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## **ATTITUDES AND PROFICIENCY OF MATHEMATICS TEACHERS TO THE USE OF ICT IN TEACHING MATHEMATICS AT SECONDARY SCHOOL LEVEL IN ILORIN, NIGERIA**

**AKANMU MORENIKEJI ALEX, (Ph.D)**

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*Department of Science Education, Faculty of Education,*

*University of Ilorin, Ilorin, Nigeria.*

*Email: alexakanmu@gmail.com*

### **Abstract**

*This paper examined the attitudes and proficiency of mathematics teachers in the use of Information and Communication Technologies (ICT) at secondary school level. Variables such as years of experience and gender were used to determine the attitude and proficiency of ICT use among teachers. The study was conducted involving 40 secondary school teachers using proficiency and Attitude Scales of ICT. The results show that the most commonly used and well-known ICT types among teachers are the Internet, e-mail and word processing, and teachers attitudes towards computers and the Internet are generally positive. It was also found that mathematics teachers attitudes to and proficiency of ICT vary with their years of experience in favour of the less experienced teachers and gender influenced teachers attitude to and proficiency of the ICT in favour of the male teachers. It was recommended among others that government at all level should provide teachers especially well experienced ones the avenue to undergo training on the use of ICT in the teaching of Mathematics.*

**Keywords:** Secondary Education, Information and Communication Technology, Teachers, Teacher Education, ICT Use, Attitudes, Gender, Mathematics.

### **Introduction**

Information and Communication Technologies appeared as a combination of Information Technologies (IT) and Communication Technologies (CT) and presently involves a variety of computer and internet technologies and related software and applications (UNESCO, 2007). ICT provides the opportunity to gather,

store, retrieve, process, analyze, and transmit information. Improvement and dissemination of ICT has begun to change the traditional class image (Tondeur, van Braak, & Valcke, 2007). ICT is regarded as an integral component of educational and curricular reforms. As an alternative to traditional teacher centered classroom, it allows the formation of learner-centered classrooms.

Information Communication and Technology (ICT) in education refers to the use of computer-based communication that incorporates into daily classroom instructional process. In conjunction with preparing students for the current digital era, teachers are seen as the key players in using ICT in their daily classrooms. This is due to the capability of ICT in providing dynamic and proactive teaching-learning environment (Arnseth & Hatlevik, 2012). ICT is a tool that can be used across the curriculum or in separate subjects where the emphasis is on the development of ICT-related skills, knowledge, processes, and attitudes. It enhances students learning outcomes within the limits of the existing curriculum. It is also a potential tool to transform the teacher-based classrooms into learner-focused, rich and interactive learning environments.

Teachers constitute the key element in this transformation based on the adoption of ICT learning and teaching tools in schools. Integrating ICT in the curricula requires an investment both in these technologies and in trained personnel. One of the factors that determine educational development and innovation in general is the teachers as they are the ones to use the ICT investments for educational development. Technology does not have an educational value in itself. It becomes important when teachers use it in learning-teaching process (Kozma, 2003)

Teachers positive views towards ICT applications or denying them all together affect attitudes, (Tondeur, Van Braak, & Valcke, 2007) as well as other important factors such as their information about and experience with ICT (Hong & Koh, 2002), and their experiences on how to use these technologies in classroom environment (Keong, Horani & Daniel, 2005), information and experiences concerning the types of applications based on ICT, age (Hartley & Bendixen, 2001), and self-confidence (Ertmer, 2006). The main problem in teachers decision to use or not to use ICT concerns their attitudes. Individual's attitudes have a significant impact on his/her behaviour in ICT use. Handling ICT goes along with attitudes because attitudes allow us to understand and make inferences from an individual's behaviours toward an object or event (change) and to identify the outcomes his/her behaviour (Albirini, 2006). In other words, teachers attitudes, whether positive or negative, affect how they respond to and use ICT. Therefore, information is required

about teachers' attitudes towards the use of ICT in the classroom process.

