

Attitude of Pre-service Teachers towards Application of Techno-pedagogy in Mathematics Classroom

Akukwe, Anthonius Chukwudi¹, Nwoke, Bright Ihechukwu² & Okebaram Humphrey³

¹Department of Computer Science Education, ²Department of Mathematics, ³Department of Business Education
^{1,2,3}Alvan Ikoku Federal College of Education Owerri, Imo State, Nigeria

Abstract: The study was carried out to investigate the attitude of pre-service teachers towards application of techno-pedagogy in mathematics classrooms. The study focused on mathematics pre-service teachers of Alvan Ikoku Federal College of Education Owerri Imo state, Nigeria. A sample of 105 degree and NCE pre-service teachers drawn through stratified random sampling technique was used for the study. The descriptive survey research design was applied in carrying out the research. A 14-items likert 4-point type questionnaire titled “Pre-service Teachers Attitude towards Techno-pedagogy in Mathematics Classroom (PTATMC)” drawn by the researchers was used for data collection. It had reliability coefficient of 0.80 determined using cronbach’s alpha formula. The data generated were analyzed using mean and standard deviation to answer research questions while the hypothesis was analyzed using t-test statistical tool tested at 0.05 level of significance. The result of the study showed that, mathematics pre-service teachers had high positive attitude towards the application of techno-pedagogy in mathematics classroom irrespective of gender. Based on the result of the study, it was recommended that, techno-pedagogy should be fully employed in teaching mathematics pre-service teachers in teacher training institutions.

Keyword: Attitude, Mathematics, pre-service teachers, Techno-pedagogy

I. INTRODUCTION

Teachers’ education is an important aspect of education that requires very important attention since the quality of teachers determines the quality of students and the entire education system. According to ziyn (2014) a sound programme of teacher’s education and effective teacher’s training institutions are essential for the qualitative improvement of overall education system of a nation. Mukhopadhaya (2002) indicated that quality of school education is the direct consequence and outcome of the quality teachers and teacher’s education system. Quality assurance in teacher’s education is a key to quality assurance in education itself. Traditional teacher education is associated with the use of chalk and talk approach, making the students passive recipients of knowledge as the teachers took total control of the learning process, this is neither profitable to the students nor the nations education system. This method of teaching has failed to meet with the increasing demand of quality and vibrant education which is required in our fast changing society. According to Nabin (2015) education system is now witnessing a paradigm shift from the traditional chalk-and-talk teaching methodology to digitizing the

pedagogical approach through technical devices. It opines that such a transformation is not only increasing the potentiality of the teachers but also widening the information base of students so as to make them competitive in the international arena. The National Council of Teachers of Mathematics (NCTM) in Shirvani(2014) in its Principles and Standards for School Mathematics has stated six important principles needed in teaching mathematics effectively, and one of them is the technology principle advocating the use of computers and calculators in the classroom. Rovi and Childress (2003) have stated that technology has become essential in the lives of students, and has shown to improve children academically and enhance their learning; however, its use has been limited in schools due to teachers’ refusal to incorporate them in their teaching.

Use of technology for instructional purposes has become very important today and therefore teachers are expected to use technology effectively and appropriately in education. Technology use in education has become important in every level of education including early childhood, secondary education and higher education (Blackwell, Lauricella, & Wartella; 2014, Prasad, Lalitha, & Srikar; 2015, Englund, Olofsson, & Price; 2017). According to Sharma (2003) educational technology as part and parcel of techno-pedagogic innovations, is becoming a fast growing science, committed to converting raw-hand teachers into really effective and efficient ones by equipping them with practical teaching skills and qualities of creative teaching. It has undergone a revolution in respect of new methods employed in teaching at different levels. One of the important educational technology/ techno-pedagogical innovations is e-learning, which may be described as the application of internet or intranet computers to assist teaching and learning (ziyn, 2014).

