relationship between technology integration and learning attitudes.

KEYWORDS: *Technology Integration, Learning Attitudes, Teacher Support, Mathematics*

INTRODUCTION

Learning mathematics is a dynamic process that needs planning and readiness. Problems on students' attitudes towards learning still happening in different academic settings. Students who have negative learning attitudes towards mathematics may lack confidence in their own talents and may oppose math-related learning activities, which can lead to low interest and poor performance. Thus, instilling a positive attitude at the very beginning may be the key to improved accomplishment. Positive attitude reinforcement can interrupt the pattern, improving learning outcomes and pushing students to study, grow and progress. Researchers argue attitude is the combination of affective feelings and cognitive beliefs (Mirza & Hussain, 2018).

In global setting, particularly in Singapore, 41.38 % of the students' population was identified for having negative attitudes towards learning mathematics. Students find mathematics as the most difficult subject, which made it feared by them. Students often believe that mathematical concepts are either impossible to learn or extremely difficult to grasp Moreover, Students increasingly develop negative attitudes toward mathematics studies from the fifth grade of elementary school, until the final year of high school, one of the most critical factors affecting students' success in mathematics is their attitude toward the subject. Students with a negative attitude toward mathematics often dislike it, view it as irrelevant, and feel apprehensive about participating in it. Therefore, students tend to avoid mathematics-related activities (Cho & Hwang, 2019).

In the Philippines, Students often develop negative attitudes toward mathematics when they struggle academically or find the subject uninteresting. This is reflected in frequent low quiz scores and, at worst, failing exams. A key issue identified is the negative attitude students exhibit during mathematics classes, characterized by boredom, disinterest, and lethargy. One major reason for their lack of motivation is their belief that their efforts won't lead to better performance, coupled with competing priorities that divert their attention. (Shoenfield, 2019).

In connection, numerous studies have been done to identify reasons, establish conclusions, and make solutions due to the seriousness of the situation. The researcher aimed to analyze the

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importance of teacher support as a mediating variable between technology integration and learning attitudes. However, the researcher had not come across a study in the Philippines, particularly in the locality, that covered all of the said variables. There had been studies conducted, such as those of Moussa, (2022), entitled "Factors Affecting Attitude toward Learning Mathematics: A Case of Higher Education Institutions in the Gulf Region" and Mazana M. et al, (2019), entitled "Investigating Student's Attitude towards Learning Mathematics", which focused on learning attitudes bur nor on the significant relationship with technology integration and teacher support, the respondents were not college students. It is based on premise that the researchers felt it was necessary to conduct this study to determine the mediating effect of teacher support on the relationship between technology integration and learning attitudes of mathematics education students. The importance of this research demonstrates the impact of that teacher support may have on the technology integration and learning attitudes in learning mathematics.

STATEMENT OF THE PROBLEM

The purpose of this study was to examine the mediating role of teacher support on the relationship between technology integration and learning attitudes of mathematics education students in learning mathematics. To be specific, this study sought to answers to the following objectives:

1. To determine the level of technology integration of mathematics education students in terms of:
   - 1.1 mathematics confidence;
   - 1.2 computer confidence; and
   - 1.3 attitudes to the use of technology in learning mathematics
2. To determine the level of learning attitudes of mathematics education students in terms of:
   - 2.1 self-confidence;
   - 2.2 mathematics anxiety;
   - 2.3 enjoyment of mathematics;
   - 2.4 intrinsic motivation; and
   - 2.5 perceived usefulness
3. To determine the level of teacher support of mathematics education students in terms of:
   - 3.1 academic support;
   - 3.2 interpersonal support; and
   - 3.3 emotional support
4. To determine the significant relationship between :
   - 4.1 technology integration and learning attitudes of mathematics education students in learning mathematics
   - 4.2 technology integration and teacher support: and
   - 4.3 Learning attitudes and teacher support.
5. To determine the significant relationship between technology integration and learning attitudes as mediated by teacher support.

METHODOLOGY RESEARCH DESIGN

This study employed a quantitative non-experimental research design using descriptive correlational techniques and mediation analysis. Mediating variables refer to behavioral, biological, psychological, or social constructs that convey the effect of one variable to another. Mediation provides a means for researchers to understand the process or mechanism through which one variable influences another. Non-experimental research is a kind of either quantitative or qualitative research that is not considered as an experiment, it is a dominant kind of research that was used in social students.

STATISTICAL TREATMENT OF DATA

The following statistical tools were utilized to calculate the data in this study in lieu of testing the researcher's objectives at a 0.05 level of significance.

Mean. This was used to determine the significant relationship technology integration and learning attitudes among the respondents.

Pearson-r. this was used to determine the significant relationship between technology integration and learning attitudes among the respondents.