Just as an individual's knowledge affects his/her attitude toward an object, so individual's knowledge is also influenced by his/her attitudes. Given that attitudes have three main components, which are cognitive, affective, and behavioural (Kağıtçıbaşı, 1985; Freedman, Sears & Carlsmith, 1989), it is obvious that attitude is a multidimensional phenomenon, rather than being one-dimensional in itself. Because behaviours are affected by one's socio-cultural environment and emotions are under the influence of experiences. The affective component of attitude consists of emotions or feelings about objects, including like, dislike, prefer or reject. The cognitive component involves individuals' emotional responses to an object or a person, while the behavioural component concerns a person's behaviour directed to an object or a person. All three components of attitude interact with each other (Freedman, Sears & Carlsmith, 1989).

There are certain factors that affect ICT use and individual's attitudes towards ICT. These factors could be listed as follows, in accordance with related research in the literature:

ICT attitudes, knowledge and use (Teo, Chai, Hug & Lee, 2008), individual characteristics (gender, age, years of teaching experience) (Aydın, 2007), Self-efficacy (Paraskeva, Bouta & Papagianni, 2008), Anxiety (Hong & Koh, 2002), Culture (Li & Kirkup, 2007), Beliefs (Teo, Chai, Hug & Lee, 2008), Experience of ICT use (Paraskeva, Bouta & Papagianni, 2008), Learning and teaching approach (Teo, Chai, Hug & Lee, 2008), Access to technology and attitudes (Hong & Koh, 2002).

Therefore, this study examined the attitudes and proficiency of Mathematics teachers in the use of ICT in teaching Mathematics at secondary school level in Ilorin, Nigeria.

### **Purpose of the Study**

The purpose of this study was to examine the following:

1. teachers' levels of proficiency of ICT;
2. teachers' attitudes towards computers and the Internet; and
3. relationship between variables such as gender, teaching experience and teachers' attitude and proficiency of ICT.

### **Research Questions**

The following questions were raised and answered in this study;

1. What are the teachers proficiency levels of ICT?
2. What are teachers attitudes towards the use of ICT?
3. Is there relationship between the attitude of teachers on the use of ICT based on gender?;
4. Is there relationship between the attitude of teachers on the use of ICT based on teaching experience?
5. Is there relationship between the proficiency of teachers on the use of ICT based on gender?
6. Is there relationships between the proficiency of teachers on the use of ICT based on teaching experience?

### **Research Hypotheses**

The following hypotheses were formulated and tested in the study;

1. there is no relationship between the attitude of teachers on the use of ICT based on gender
2. there is no relationship between the attitude of teachers on the use of ICT based on teaching experience
3. there is no relationship between the proficiency of teachers on the use of ICT based on gender
4. there is no relationship between the proficiency of teachers on the use of ICT based on teaching experience

### **Methodology**

The researcher adopted a descriptive research design of the survey type. The design was to examine the attitudes and proficiency of Mathematics teachers in the use of ICT in teaching Mathematics at secondary school level in Ilorin, Nigeria. Random sampling technique was used to select ten (10) co-education secondary schools for the study. The sample for this study was forty (40) secondary school Mathematics teachers from the selected schools (4 teachers each from the 10 selected secondary school).

A researcher designed instrument titled Mathematics Teachers Attitude and Proficiency of ICT Questionnaire was used for data collection. The questionnaire was divided into three sections: section A deals with the personal background of the respondents, section B consists of 14-items of a 5 likert scale of the teacher proficiency of the ICT and usage while section C deals with 14-items of 5-likert

scale on the teacher attitude towards the use of UCT in mathematics class. The instrument was validated by two Mathematics educators from University of Ilorin and yielded 0.71 reliability value. The data collected was subjected to statistical analysis. Thus, chi-square was used to test hypotheses 1-4 at 0.05 level of significance.

## Results

### Research Question One: What are the teachers proficiency levels of ICT?

Information levels about ICT among teachers were rated through responses including 14 statements from 1 to 5 (from 1 representing I cannot use to 5 representing I can use it very well). Mean levels of teachers knowledge about ICT are given in Table 1.

