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# Assessment of Science Teachers' Pedagogical Beliefs and Information and Communcation Technology (ICT) Classroom Practices in Secondary Schools in Taraba State, Nigeria.

DANJUMA, Gideon S, GBADAMOSI Omobolanle B, BELLO, Adamu Kafi
*Science Education Department Taraba State University, Jalingo*
*Physics Department, Peacock College of Education, Jalingo, Taraba state*
*Educational Foundations Department, Peacock College of Education, Jalingo, Taraba state*

**Abstract:** This study assessed science teachers' pedagogical beliefs and ICT classroom practices in secondary schools in Jalingo, Taraba State. Descriptive survey design was adopted for the study. Population of the study covered 46 science teachers from 3 secondary schools. The research instrument (questionnaire) used was adapted with modification. Three research questions and one research hypothesis were used for the study. The research questions were answered using mean and standard deviation while hypothesis was tested using Pearson product moment correlation at 0.05 level of significance. The results revealed among othersa small positive significant correlation ($r = .145$; $p > 0.05$ significant level) between science teachers' pedagogical beliefs and their ICT classroom practices. By implication, the analysis showed that innovative pedagogical beliefs of science teachers can still be achieved despite their poor ICT classroom practices. Therefore, it was recommended that in-service training on "integration of ICT into science classroom" be organized for science teachers; to equip them better for 21st century classroom teaching.

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## I. INTRODUCTION

This study was founded on the premise that every science teacher's beliefs are strong indicators of his or her instructional classroom practices. These beliefs can be thought of as guiding principles teachers hold to be true that serve as lenses through which new experiences can be understood. When people believe something is true, they perceive information supporting that belief. What teachers do in the classroom is said to be governed by what they believe, and these beliefs often serve to act as a filter through which instructional judgments and decisions are made (Pajares, cited in Fakhri (2012); Cantu, 2001). This assertion could be insinuating that science teachers possess a vast array of complex beliefs about pedagogical issues.

Accepting the nature and role of these beliefs is essential to understanding the choices and decision these teachers will make. It has become widely recognized that science teachers' pedagogical beliefs play a central role in their classroom practices (Handal & Herrington, 2003). In line with the submission of Handal & Herrington, Borg (2001) was of the opinion that these beliefs are manifested in the teaching methods, in choosing the subjects and activities, decision-making, and evaluation in the classrooms. This could mean that teachers' beliefs are a set of ideas rooted in the psychological and mental content of the teacher and play a central role in guiding his/her teaching behavior. From the viewpoint of Tsui (2003), the perceptions and presumptions the science teachers receive may be considered a very strong influence in affecting their pedagogical beliefs. There is an increasing interest in studying the relationship between teachers'pedagogical beliefs and their ICT classroom practices. Although some studies (Parmelee, Van Zoest,& Nespar cited in Fakhri, 2012) have shown that the teachers' ICT classroom practices were inconsistent with their pedagogical beliefs, some researchers found that the teachers' beliefs played an important role in the classroom practices. Fakhri, (2012) found that teachers' beliefs affect their teaching abilities. Implying that effective delivery of classroom instruction may not be a reality. There is therefore the need to assess pedagogical beliefs and ICT classroom practices of science teachers in order to prepare them better for 21st century classroom practices.

Assessment is making judgment about something. Huba and Freed (2000), defined assessment as a process of gathering and discussing information in order to develop a deep understanding of what students or teachers know, understand, and can do with the knowledge acquired as a result of their educational experiences. This is in line with Allen's opinion cited in Nwagbo & Ugwuanyi (2015), who viewed assessment as the use of empirical data on students' learning to refine programs and improve student learning. This implied that assessment is an important tool in teaching and learning process.

The use of ICT in teaching is becoming increasingly vital looking up to the global nature of the 21st century teaching and learning. Thus, the use of modern technology such as ICT offers many ways of improving teaching and learning in the classroom. Classroom practices are set of teaching strategies and methods of instruction employed in the classroom. The interaction between the teacher and his students in order to expand their cognitive and skillful perceptions through the appropriate classroom management, determination to teach and continuous evaluation to achieve the desired teaching objectives was defined by Cotton cited in Fakhri (2012). In re-shaping classroom practices, it has been suggested that ICT is a means for constructing knowledge but not an end in itself and that qualitative changes in the teaching and learning process are all that is required (Twining,2002). Such change also includes proper assessment of teachers' pedagogical beliefs.

