



Colleges of Education Pre-service Mathematics Teachers' Attitude as Correlate of Self-efficacy in Learning mathematics in Northwest Nigeria

Muhammad, Abdullahi

Email: 107abdul@gmail.com,

Tel: +2348032284405

Department of Mathematics, School of Secondary Education (Science)
Federal College of Education (Technical) Gusau, Zamfara State, Nigeria

Abstract

This paper examined pre-service mathematics teachers' attitude toward learning mathematics and their mathematics self-efficacy in learning mathematics among Nigerian colleges of education pre-service teachers. The study employed correlational design, questionnaires were distributed through personal visit to all the 366 final year pre-service mathematics teachers of COEs in the northwest, Nigeria who were selected as sample for this study from the population of 2761 colleges of education pre-service mathematics teachers using Cochran formula. The questionnaire used for this study was adapted from previously validated instruments after receiving written permission from the original authors of the used questionnaire. Cronbach alpha value of 0.86 was obtained as internal consistency of the instrument. The data collected was analyzed using both descriptive and inferential statistics (correlation). The findings of this study revealed that pre-service teachers' attitude towards learning mathematics is high and there exist a significant relationship between pre-service teachers' attitude towards learning mathematics and their mathematics self-efficacy among other findings. The researcher's recommendations among others is government and all stakeholders in education need to support and retain these highly confident and well determined future qualified mathematics teachers in education sector as they will play a vital role in solving problem of poor achievement in mathematics and low desire to accept mathematics as a course of study at tertiary institutions by students, which previous studies attributed to negative attitude and low self-efficacy in learning mathematics.

Keyword: Pre-service teachers, Attitude, Mathematics self-efficacy, Colleges of Education Mathematics learning.

Introduction

Attitude is one of the significant factors that characterizes human distinctiveness. In every culture people like or dislike, love or hate, favour or oppose, agree, or disagree, encourage or discourage, claim or disclaim and so on. All these are judgmental reactions to an object. Thus, attitudes are summary appraisal of an object of thought. People's belief or perception they have about their capabilities to carry out or accomplished certain tasks successfully motivates them to do so.

Self-efficacy was defined by Gavora (2010) as one's conviction about their capabilities to accomplish certain tasks in an appropriate and effective manner. Han, et al (2015) defined self-efficacy as one's belief or perception about one's ability to perform at a certain level on a job. Therefore, self-efficacy is the individual's conviction or confidence that they can successfully accomplish given activity at designated level. Having high level of self-efficacy about one's ability is important as it motivates one to succeed in life. Researchers in field of education have been conducting studies on self-efficacy over the last four decades (Bandura, 1977). Educational research on self-efficacy stemmed from the theory of Bandura. According to Bandura (1997), self-efficacy beliefs affect one's ways of thinking and feelings, which may allow or stop actions. Meaning that if a person has high level of self-efficacy about his capabilities, it will motivate him to put more effort on the activity, while low level of self-efficacy will lead to idleness and non-performance. Bandura (1994) defined mathematics self-efficacy as one's beliefs or perceptions with respect to their abilities in mathematics. Mathematics self-efficacy is one's conviction or confidence in their abilities to solve problems in mathematics. Ferla, et al (2015) posited that mathematics self-efficacy indicates individual's self-perceived confidence to successfully accomplish a particular mathematics activity (Briley, 2012). In Nigerian context, studies related with mathematics self-efficacy (Adedeji, 2011; Ayotola & Adedeji, 2009).

Mathematics is made a compulsory subject from primary to senior secondary schools in Nigeria and a foundation for scientific and technological expansion (Azuka, 2000). To this end, well-trained mathematics teachers must be produced at Colleges of Education in Nigeria to teach the subject at the basic education level in Nigeria. In order to attain the mission of establishing the colleges of education (COEs) thus. The mission of colleges of education in Nigeria is to produce highly motivated and well-trained Nigeria Certificate in Education (NCE) teachers' worthy of character and learning through effective teaching, research, and public service for the Basic Education level (NCCE, 2012; Isiyaku, et al (2015). In recent times, the