Techno-pedagogy is a method of teaching that incorporates technology in the classroom process. Pradeep,(2018) stated that Techno pedagogy is the hybrid method of teaching in which ICT resources are utilized in class room interaction process. It is the art and craft of incorporating technology in tailoring teaching learning experiences in an effective manner. It requires conscious recognition of the mediated learning environment in order to maximize the ease and clarity in the transmission of information. Technology encompasses modern technologies such as computer, Internet, digital video and commonplace technologies including overhead projectors,

blackboards, and books. Pedagogy describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment, and student learning (Nabin,2015). Acquiring techno-pedagogical proficiency will make teaching and learning a pleasurable exercise as it would lessen the pressure on the teachers, and enable the students to plunge deeper into knowledge acquisition process. Beaudin and Hadden (2004) revealed in their study that techno-pedagogical skill helps the students for further development, accomplishment of learning outcomes and preserve the context of designing classroom based resources through the use of ICT by the teachers. Therefore, techno-pedagogy method was an essential component of teacher education.

Techno-pedagogical competency is very much needed for teachers in their learning space, as it facilitates teaching and learning. Techno-pedagogical competency is the ability of teachers to make use of technology effectively in teaching. It is described as the ability and the will to regularly apply the attitude, knowledge, and skills that promote learning (Pradeep, 2018). Teachers without the competence in technology will likely not apply them in the classroom depriving the pre-service teachers the opportunity to be conversant with them.

Technology has become an essential tool for doing mathematics in today's world. It can be used in a variety of ways to improve and enhance the learning of mathematics. As NCTM (2000) highlights in its standards, technology can facilitate mathematical problem solving, communication, reasoning and proof; moreover technology can provide students with opportunities to explore different representations of mathematical ideas and support them in making connections both within and outside of mathematics (NRC, 2000). According to García-Santillán, Escalera-Chávez, Rangel, and López-Morales, (2013) students can use calculators and computers to extend their capacity to investigate and analyse mathematical concepts and to reduce the time they might need otherwise spent on purely mechanical activities," and added that technology is conceived as a tool to extend students' abilities with tasks which are challenging or impossible in paper-and-pencil environments. Nabin(2015) noted that techno-pedagogy, helps to

- Enhance linguistic abilities
- Develop teaching learning process
- Improve to develop study materials
- Design multi-grade instruction
- Plan specific pedagogy
- Support in Distance Education through e-learning
- Guide and Counsel for career choices
- Stimulate Self Learning ability

- Enhance enrolment and examination process
- Assist in research activities
- Reinforce for cognitive learning
- Development of life skills
- Develop aesthetic sensibility

The success of application of techno-pedagogy in mathematics classroom depends on the pre-service teachers' attitude. Their views about its relevance in their study will determine how much they key in to it.

Attitude is a psychological construct that determines a person behavior towards an issue or object. According to Gloria and Benjamin (2018) attitude refers to a manner of acting feeling, or thinking that shows one's disposition; opinion or mental set. Allport in Haji (2015) defined attitude as 'a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related. Triandis in Özcan, Gökçearslan, and Solmaz (2016) noted that attitude is the characteristic of individuals, which motivates them to exhibit either positive or negative behavior and which reflect feeling and cognizance toward a certain concept or subject. Awofala (2016) noted that attitudes are proclivities and dispositions that chaperon a person's behaviour and induce him or her to an act that can be appraised as either positive or negative. Attitudes toward techno-pedagogy in mathematics can be positive or negative. Positive attitudes toward techno-pedagogy may increase the tendency of the individual to continue to apply it to learn mathematics, to regularly take advantage of various components technology may render in mathematics problem solving and to engage in mathematical activities that require technological skills. However, a negative attitude towards techno-pedagogy in mathematics may weaken students' application of it in and outside math classes, reduce its options, and promote unwanted behaviour toward any activities that may include its applications in mathematical operations.

Statement of the Problem

Technology has been playing a significant role in the development of teacher education and mathematics in particular worldwide. The pre-service teachers are trained to acquire technological skills which they will apply them in their full time professional practices to complement their mathematics content knowledge and pedagogy expertise. The relevance of technology in teacher education and the need for teachers to be competent in its' application, motivated this study to investigate pre-service teachers' attitude towards application of techno-pedagogy in mathematics classroom in teacher training Institutions.