Pedagogy is 'the science of teaching'. It can be define as the nature of teaching. Alexander cited in Mary & Margaret (2004) identifies teaching methods and student organisation asthe two facets of pedagogy. These are included in Alexander's conceptualframework for educational practice, where pedagogy is one of seveninterrelated aspects of educational practice. This implies that pedagogy ofICT should be elucidated within a broad framework of educational practice.A further point to note from this framework is that what can be observed inthe classroom is only part of educational practice. Thus, identifying teachers'ICT-related pedagogies will require examining teachers' ideas, values, beliefsand the thinking that leads to observable elements in practice.Pedagogy is the activity of teaching or instructing and the methods used to instruct. It is the art or science of being a teacher. Beliefs on the other hand, are judgments and evaluations that we make about ourselves, about others, and about the world around us. They are personal convictions based on observation or logical reasoning. Ford cited in Fakhri (2012), defined the beliefs as a group of norms or opinions which were formed in the individual through his experiences and the overlapping of thoughts during the learning processes.

Science teachers' beliefs involve the attitudes and values about teaching students, and the education process those teachers bring to classrooms. They are the thoughts held by the science teacher about science education, which influence his/her classroom practices (ICT classroom practices inclusive).Science teachers' pedagogical beliefs refer to ways of teaching as preferred by science teachers. These beliefs play an important role in implementation of instructional choice as declared by Floweday & Schraw, (2000). According to Teo, cited in Nwagbo & Ugwuanyi (2015), these beliefs are majorly categorized into the knowledge transmission view or knowledge construction view. This implies that science teachers `that engage in the knowledge transmission view are inclined to conventional beliefs, while those who embrace the knowledge construction view (tend to emphasize more students-centered activities) are inclined to innovative beliefs. This is in line with (Wong & Chan, 2009); teachers who facilitate students' knowledge through active self-reflection, peer interaction, and meaning-making process hold the constructivist view. These pedagogical beliefs vary from one teacher to another. The integration of ICT into classroom practices does not necessarily mean to change individual's beliefs but to display some ICT influences for successful classroom practices. However, Hokanson & Hooper cited in Nwagbo & Ugwanyi (2015), suggested that one of the real challenges to teachers' use of ICTs and practices is pedagogical. Close observation has shown that not much attention has been given to science teachers' ICT classroom practices inthe study area. Therefore, there is a need to assess teachers' pedagogical beliefs and ICT classroom practices in secondary schools in Jalingo metropolis, in Taraba State.

**Purpose of the study**

The purpose of this study is to assess science teachers' pedagogical beliefs and ICT classroom practices in secondary schools in Jalingo, Taraba State Nigeria. Specifically, the study focused on these objectives:

1. To determine Secondary School Science teachers' pedagogical beliefs
2. To determine in Secondary School Science teachers' ICT classroom practices.
3. To determine a relationship between the teachers' pedagogical beliefs and their ICT classroom practices?

**Research questions of the study**

1. What are the secondary school science teachers' pedagogical beliefs in Taraba State?
2. What are the secondary school science teachers'ICT classroom practices in Taraba State
3. What is the relationship between thesecondary school science teachers' pedagogical beliefs and their ICT classroom practices?

**Research Hypothesis of the study**

1. There is no significant relationship between science teachers' pedagogical beliefs and ICT classroom practices.

**Research Methodology**

The design of this study is a descriptive survey. The population of the study comprised of one hundred and fifty (150)secondary school science teachers in Jalingo Education zone, Taraba state. Using simple random sampling,

forty six (46) science teachers from three secondary schools in Jalingo metropolis, Jalingo Local Government area were sampled out for the study. The instrument used for collecting data was an adapted and modified questionnaire titled "Science Teachers' Pedagogical Beliefs and ICT Classroom Practices". The questionnaire containing 20 dichotomous items has two sections, section A sought information about Teachers' Pedagogical Beliefs while section B sought information about Science Teachers' ICT Classroom Practices. The responses of the subjects of the study were analyzed using mean and standard deviation to answer research questions 1 and 2; while Pearson product moment correlation coefficient was used to answer research question 3 and test the null hypothesis, at 0.05 level of significance.