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attitude, enrolment, and desire to accept mathematics as a course of study by students at tertiary institutions and COEs in particular in Nigeria has not been encouraging (Salman, et al 2011). In Nigeria, several studies revealed that students' attitude toward mathematics influenced the effort they put in understanding and practicing mathematical concepts and skills (Enu, et al 2015; Adedolun 2014), students' attitude toward learning mathematics is generally negative, this negative attitude contributed to their low desire to accept mathematics as a course of study at the tertiary institutions (Suleiman & Muhammad, 2016; Musa & Dauda, 2014). Based on this, many students have perceived mathematics as a very difficult school subject to study because of the negative impression they have had from their past generations who have had bad experience with unqualified mathematics teachers. That mathematics is the most difficult subject in school, it is not meant for everyone and not everybody passes it, based on these many students do not concentrate in learning the subject and spend little time practicing it (Dauda, et al 2016; Eraikhuaman & Omoregbe, 2017). More so, the study of Awofala (2016) revealed that university pre – service mathematics teachers' attitude toward learning mathematics were positive and high. Based on this the current study intends to examine the pre-service teachers' attitude as it correlates to self-efficacy in learning mathematics and to investigate whether there exists any relationship between pre-service teachers' attitude and self-efficacy among colleges of education pre-service mathematics teachers in Nigeria.

Objectives of the Study

The main objective of the study is to examine the relationship between Colleges of Education Pre-service Mathematics Teachers Attitudes and Self-efficacy in learning mathematics. Specifically, the study aimed to

1. Examine the attitude of colleges of education pre-service mathematics teachers toward learning mathematics.
2. Ascertain the confidence level of colleges of education pre-service mathematics teachers to the learning of mathematics.
3. Determine the extent do colleges of education pre-service mathematics teachers' attitude toward learning mathematics relates to their self-efficacy in learning mathematics.

Research Questions

The following research questions were raised by the researchers to guide the current study.

1. What is the attitude of colleges of education pre-service mathematics teachers toward learning mathematics?
2. What is the confidence level of colleges of education pre-service mathematics teachers to the learning of mathematics?
3. To what extent do colleges of education pre-service mathematics teachers' attitude toward learning mathematics and mathematics self-efficacy are related?

Research Hypothesis

The following null hypothesis was formulated by the researchers in the conduct of this study

1. There is no significant relationship between colleges of education pre-service mathematics teachers' attitude towards learning mathematics and mathematics self-efficacy in learning mathematics.

Methodology

The current study employed correlational research design to investigate the extent of relationship between attitude toward learning mathematics and mathematics self-efficacy among colleges of education preservice mathematics teachers in learning mathematics. 366 final year mathematics pre-service teachers' of 2018/2019 academic session from federal and states own colleges of education (12 COEs) in the northwest geo-political zone participated in the research. However, 339 valid questionnaires were used for this study. The selection of sample was done based on Cochran 1977 formular. Data was collected using a survey questionnaire from randomly selected pre-service mathematics teachers (mathematics students) that are willing to participate in the research. For the purpose of this study, the researcher used a questionnaire as an instrument for data collection tagged "Colleges of Education Mathematics Students' Attitude and Self-efficacy Questionnaire (COEMSAS), with a total of 16 item statements (Attitude toward learning Mathematics 7, Self-efficacy in learning Mathematics 9). The questionnaire was structured on 5-points Likert scale with Strongly Agreed which takes 5 points, Agreed 4, Somewhat Agreed 3, Dis Agreed 2 and Strongly Disagreed 1 point. The criterion mean value of acceptance is 3.0 any statement with a mean value less than 3.0 is indicating rejection (disagreement) by respondents. the questionnaire was adapted from previously validated instrument. Mathematics self-efficacy will assess colleges of education mathematics students' assessment of their capability to solve mathematics problems effectively, as well as the students' confidence in their skill to solve mathematics problems. Nine items were adapted from Vandecandelaere, et al (2012). Attitude toward learning mathematics aims at investigating the COEs' mathematics students' set of feelings (favourable or unfavourable feelings) and trends that influence their decision to learn mathematics. Seven items were adapted from Zsoldos-Marchis (2015).



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A pilot test was conducted with 52 final year (NCE III) mathematics students selected from three colleges of education in the northwest, Nigeria. The reliability coefficient, Cronbach Alpha of each construct is greater than 0.80 using SPSS version 25 (Table 1). The internal consistency of the instrument is considered reliable; therefore, the questionnaire items are acceptable since all the values of the Cronbach Alpha of each construct is greater than 0.70 according to George & Mallery (2003).

Table 1. Construct Reliability

Construct	No. of Item	α -value for pilot study (n = 52)
Mathematics Self-efficacy	9	0.88
Attitude toward Mathematics	7	0.84

SPSS V25

Result

Research Question 1

What is the attitude of Colleges of Education pre-service mathematics teachers?