Table 1: Teachers proficiency of ICT use in education

| Items                         | I can-not use it | I can use it to a small extent | I can use it Satisfactorily | I can use it well | I can use it very well | M    | SD   |
|-------------------------------|------------------|--------------------------------|-----------------------------|-------------------|------------------------|------|------|
| Word processing *             | 2.9              | 9.3                            | 15                          | 50.6              | 22.3                   | 3.80 | 0.98 |
| Databases                     | 37.1             | 20.9                           | 22.8                        | 15                | 3.7                    | 2.28 | 1.21 |
| Spreadsheets*                 | 12.5             | 22.4                           | 24.4                        | 30.4              | 10.4                   | 3.04 | 1.20 |
| Graphics *                    | 13.2             | 18.5                           | 24.5                        | 31.2              | 12.5                   | 3.11 | 1.23 |
| Microworlds/ Simulations      | 81.7             | 8.8                            | 5.9                         | 2.9               | 0.6                    | 1.32 | 0.77 |
| Multimedia authoring software | 56.1             | 18.2                           | 13.9                        | 9.7               | 2.1                    | 1.83 | 1.11 |
| Presentation software*        | 13.1             | 18.8                           | 20.7                        | 30.0              | 17.4                   | 3.20 | 1.29 |
| Concept mapping               | 41.6             | 21.2                           | 18.5                        | 15.2              | 3.5                    | 2.18 | 1.22 |
| Internet*                     | 1.2              | 4.9                            | 11.3                        | 49.6              | 33                     | 4.08 | 0.86 |
| E-mail*                       | 8.8              | 7.5                            | 12.7                        | 42.2              | 28.9                   | 3.75 | 1.21 |
| Publishing software           | 54.8             | 14.5                           | 15.5                        | 9.9               | 5.3                    | 1.96 | 1.25 |
| Webpage authoring software    | 59.7             | 15.4                           | 12.2                        | 8.2               | 4.4                    | 1.82 | 1.19 |
| Programming languages         | 72.1             | 11.9                           | 9.0                         | 5.1               | 1.9                    | 1.53 | 0.98 |
| Modeling software             | 80.4             | 10                             | 5.8                         | 3.2               | 6                      | 1.34 | 0.78 |

\* = indicates a high level of ICT proficiency

According to teachers responses, the most widely used ICT type is the Internet ( $M= 4.08$ ,  $SD= 0.86$ ), which is followed by word processing ( $M=3.80$ ,  $SD=.98$ ). The least widely used ICT types are microworlds/simulations ( $M= 1.32$ ,  $SD= .77$ ) and modeling software ( $M= 1.34$ ,  $SD= 0.78$ ). The mean scores of the responses in relation to 14 items are close to having little information ( $M= 2.51$ ,  $SD= .96$ ). The results indicate that teachers had a high level of proficiency about six of ICT software while they had low levels of information on most of the software.

**Research Question Two: What are teachers attitudes towards the use of ICT?**

Each item was rated from 1 to 5 (from 1=completely disagree to 5= completely agree) (including positive and negative attitude items) to create overall scores (minimum 15, maximum 75). The results showed (Table 2) the mean score was 56.97 ( $SD= 7.12$ ).

**Table 2: The means and distribution of the teachers attitude to the use of ICT**

|    | Items                                                                                                            | Mean  | SD   |
|----|------------------------------------------------------------------------------------------------------------------|-------|------|
| 1  | I feel comfortable with the idea of the computer as a tool in teaching and learning.                             | 3.94  | 0.86 |
| 2  | The use of computers in teaching and learning stresses me out.                                                   | 3.52  | 1.01 |
| 3  | If something goes wrong I will not know how to fix it.                                                           | 3.17  | 1.11 |
| 4  | The idea of using a computer in teaching and learning makes me skeptical.                                        | 3.79  | 0.95 |
| 5  | The use of the computer as a learning tool excites me.                                                           | 3.40  | 1.08 |
| 6  | The use of computers in teaching and learning scares me.                                                         | 4.07  | 0.90 |
| 7  | The computer is a valuable tool for teachers.                                                                    | 3.52  | 1.15 |
| 8  | The computer will change the way I teach.                                                                        | 3.66  | 0.97 |
| 9  | The computer will change the way students learn in my classes.                                                   | 14.13 | 0.81 |
| 10 | I can do what the computer can do equally as well.                                                               | 4.07  | 0.83 |
| 11 | The computer is not conducive to student learning because it is not easy to use.                                 | 4.21  | 0.81 |
| 12 | The computer helps students understand concepts in more effective ways.                                          | 3.90  | 0.84 |
| 13 | The computer helps students learn because it allows them to express their thinking in better and different ways. | 3.82  | 0.87 |
| 14 | The computer helps teachers to teach in more effective ways.                                                     | 3.95  | 0.80 |
| 15 | The computer is not conducive to good teaching because it creates technical problems.                            | 3.82  | 0.91 |