## II. RESULTS

**Research Question One:** What are the secondary school science teachers' pedagogical beliefs in Taraba State?

**Table 1**: Descriptive Statistics of Secondary School Science Teachers' Pedagogical Beliefs in Taraba State

| S/N | **Statement of item** | **N** | **Sum** | **Mean** | **SD** |
|---|---|---|---|---|---|
| 1 | Science teaching should involve students' real life experience | 46 | 44 | .9565 | .20618 |
| 2 | Students should always take teachers' ideas or view | 46 | 18 | .3913 | .49344 |
| 3 | The teaching of science subjects should involve learners centered activities | 46 | 40 | .8696 | .34050 |
| 4 | Science students should not be allowed to construct their own knowledge because they have limited knowledge | 46 | 40 | .8696 | .34050 |
| 5 | Science students should be given chance to learn independently/separately | 46 | 34 | .7391 | .44396 |
| 6 | The best way to ensure good grades is for teacher togive students notes to read or memorize | 46 | 28 | .6087 | .49344 |
| 7 | Students need to work in groups to facilitate learning | 46 | 44 | .9565 | .20618 |
| 8 | Only teachers should carryout experiment demonstration in classroom | 46 | 34 | .7391 | .44396 |
| 9 | Teachers have all the information about subject topics | 46 | 30 | .6522 | .48154 |
| 10 | laboratory practical should not be combined with theory lessons | 46 | 28 | .6087 | .49344 |
| | **Overall Mean** | **46** | **34** | **.7391** | **.39431** |

From the table above, the analysis shows that mean responses to all items except for item 2 are above 0.5000 average value. This implies that science teachers hold more of innovative belief than conventional belief. The overall mean response gives .7391; which equally shows that the pedagogical belief of science teachers is high and in favour of the innovative concepts.

**Research Question Two:** What are the science teachers' ICT classroom practices in secondary schools in Jalingo Metropolis, in Taraba State?

**Table 2**: Descriptive Statistics ofSecondarySchool Science Teachers' ICT Classroom Practices in Taraba State.

| **S/N** | **Item Statement** | **N** | **Sum** | **Mean** | **SD** |
|---|---|---|---|---|---|
| 1 | I ask students to go on-line to search for materials in order to do their assignment | 46 | 34 | .7391 | .44396 |
| 2 | I use spreadsheet like Microsoft excel to prepare students' results | 46 | 16 | .3478 | .48154 |
| 3 | I use PowerPoint to present or deliver my lessons in the classroom | 46 | 12 | .2609 | .44396 |
| 4 | use my e-mail to give class instructions to students | 46 | 1 | .0217 | .14744 |
| 5 | I use word processing software like Microsoft word to prepare lesson notes/plans | 46 | 6 | .1304 | .34050 |
| 6 | I as well reply Students' messages On-time through theire-mail address | 46 | 3 | .0652 | .2494 |
| 7 | I make use of flash disk or CD-ROM to keep students' records, | 46 | 23 | .5000 | .50553 |

| | | | | | |
|---|---|---|---|---|---|
| | information on internet | | | | |
| 8 | I print out Continuous Assessment Sheets if requested for, rather than writing out the information on a paper from the computer | 46 | 12 | .2609 | .44396 |
| 9 | I use MODEM with computer or android phone to sort for information on internet | 46 | 38 | .8261 | .38322 |
| 10 | Teleconferencing helps me to support students' collaboration for learning | 46 | 21 | .4565 | .50361 |
| | **Overall Mean** | **46** | **16.6** | **.3609** | **.39434** |

From the table above, the analysis shows that mean responses to items 12, 13, 14, 15, 16, 18, 20 are below 0.5000 average value while few items (11, 17 & 19) are of agreeable response to ICT classroom practices. This implies that science teachers disagree with many expected ICT classroom practices. The overall mean response gives .3609; which equally confirms that the ICT classroom practices of science teachers is poor.