Regression. This was used to determine the indicator(s) of technology integration that can significantly influence learning attitudes

RESEARCH RESPONDENTS

The respondents of this study were mathematics education students of Kapalong College pf agriculture, Sciences and Technology located at the Municipality of Kapalong, Province of Davao del Norte. Particularly, these includes first-year to fourth-year mathematics education students. To ensure an accurate distribution of samples, the researcher employed stratified random sampling, utilizing proportional allocation, through Slovin's formula with a margin of error of 0.05. In stratified random sampling, the population is partitioned into subgroups called "strata". From within each stratum, uniform random sampling is used to select a per-stratum sample. All per-stratum samples are combined to derive the stratified random sample (Nguyen et al, 2020). The criterion of selecting the respondents is the following: the respondents must be enrolled in the first semester of the academic year 2023-2024 under mathematics education program in Kapalong College of Agriculture, Sciences and Technology and they must be from first year to fourth year.

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RESULTS AND DISCUSSION

The following are the results of the study.

Table 1
Summary on the Level of Technology Integration

Technology Integration	Mean	Description
Mathematics Confidence	3.72	High
Computer Confidence	3.53	High
Attitudes to the use of technology in learning mathematics	3.89	High
OVERALL	**3.71**	**High**

The overall level of technology integration in terms of mathematics confidence, computer confidence and attitudes to the use of technology in learning mathematics. The data revealed that the level of technology integration of mathematics education students has a total mean of 3.71 with the descriptive equivalent of high. This indicates that the level of technology integration of mathematics education students is oftentimes observed. Moreover, the highest mean is 3.89 with the descriptive equivalent of high. This indicates that the level of technology integration as perceived by students in terms of attitudes to the use of technology in learning mathematics is oftentimes observed. Likewise, the lowest indicator is computer confidence which obtained a mean of 3.53 with a descriptive equivalent of high. This indicates that the level of technology integration in terms of computer confidence is oftentimes observed. Furthermore, mathematics confidence obtained a mean of 3.72, which means high. This indicates that the level of technology integration in terms of mathematics confidence is often observed.

Table 2
Summary on the Level of Learning Attitudes

Indicators	Mean	Description
Self-Confidence	3.72	High
Mathematics Anxiety	3.61	High
Enjoyment Of Mathematics	4.08	High
Intrinsic Motivation	4.06	High
Perceived Usefulness	4.20	High
OVERALL	**3.93**	**High**

The overall level of learning attitudes in terms of self-confidence, mathematics anxiety, enjoyment of mathematics, intrinsic motivation, and perceived usefulness. The data revealed that the level of learning attitudes of mathematics education students has a total mean of 3.93 with the descriptive equivalent of high. This indicates that the level of learning attitudes of mathematics education students is oftentimes observed. Moreover, the highest mean is 4.20 with the descriptive equivalent of high. This indicates that the level of technology integration as perceived by students in terms of indicates that the level of technology integration as perceived by students in terms of perceived usefulness is oftentimes observed. Likewise, the lowest indicator mathematics anxiety, which obtained a mean of 3.61 with a descriptive equivalent of high. This indicates that the level of learning attitudes in terms of mathematics anxiety is oftentimes observed. Furthermore, self-confidence obtained a mean of 3.72, which means high. This indicates that the level of learning attitudes in terms of self-confidence is oftentimes observed. Additionally, enjoyment of mathematics obtained a mean of 4.08, which means high. Lastly, intrinsic motivation obtained a mean of 4.06, which means high. This indicates that the level of learning attitudes in terms of enjoyment and intrinsic motivation is oftentimes observed.

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Table 3
Summary on the Level of Teacher Support

Indicators	Mean	Description
Academic Support	4.38	Very High
Interpersonal Support	4.03	High
Emotional Support	4.22	High
OVERALL	**4.21**	**High**

The overall level of teacher support in terms of academic support, interpersonal support and emotional support. The data revealed that the level of teacher support of mathematics education students has a total mean of 4.21 with the descriptive equivalent of high. This indicates that the level of teacher support of mathematics education students is oftentimes observed. Moreover, the highest mean is 4.38 with the descriptive equivalent of very high. This indicates that the level of teacher support as perceived by students in terms of academic support is always observed. Likewise, the lowest indicator interpersonal support, which obtained a mean of 4.03 with a descriptive equivalent of high. This indicates that the level of teacher support in terms of interpersonal support is oftentimes observed. Furthermore, emotional support obtained a mean of 4.22, which means high. This indicates that the level of teacher support in terms of emotional support is oftentimes observed.

Table 4
Significant Relationship between Technology Integration and Learning Attitudes

Variable	Mean	R-Value	P-Value	Decision @=0.05
Technology Integration	3.71	.713	<.001	Ho Rejected
Learning Attitudes	3.93			

The result of the significant relationship between technology integration and learning attitudes, r (148) =.713, $p<.001$. Since the probability value ($p<.001$) is less than the level of significance ($\alpha=0.05$), null hypothesis is rejected. This means that there is a positive and significant relationship between technology integration and learning attitudes.

Table 5
Significant Relationship between Technology Integration and Teacher Support

Variable	Mean	R-Value	P-Value	Decision @=0.05
Technology Integration	3.71	.463	<.001	Ho Rejected
Teacher Support	4.21			

The result of the significant relationship between technology integration and teacher support, r (148) =.463, $p<.001$. Since the probability value ($p<.001$) is less than the level of significance ($\alpha=0.05$), null hypothesis is rejected. This means that there is a positive and significant relationship between technology integration and teacher support.