Teachers' attitudes towards ICT were positive and at moderate levels. That is, the mean teacher attitude score is above 52.5. In terms of sub-dimensions, in the first sub-dimension (minimum 11, maximum 35), the mean score was 27.25 (SD=3.79), and in the second sub-dimension (minimum 8, maximum 40) the mean score was 29.72 (SD=4.76). The teachers stated that they agreed and certainly agreed with all items concerning the attitude toward ICT. However, given the items with negative meanings (item 11 with the highest mean value), it could be argued that they did not state positive views on all the items about ICT.

**Hypothesis One:** there is no relationship between the attitude of teachers on the use of ICT based on gender.

**Table 3: Correlation Analysis of teachers attitude towards the use of ICT based on gender**

|        |                     | Male  | Female |
|--------|---------------------|-------|--------|
| Male   | Pearson Correlation | 1.00  | .890   |
|        | Sig. (2-tailed)     |       | .015   |
|        | N                   | 20.00 | 20.00  |
| Female | Pearson Correlation | .890  | 1.00   |
|        | Sig. (2-tailed)     | .015  |        |
|        | N                   | 20.00 | 20.00  |

Table 3 shows the Correlation Analysis of teachers attitude towards the use of ICT based on gender. It was discovered that male teachers had better positive attitude to the use of ICT than their female counterparts. The Pearson Correlation value of 0.890 with the p value of 0.015 is less than 0.05 which indicates that the null hypothesis was rejected. Therefore, there is a statistically significant difference in the relationship between the teachers attitude towards the use of ICT based on gender in favour of male teachers.

**Hypothesis Two:** There is no relationship between the attitudes of teachers on the use of ICT based on teaching experience.

**Table 4: Correlation Analysis of teachers attitude towards the use of ICT based on experience**

|        |                     | Male  | Female |
|--------|---------------------|-------|--------|
| Female | Pearson Correlation | 1.00  | .762   |
|        | Sig. (2-tailed)     |       | .030   |
|        | N                   | 20.00 | 20.00  |
| Male   | Pearson Correlation | .762  | 1.00   |
|        | Sig. (2-tailed)     | .030  |        |
|        | N                   | 20.00 | 20.00  |

Tables 4 shows the Correlation Analysis of teachers attitude towards the use of ICT based on gender. It was discovered that teachers low or little teaching experience had better positive attitude to the use of ICT than their well experienced/ senior colleagues. The Pearson Correlation value of 0.762 with the p value of 0.030 is less than 0.05 which indicates that the null hypothesis was rejected. Therefore, there is a statistically significant difference in the relationship between the teachers attitude towards the use of ICT based on teaching experience in favour of less experienced teachers.

**Hypothesis Three:** There is no relationship between the teachers proficiency of the use of ICT based on gender.

**Table 5 Correlation Analysis of teachers proficiency of the use of ICT based on gender**

|                 |                     | Non Utilization | Utilization |
|-----------------|---------------------|-----------------|-------------|
| Non Utilization | Pearson Correlation | 1.00            | .890        |
|                 | Sig. (2-tailed)     |                 | .015        |
|                 | N                   | 17.00           | 17.00       |
| Utilization     | Pearson Correlation | .890            | 1.00        |
|                 | Sig. (2-tailed)     | .015            |             |
|                 | N                   | 17.00           | 17.00       |

Tables 5 shows the Correlation Analysis of teachers attitude towards the use of ICT based on gender. It was discovered that teachers low or little teaching

experience had better positive attitude to the use of ICT than their well experienced/senior colleagues. The Pearson Correlation value of 0.762 with the p value of 0.030 is less than 0.05 which indicates that the null hypothesis was rejected. Therefore, there is a statistically significant difference in the relationship between the teachers attitude towards the use of ICT based on teaching experience in favour of less experienced teachers.