**Research Question Three:** What is the relationship betwen secondary schools Science teachers' pedagogical beliefs and their ICT classroom practices in Taraba State?

**Table 3**: Correlation Statistics of Secondary School Science Teachers' Pedagogical Beliefs and Their ICTClassroom Practices in Taraba State

| | TEACHERS' PEDAGOGICAL BELIEFS | TEACHERS' ICT CLASSROOM PRACTICES |
|---|---|---|
| TEACHERS' PEDAGOGICAL BELIEFS | Pearson Correlation | 1 .145 |
| | Sig. (2-tailed) | .337 |
| | N | 46 46 |
| ICT CLASSROOM PRACTICES | Pearson Correlation | .145 1 |
| | Sig. (2-tailed) | .337 |
| | N | 46 46 |

*Correlation is significant at the 0.05 level (2-tailed).

From Table 3, the result shows that the correlation between teachers' pedagogical beliefs and their ICT classroom practices is .145; meaning there is a low positive relationship between teachers' pedagogical belief and their ICT classroom practices.

**Hypothesis 3:** There is no significant relationship between science teachers' pedagogical beliefs and ICT classroom practices.

From the same Table 3, the analysis shows that the significance or p-value of r (.145) is .337, and therefore the p > 0.05 level of significance. Hence, the null hypothesis is not rejected; which implies that there is no significant positive relationship between teachers' pedagogical beliefs and their ICT classroom practices.

## III. DISCUSSION OF RESULTS

The data analyzed on table 1 showed that higher percentage of science teachers in Taraba State are pedagogically inclined to innovative beliefs. They believe in innovative strategies in teaching science subjects which is in support of Ertmer (2005), who stated that pedagogical beliefs are the personal views of teachers regarding how he / she views the process of teaching. The result indicates that majority of science teachers serve as facilitator to emphasize more student-centered activities that facilitate students' learning.

Table 2 above, revealed that science teachers' ICT classroom practices are poor despite the fact that such teachers hold innovative pedagogical belief. This may be as a result of un-available or in-adequate ICT resources, lack of or in-adequate knowledge of the use of ICT in the classrooms and sometimes ICT phobia. Though, Chanlin et, al cited in Nwagbo & Ugwuanyi (2015), in their study to determine the extent of successful ICT usage in the classrooms, found that science teachers were not fully using ICT in teaching and learning process even when their schools were fully equipped with ICT resources. Therefore, lack of adequate knowledge and ICT skills can probably be a great limitation to ICT integration in classroom practices.

Table 3 analyses showed that there is a very small positive correlation between teachers' pedagogical beliefs and their ICT classroom practices. This agrees with Nwagbo & Ugwuanyi (2015), who reported that; despite that the science teachers hold innovative pedagogical beliefs, their ICT classroom practices are poor. Although some studies (Parmelee, Van Zoest, & Nespar cited in Fakhri; 2012) have shown that the teachers' ICT classroom practices were inconsistent with their pedagogical beliefs, some researchers found that the teachers' beliefs played an important role in the classroom practices. King (2002) and Farrow (1999) found that teachers' beliefs affect their teaching abilities.

Since the result in Table 3 showed that the null hypothesis is not rejected, there may be other factors that can contribute to innovative pedagogical beliefs in classroom practices and not wholly the specific ICT classroom practices. This is in line with the viewpoint of Tsui (2003), the perceptions and presumptions the science teachers receive may be considered a very strong influence in affecting their pedagogical beliefs.

**Conclusion**

Based on the findings of this study, it was concluded that there is an in-significant positive low relationship between science teachers' pedagogical belief and their ICT classroom practices. Therefore, the following recommendations were given:

**Recommendation**

In- service training for science teachers on effective use of ICT in classroom should be organized by the Government.

Government should make compulsory the integration of the use of ICT in science classroom, in every secondary school.

Science teachers should upgrade their knowledge of ICT usage to support the implementation of science curriculum.

Science educators can further investigate other strategies/factors contributing to the innovative pedagogical beliefs in classroom practices.

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