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Table 6
Significant Relationship between Teacher Support and Learning Attitudes

Variable	Mean	R-Value	P-Value	Decision @=0.05
Learning Attitudes	4.93	.560	<.001	Ho Rejected
Teacher Support	4.21			

The result of the significant relationship between learning attitudes and teacher support, r (148) =.560, p<.001. Since the probability value (p<.001) is less than the level of significance (α=0.05), null hypothesis is rejected. This means that there is a positive and significant relationship between learning attitudes and teacher support.

Table 7
Path Coefficients

			Estimate	Std. Error	z-value	p	95% Confidence Interval Lower	95% Confidence Interval Upper
MV	→	DV	0.254	0.052	4.878	< .001	0.152	0.356
IV	→	DV	0.490	0.051	9.629	< .001	0.390	0.590
IV	→	MV	0.454	0.071	6.405	< .001	0.315	0.592

Table 7 revealed that technology integration significantly influenced learning attitudes, β=.490, p<.001. In addition, technology integration significantly affected teacher support, β=.454, p<001. Lastly, teacher support is found to be a significant predictor of learning attitudes, β=.254, p<.001. In addition to the result of the study, Figure 3 shows the path estimates be-tween Technology Integration and Learning Attitudes (Path c), Technology Integration and Learning Attitudes (Path a), and Teacher Support and Learning Attitudes (Path b). It revealed that technology integration significantly influenced learning attitudes, β=.490, p< .001.

Moreover, technology integration significantly affected teacher support, β=.454, p<.001. Lastly, teacher support is found to be a significant predictor of learning attitudes, β=.254, p<.001. These results suggested the relationship between technology integration and learning attitudes was partially mediated by the indirect pathway through teacher support, a claim that was also supported in Table 20 by the estimation of a significant indirect effect.

Furthermore, the results suggest that learning attitudes should not be solely attributed to students' technology integration. Teachers need to consider other factors that influence students' learning attitudes, beyond just their use of technology. It may be beneficial for teachers to also focus on providing support in areas such as academic, emotional, and interpersonal support, as these factors partially mediate or significantly impact the relationship between technology integration and learning attitudes.

RECOMMENDATIONS

The suggestions of the researcher are established based on the results and the wholeness of the paper. In light of the aforementioned findings of the study, the following recommendations were made. The study results show that individuals enrolled in mathematics education programs have high technology integration, but they tend to do worse on the computer confidence scale when compared to other indicators. Digital learning, personalized learning, and the ability to do tasks on computers are all components of computer confidence. Students such as these may do very well on doing assignments, tasks and assessments in mathematics

Additionally, incorporating innovative teaching techniques can help stimulate favorable learning attitudes among mathematics education students in learning mathematics. Students have become known for their capacity to consider several viewpoints. In order to tackle this issue, there is a greater focus on incorporating and enhancing effective teacher's support mathematics education.

It is recommended that, as the mediation analysis revealed that teacher support in the relationship between technology integration and learning attitudes, it is recommended that future researcher investigate other variables that could fully mediate the relationship between technology integration and learning attitudes throughout the learning of mathematics. They are also encouraged to utilize other methodologies, factors, or variables that the study was not able to cover. In addition, they might conduct it in other locales and/or with larger scale participants.

Finally, for future researchers, if you want to study teacher support, technology integration, and learning attitudes across different educational institutions, you must utilize a challenging strategy that accommodates varied individuals and learning preferences. Collaborating with college authorities, professors, and students from other institutions helps broaden and authenticate the research. Standardized evaluations and personalized surveys give solid evidence of the association between teacher support, technology integration, and learning attitudes on a larger scale. Encourage open communication; develop clear criteria for recruiting participants and receiving their consent, and follow ethical standards to keep the research honest and trustworthy in various educational contexts.

CONCLUSIONS

The study shows a strong correlation between learning attitudes and teacher support, especially interpersonal support. The research underscores the need of using technology that accommodate various teacher support in order to improve students' learning attitudes in learning mathematics. To improve mathematics learning, creative methods like realistic learning and guided inquiry to support students' learning effectively are advised. Importantly, these techniques complement Bronfenbrenner's idea of ecological theory, offering a comprehensive approach to improve teaching and learning environment.

Additionally, the mediation research showed how teacher support influence the relationship between technology integration and learning attitudes. It emphasizes the importance of social interactions and supportive learning environments, as well as the connection between teaching and learning interests in mathematics education. However, within the parameters of the results, they claim that the relationship between technology integration and learning attitudes is somewhat mediated by teacher support; this claim is further supported by the evaluation of a significant indirect influence.

Finally, the findings of this study, in connection with the theory of Bronfenbrenner's ecological theory, which emphasizes the importance of good learning environment/atmosphere in learning, provide crucial insights into how individuals acquire learning attitudes. This theory underscores the importance of recognizing and adapting to diverse learning styles, ultimately enhancing students' mathematical learning outcomes. By incorporating Bronfenbrenner's theory into the study's framework, it offers a valuable lens through which to analyze how educators can optimize instructional approaches to support mathematics education students.

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