Purpose of the Study

The main purpose of the study was to determine the attitude of pre-service teachers towards the application of techno-pedagogy in mathematics classroom. Specifically, the study will determine;

1. Pre-service teachers’ attitude towards application of techno-pedagogy in mathematics classroom.
2. If attitude of pre-service teachers towards application of techno-pedagogy in mathematics classroom is dependent on gender.

Research Questions

The following research questions guided the study

1. What is the level of pre-service teachers’ attitude towards application of techno-pedagogy in mathematics classroom?
2. What is the difference between the response mean of pre-service teachers’ attitude towards application of techno-pedagogy in mathematics classroom based on gender?

Hypothesis

This hypothesis was formulated to guide the study

H₀₁: There is no significant difference between the response mean of pre-service teachers on their attitude towards application of techno-pedagogy in mathematics classroom based on gender.

II. METHODOLOGY

The descriptive survey research design was adopted in investigating the pre-service teachers’ attitude towards application of techno-pedagogy in mathematics classroom. The population of the study consists of all the Degree and NCE mathematics pre-service teachers of Mathematics Department of Alvan Ikoku Federal College of Education Owerri, Imo State. The degree programme runs for four years while the Nigerian Certificate on Education (NCE) programme runs for three years. The sample of the study consists of one hundred and five (105) Degree and NCE mathematics pre-service teachers selected through stratified random sampling technique. This consists of eighty seven (87) females and sixty three (63) males, and 25 NCE and 80 Degree pre-service teachers. The instrument for data collection was a 14-items likert 4-point type questionnaire titled “Pre-service Teachers Attitude towards Techno-pedagogy in Mathematics Classroom (PTATMC)” designed by the researchers. It was divided into two sections, section A consist of respondents characteristics while section B consists of items related to the objectives of the study and their responses ranged as follows: Strongly Agree=4points, Agree(A)=3points, Disagree(D)=2points Strongly Disagree(SD)=1point. The face and content validity of the instrument were determined by 3 experts each from curriculum, computer Education and measurement and

evaluation departments of the institution. Their inputs were given consideration in restructuring the instrument. To determine the reliability of the instrument, it was administered on 35 pre-service teachers outside the study sample but with the same characteristics. Their result gave a reliability coefficient of 0.80 determined through cronbach’s alpha formula. To administer the instrument, the researchers met with representatives of the sample selected for the study and explained the purpose of research work and assured them of the confidentiality of the information they will tender on the instrument. They were then handed the instrument to distribute to their colleagues while the researchers monitored the process and they were filled out and handed to the researchers on the spot without losing any copy of the instrument. The data collected was analyzed using mean and standard deviation to answer research questions, and response mean within and above the criterion mean of 2.50 was accepted while any below was rejected. The hypothesis was tested at 0.05 level of significance using t-test statistical tool.

IV. RESULT

Research Question1: What is the level of pre-service teachers’ attitude towards application of techno-pedagogy in mathematics classroom?

Table 1: Summary of pre-service teachers’ attitude responses

S/N	Item	Mean	SD	Remark
	Attitude of pre-service teachers towards techno-pedagogy in mathematics classroom			
1	I like learning mathematics with technology.	3.36	0.93	Accept
2	Learning mathematics with technology makes it interesting.	2.86	1.22	“
3	Technology in mathematics classroom makes learning interactive.	2.94	1.31	“
4	Technology based learning makes me collaborate with others in class	3.12	0.97	“
5	Technology based learning motivates me to learn.	3.10	1.00	“
6	Using technology in class gives me confidence to learn mathematics	2.88	1.19	“
7	I understand mathematics concepts easily when technology is applied	3.01	1.08	“
8	I prefer learning mathematics with technology to chalk and talk approach	3.00	1.11	“
9	I feel very comfortable when technologies are integrated in mathematics classroom	3.41	0.86	“
10	Use of technologies in classroom allows me to learn mathematics at my pace	2.97	1.25	“
11	Technologies help obtain learning resources easily	3.02	1.01	“
12	I easily retain mathematics concepts taught using technologies	3.21	0.95	“
13	My problem solving skills are improved through use of technology in learning mathematics	2.91	1.17	“
14	Technology allows me to learn individually any time	3.07	0.88	“