Table 2. Mean and Standard deviation of Attitude towards Mathematics

Items	Mean	Std. Dev
I like mathematics	4.32	0.72
Mathematics will be useful to me in the future.	4.42	0.79
*Mathematics is one of the most boring subjects in school.	4.36	0.76
If I practice more, I would be better in mathematics	4.40	0.79
*When I study mathematics courses, I feel more uncomfortable than when I study other courses.	4.34	0.73
I feel happy when solving mathematics problems.	4.33	0.81
*No matter what I do, I always get low grade in mathematics courses.	4.39	0.76
Overall Mean and Std. Dev.	4.37	0.77

*Represent negative statement

In answering this research question, pre-service mathematics teachers' responses on attitude toward learning mathematics scale were analyzed using descriptive statistics where mean and standard deviation of each statement under the attitude construct of the respondents were calculated. The result of the analysis is presented in table 2. From table it is clear that the mean response on each item is greater than 4.0 and the overall mean of the attitude toward learning mathematics is 4.37 (see table 2) indicating high level of acceptance by the respondents. Hence, this result indicated that pre -service mathematics teachers at Colleges of Education in Nigeria have high and positive attitude toward learning mathematics. Please note that all items with stars (*) are negative statement but re-coded before the analysis.

Research Question 2

What is the confidence level of Colleges of Education pre-service mathematics teachers?

Table 3. Mean and Standard deviation of Mathematics Self-efficacy

Items	Mean	Std. Dev.
I am very good at mathematics	4.28	0.73
I usually do well in mathematics.	4.30	0.76
I am sure of my ability to study mathematics.	4.31	0.69
I am confident in my ability to study mathematics in any university.	4.31	0.68
I learn mathematics quickly.	4.32	0.67
*Mathematics is more difficult for me compared to my classmate.	4.32	0.81
I have necessary skills to continue my education in mathematics.	4.24	0.82
*I am always afraid when ever remember that I am going to become mathematics teacher.	4.31	0.79
I would like a course that involved mathematics.	4.39	0.77
Overall Mean and Std. Dev.	4.31	0.75

*Represent negative statement



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To answer research question two in this study data obtained through the questionnaire under the construct of mathematics self-efficacy were analyzed using descriptive statistics where mean and standard deviation of each item of mathematics self-efficacy is obtained and used in determining the level of mathematics self-efficacy of pre-service mathematics teachers of Colleges of Education. The analysis was showed in Table 3. Form the table it is clear that all item under the mathematics self-efficacy construct has the mean response of greater than 4.0. This revealed that huge majority of respondents have showed high level of confidence in their learning of mathematics. More so, the overall mean of this scale (mathematics self-efficacy) is 4.31 which indicated that in general pre-service mathematics teachers of Colleges of Education (colleges of education) have high level of confidence in the learning of mathematics. Please note that all items with stars (*) are negative statement but re-coded before the analysis.

Research Question 3

To what extent do Colleges of Education pre-service mathematics teachers' attitude toward learning mathematics and mathematics self-efficacy are related?

In answering this research question, Pearson product moment correlation coefficient was calculated, and the result of the analysis is showed in the Table 4. As indicated in the table 4 it reveals a positive relationship between attitude toward learning mathematics and mathematics self-efficacy of the pre-service mathematics teachers at Colleges of Education. To further confirm whether the relationship observed between attitude toward learning mathematics and mathematics self-efficacy significant or not? The null hypothesis formulated was tested at 0.05 confidence level.

Hypothesis 1

There is no significant relationship between Colleges of Education pre-service mathematics teachers' attitude towards learning mathematics and mathematics self-efficacy in learning mathematics.

Table 4. Correlation between independent and dependent variable

Constructs	Attitude toward learning mathematics	Mathematics self-efficacy
Attitude toward learning mathematics	1	.350** P <.001
Mathematics self-efficacy	.350** P <.001	1

** . Correlation is significant at the 0.01 level (2-tailed).

On the correlation coefficient between attitude toward learning mathematics and mathematics self-efficacy Table 4 reveals that there was a positive correlation between mathematics self-efficacy with attitude toward learning mathematics ($r = .350$; $p < .001$). From the result of this analysis, it clearly showed that the positive relationship between attitude and mathematics self-efficacy is significant.