**Hypothesis Four:** There is no relationship between the proficiency of the teachers on the use of ICT based on teaching experiences.

**Table 6: Correlation Analysis of teachers proficiency of the use of ICT based on teaching experienced**

|                  |                     | Less experienced | Well Experi-<br>enced |
|------------------|---------------------|------------------|-----------------------|
| Well experienced | Pearson Correlation | 1.00             | .708                  |
|                  | Sig. (2-tailed)     |                  | .004                  |
|                  | N                   | 20.00            | 20.00                 |
| Less Experienced | Pearson Correlation | .708             | 1.00                  |
|                  | Sig. (2-tailed)     | .004             |                       |
|                  | N                   | 20.00            | 20.00                 |

Tables 6 shows the Correlation Analysis of teachers proficiency of the use of ICT based on teaching experience. It was discovered that teachers low or little teaching experience had better knowledge of the use of ICT better than their well experienced/senior colleagues. The Pearson Correlation value of 0.708 with the p value of 0.004 is less than 0.05 which indicates that the null hypothesis were rejected, therefore, there is a statistically significant difference in the relationship between the teachers proficiency of the use of ICT based on teaching experience in favour of less experienced teachers.

## Discussion

The findings of the study are summarized under six headings, which are the levels of proficiency on and the use of ICT, attitude towards the use of ICT, the correlation between attitudes and gender, the correlation between attitudes and

teaching experiences, the correlation between proficiency and gender and the correlation between proficiency and teaching experiences.

The first shows that teachers ability in ICT and their ICT use in learning-teaching process are of average. The most common uses of ICT are the Internet, e-mail, word processing and educational CDs, though rarely used. The results seem similar to the results of previous research (Thomas & Stratton, 2006; Tondeur, van Braak & Valcke, 2007). The study also revealed that ICT use in classroom is limited, a finding which is attributed to the level of experience; and the most commonly used. ICT types were determined as the Internet, e-mail, word processing, and educational CDs. Teachers low levels of software use for educational purposes might be strongly influenced by their low levels of expertise and lack of knowledge and experience about how to use and adapt themselves to the program.

The second finding is related to attitudes, it shows that majority of the teachers attitudes towards ICT were positive. The findings of this research confirmed those of Paraskeva, Bouta & Papagianni (2008), and Albirini (2006) on computers and the Internet. These researches concluded that teachers had positive attitudes towards the use of computer and internet.

The third finding concerns the gender variable. In the comparisons in terms of gender, ICT proficiency, their use in education and attitudes towards the ICT show statistical difference. Male teachers had higher scores than female teachers in terms of proficiency and usage. They had more positive attitudes than female teachers did. Findings revealed in the literature by Volman, van Eck, Heemskerk & Kuiper (2005) and Bove'e, Voogt & Meelissen (2007) demonstrated that females had more positive attitudes than males. In these researches, gender was found to be a significant variable itself but rather it can be assumed to be shaped by experience, as well as cultural and educational objectives.

The fourth finding involves teachers experience. Teachers levels of proficiency and use of ICT, and attitudes towards ICT show statistical difference. Less experienced teachers had higher scores than the well experienced teachers in terms of proficiency and usage. They had more positive attitudes than the well experienced teachers did. The less the years of experience, the higher their proficiency and ICT use. In addition, they have more positive attitudes towards ICT and usage, a finding which is, in fact, not surprising.

### **Recommendations**

Based on the findings of this study, the following recommendations were made:

1. Both state and federal ministry of education should provide teachers especially well experienced ones the avenue to undergo training on the use of ICT in the teaching of Mathematics in order for them to be acquaintance with the model way of teaching.
2. Female Mathematics teachers should be encouraged to develop more interest in ICT for better teaching and learning of Mathematics.

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