Average mean = 3.06

Table 1 shows that all the items were accepted as they had response mean greater than the instrument criterion mean of 2.50, these are indicators of the pre-service mathematics teachers attitude towards techno-pedagogy in mathematics classroom. Also, the average mean of their responses was 3.06 which is greater than the instrument criterion mean, this is an indication of high positive attitude among mathematics pre-service teachers towards techno-pedagogy in mathematics classroom.

Research Question 2: What is the difference between the response mean of pre-service teachers' on their attitude towards application of techno-pedagogy in mathematics classroom based on gender?

Table 2: Summary of pre-service mathematics teachers responses based on gender

Gender	N	Mean	SD	Diff in mean	Df	t _{cal}	t _{0.05}	Remark
Male	63	3.02	1.07	0.07	103	0.49	1.65	Ns
Female	87	3.09	1.04					

Table 2 shows that, the male pre-service mathematics teachers had response mean of 3.02 with standard deviation of 1.07 while their female counterparts had 3.09 with standard deviation of 1.04, these gave a difference in mean of 0.07 in favour of the females which indicates a more positive attitude on their part towards use of technology in mathematics classroom.

Hypothesis

H₀₁: There is no significant difference between the response mean of pre-service teachers attitude towards application of techno-pedagogy in mathematics classroom based on gender.

Table 2 also shows that the calculated t value of 0.49 is less than the critical table value of 1.65 at 0.05 level of significance and 0.65 degree of freedom. Based on the result, the null hypothesis is upheld at 0.05 level of significance.

V. DISCUSSION

The study revealed that, pre-service mathematics teachers have high positive attitude towards application of techno-pedagogy in mathematics classrooms. All the items on table 1 were accepted as they had response mean greater than the instrument criterion mean and the average response mean was also higher than the instrument criterion mean. This was indication of high positive attitude of pre-service teachers towards application of techno-pedagogy in mathematics classroom. The result is in tandem with that of Oparah, Nwoke, Nwoga and Ugwu (2017) which indicated a high positive attitude among pre-service teachers towards application of ICT as a pedagogical tool in teacher education.

The study also revealed that gender was not a factor in pre-service teachers' attitude towards application of techno-pedagogy in mathematics classroom. This implied that both male and female pre-service teachers had positive attitude

towards application of techno-pedagogy in mathematics classroom. Further statistical analysis showed that, there was no significant difference between the response mean of pre-service teachers attitude towards application of techno-pedagogy in mathematics classroom based on gender. This result is in disagreement with Sang, Valcke, Braak, and Tondeur, (2010), which revealed teacher's gender to be a significant factor in the use of technology.

VI. CONCLUSION

The study was carried out to investigate pre-service teacher attitude towards application of techno-pedagogy in mathematics classroom. The study revealed that pre-service teachers had high positive attitude towards application of techno-pedagogy in mathematics and gender was not a factor towards it.

VII. RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

1. Teacher training institutions should apply techno-pedagogy in mathematics pre-service teacher education to enable them implement it in their profession.
2. Techno-pedagogy should be implemented in pre-service teachers' curriculum to aid their understanding of mathematics concepts.
3. There should be constant and alternative power supplies to enable techno-pedagogy to be applied in mathematics classrooms.
4. Mathematics educators in teacher training institutions should develop competence in the use of techno-pedagogy in classrooms
5. Technical manpower should be made available in teacher training institutions to handle maintenance of techno-pedagogical facilities.
6. There should be effective connectivity in teacher training institutions to enable pre-service teachers and their educators apply techno-pedagogy in the classrooms.
7. The government and school managers should provide technology facilities in teacher training institution to enhance techno-pedagogy.

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