Discussion of Findings

The result of this study indicated that colleges of education preservice mathematics teachers' attitude toward learning mathematics is positive. This finding is in line with the previous literature (Awofala & Ojaleye, 2018; Eraikhuaman & Omoregbe, 2017; Awofala, 2016; Zsoldos-Marchis, 2015; Adelodun, 2014; Briley, 2012; Marchis'(2011). The study of Awolala (2016) that was conducted on university pre-service mathematics teachers with the aim of investigating their attitude towards learning mathematics and his findings revealed that the attitude of university pre-service mathematics teachers towards mathematics was positive and high. Therefore, the findings of this study indicated that colleges of education pre-service mathematics teachers' attitudes are also positive and high like that of their counterpart in the universities. Although some literature reported that the poor achievement of Nigerian students in mathematics was because of their negative attitude toward learning mathematics (Enu, Agyman, & Nkum, 2015; Musa & Dauda, 2014). However, with the research findings of Awofala (2016) and the result of this current study that was all conducted on pre-service mathematics teachers (future trained mathematics teachers) the future of Nigeria students and Nigerian education sector in general will be bright, because this future qualified mathematics teachers' attitude is positive and high, then they will have the zeal of putting their best in training their students to their understanding without getting angry.

Further more, another finding in this study is the result of pre-service mathematics teachers level of confidence in learning mathematics. Where the findings revealed that colleges of education pre-service mathematics teachers have high level



Colleges of Education Pre-service Mathematics... (Muhammad, 2023) DOI: <https://doi.org/10.5281/zenodo.8367817> of confidence in learning mathematics. This finding is also in agreement with the findings of Zuya, Kwalat and Attah (2016) where in their study they investigated the mathematics self-efficacy of university pre-service mathematics teachers and their results among others revealed that university pre-service mathematics teachers have above average confidence level in learning mathematics. Other literature which the current study is in agreement with their findings are Ayotola and Adedeji (2009), Adedeji (2011). From the findings of this study it is clear that colleges of education pre-service mathematics teachers have high confidence level in learning mathematics like their colleagues in the universities that was reported to have above average confidence level in learning mathematics by Zuya et al. (2016). The implication of this finding to the Nigerian government is that if this well trained qualified mathematics teachers with high mathematics self-efficacy and positive attitude toward learning mathematics will be employed to teach mathematics with good condition of service the poor performance and low achievement of students in mathematics will be come history in Nigeria.

In addition, another very significant finding of the research is that the positive relationship that was found between colleges of education pre-service mathematics teachers' attitude towards learning mathematics and their mathematics self-efficacy. Meaning that the positive feelings about learning mathematics the pre-service mathematics teachers have correlated positively with the conviction and confidence they have in their capability to do or accomplish any mathematics task successfully. The finding is in harmony with the findings of Han, Liou-Mark, Yu and Zeng (2015). The result of the overall mean of the construct of attitude towards learning mathematics is higher than that of mathematics self-efficacy construct, even though all the two constructs revealed high level of acceptance. However, the need to do more in instilling confidence of learning mathematics on the pre-service mathematics teachers of colleges of education.

Conclusion

The present study was conducted with the main aim of examining the pre-service teachers' attitude toward learning mathematics and their mathematics self-efficacy. Its findings had shown that the preservice mathematics teachers' attitudes toward mathematics were at high level even at the subscale levels of attitudes toward mathematics. More so, pre-service mathematics teachers' self-efficacy in mathematics were also at the high level of acceptance, as all the scales under the mathematics self-efficacy have indicated high level of acceptance by the respondents. Despite the low performance of the students in mathematics according to previous literature However, colleges of education preservice mathematics teachers that participated in this study had confidence toward teaching/learning mathematics, and their attitude was positive and high.

References

- Adedeji, T. (2011). An assessment of mathematics teacher internet self-efficacy: Implication on teachers' delivery of mathematics instruction. *International journal of mathematics education in science and Technology*, 42(2), 10-15. <https://doi.org/10.1080/0020739X.2010.519798>
- Adelodun, O. A. (2014). Relevance of the mathematics education programmes of the Nigerian colleges of education to the teaching of junior secondary mathematics, *Journal of Education and Practice*, 5(7), 24–28. I
- Awofala, A. O. A. (2016). Examining preservice mathematics teachers' attitudes toward mathematics, *Nigerian Journal of Curriculum Studies* 23(1), 292–300.
- Awofala, A. O., & Ojaleye, O. (2018). An exploration of preservice teachers' educational values of mathematics in relation to gender and attitudes toward mathematics in Nigeria, *Journal of Pedagogical Research*, 10(1), 203–216.
- Ayotola, A., & Adedeji, T. (2009). The relationship between mathematics self-efficacy and achievement in mathematics. *Procedia - Social and Behavioral Sciences*, 1(1), 953–957. <https://doi.org/10.1016/j.sbspro.2009.01.169>
- Azuka, E.B. (2000). Mathematics in technological development: Implication for secondary education. *Journal of Mathematical Association of Nigeria*, 25 (1), 78 – 82.
- Bandura, A. (1977). Social learning theory. In B. B. Wolman & L. R. Pomroy (Eds.), *International encyclopedia of psychiatry, psychology, psychoanalysis, and neurology*. NW: Van Nostrand Reinhold.
- Bandura, A. (1994). Self-efficacy. In V.S. Ramachandran (Ed.), *Encyclopedia of human behavior*, 4, 71-81.
- Briley, J. S. (2012). The relationships among mathematics teaching efficacy, mathematics self efficacy and mathematical belief for elementary pre- service teachers. *Issues in the Undergraduate Mathematics Preparation of School Teachers: The Journal*, 5(1), 1 – 13.
- Dauda, B., Jambo, H. E., & Umar, M. A. (2016). Students' perception of factors influencing teaching and learning of mathematics in senior secondary schools in Maiduguri Metropolis, Baro state, Nigeria. *Journal of Education and Practice*, 7(20), 114–122.
- Enu, J., Agyman, O. K., & Nkum, D. (2015). Factors influencing students' mathematics performance in some selected colleges



- Colleges of Education Pre-service Mathematics...** (Muhammad, 2023) DOI: <https://doi.org/10.5281/zenodo.8367817>
of education in Ghana. *International Journal of Education Learning and Development*, 3(3), 68–74.
- Eraikhuemen, L., & Omoregbe, M. E. (2017). An Investigation of teachers' attitude to the use of instructional materials in mathematics teaching, *Journal of Developing Country Studies*. 7(2), 127–132.
- Federal Government of Nigeria (2013). *National Policy on Education 2013*. Lagos: Nigerian Educational Research & Development Council.
- Gavora, P. (2010). Slovak Pre-Service Teacher Self-efficacy: Theoretical and research considerations. *The New Educational Review*. 21(2), 17-30.
- George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. 11.0 update (4th ed.). Boston: Allyn & Bacon.
- Han, S., Liou-Mark, J., Yu, K. T., & Zeng, S. (2015). Self-efficacy and attitudes towards mathematics of undergraduates: A US and Taiwan comparison. *Journal of Mathematics Education*, 8(1), 1-15.
- Isiyaku, D. D., Ayub, A. F. M., & Abdulkadir, S. (2015). Empirical modeling of information communication technology usage behaviour among business education teachers in Colleges of Education of a developing country. *South African Journal of Education*, 35(4). DOI: [10.15700/saje.v35n4a1101](https://doi.org/10.15700/saje.v35n4a1101)
- Marchis, I. (2011). Factors that influence secondary school students' attitude to mathematics. *Procedia Social and Behavioural Sciences*, 29, 786–793. <https://doi.org/10.1016/j.sbspro.2011.11.306>
- Musa, M., & Dauda, E. S. (2014). Trends Analyses of students' mathematics performance in west African Senior Secondary Certificate Examination from 2004 to 2013: Implication for Nigeria's Vision 20:2020. *British Journal of Education*, 2(7), 50–64.
- Nigeria Certificate in Education (2012). *Minimum Standards for Sciences Federal Republic of Nigeria Minimum Standards* (2012th ed.). Abuja: National Commission for Colleges of Education.
- Salman, M. F., Yahaya, L. A., & Adewara, A. A. (2011). Mathematics education in Nigeria: Gender and spatial dimensions of enrolment. *International Journal of Educational Sciences*, 3(1), 15-20. <https://doi.org/10.1080/09751122.2011.11890004>
- Suleiman B & Muhammad A (2016). Survey of factors influencing students' attitude as a predictor towards their performance in mathematics and implication on Economic development. *Journal of Educational Research and Development*. 10(2), 62 -65.
- Vandecandelaere, M., Speybroeck, S., Vanlaar, G., De Fraine, B., & Van Damme, J. (2012). Learning environment and students' mathematics attitude. *Studies in Educational Evaluation*, 38(3-4), 107–120. <https://doi.org/10.1016/j.stueduc.2012.09.001>.
- Zsoldos-Marchis, I. (2015). Changing pre-service primary-school teachers' attitude towards Mathematics by collaborative problem solving. *Procedia-Social and Behavioural Sciences*, 186, 174-182. <https://doi.org/10.1016/j.sbspro.2015.04.100>
- Zuya, Kwalat, & Attah. (2016). Pre-Service teachers' mathematics self-efficacy and mathematics teaching self-efficacy. *Journal of Education and Practice*, 7(14), 93–98.