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## Adopting Of Microsoft Excel Spreadsheet Package for Teaching of Numerical Courses as Alternative To Conventional Teaching Methods

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### **Abstract**

*In the 21<sup>st</sup> century, there are many innovations and transformations in teaching and learning process. The use of information and communication technology (ICT) tools such as computers, Internet, DVD players, software and hardware, to mention, but a few are inclusive. This study assesses the use of conventional lecture method and computer software (Microsoft Excel Spreadsheet Package) on students performance in Numerical Methods course. A total number of fifty two (52) Nigeria Certificate in Education (NCE.) II students consisting of 20 females and 32 males were used for this study. Numerical Methods Test (NMT) sampled from the past questions of Introduction to Numerical Methods offered at Nigeria Certificate in Education (NCE) level was used to assess the students performance. All the 52 students were subjected to pre-test after they were taught with conventional lecture method. Post-test was also conducted after exposing the students to use of Microsoft Excel Spreadsheet Package in solving Numerical Methods problems. Mean, standard deviations and t-test statistics at  $p = 0.05$  level of significance were used in analyzing the results. The result revealed that there was significant difference in the mean scores of male and female students with the use of conventional lecture method. Whereas, there was no significant difference in the mean scores of students performance in the use of conventional lecture method and Microsoft Excel Spreadsheet package in Numerical Methods Test (NMT). Finally, there was significant difference in the mean scores of male and female students performance after exposing them to the use Microsoft Excel Spreadsheet Package in solving Numerical Methods problems.*

**Keywords:** ICT. Microsoft Excel Spreadsheet. Packages. Software, Numerical Methods, Students' Performance

The use of Information and Communication Technology (ICT) tools, such as: Computer system, mobile phones, tablets, Computer Aided Instruction (CAI), Multimedia, tutorials, to mention but a few, in transforming teaching and learning process is very crucial in this information-driven societies. The roles that these ICT devices play in educational development have been well documented (Glen & Isaacs, 2007: The Republic of Kenya, 2006; Ndukwe, 2004 and Ndukwe, 2007). In assessing the roles of ICT to national development, Ndukwe (2004) asserted that ICTs open the door to e-commerce, e-education, e-health, and e-government.

Federal Government of Nigeria - FGN (2001) having critically observed crucial roles that Information Technology perform in the development of educational sector, it clearly stated in its mission statement that Information Technology (IT) should be used for: "education: creation of wealth: poverty eradication; job creation; and global competitiveness. It can be seen clearly here that the first point in the mission statement of FGN's National Policy on Information Technology is education, which is the key driver to any national development.

According to United Nations Education Scientific and Cultural Organization UNESCO (2006), the five key ways in which ICT can support literacy level of a country are: enhancing learning; broadcasting access to literacy education; creating local content: professional development: and cultivating literacy conducive for learning. Oliver (2002) opined that using ICT tools make the lesson to be learners' centered rather than teachers' centered. Thus, it makes students to learn at their own pace.

Observing the potentiality in ICT-based technology, Kwache (2007) opined that: ICT based technology like e-learning has great potential to supplement traditional learning. This is so because ICT-enhanced learning can provide new opportunities to explore high level cognitive activities such as autonomy, creativity, problem solving and team work while providing teachers with the means to take into account individual needs of students, especially while using web-based technology (p.396).

In the words of Jager and Lokman (1999), ICT is a generic term referring to technologies which are being used for collecting, storing, editing and passing of information in various forms, Buttrressing the definition above, Jimoh and Salawu (2009) describe ICT as a field that encompasses all forms of technology products or tools that can be used to organize, collect, share, create, transmit, record and store information electronically be it on standalone computer, Internet, Satellites, mobile and fixed line phones, radio, television, and so on.

Computer system, as one of major tools in ICT gadgetries is an electronic device that has capabilities in handling mathematical computations without wasting much of time following the instructions given by the user with the aid of software. Computer is data processor machine that can perform substantial computations with the

aid of software such as, Microsoft Excel Spreadsheet package. Software is generic term used to describe all forms of programs that make computer perform its function effectively.

Microsoft Excel Spreadsheet Package is an application software produced by the Microsoft Corporation (Cusumano, 2009) to ease tasks of mathematicians, statisticians, accountants, etc. Microsoft Excel Spreadsheet Package consists of grid of lines of rows and columns that can be used to organize data. It aids in mathematical computation, graph plotting, financial calculations, forecasting, etc. and can be applied in the teaching of Numerical Methods to enable students comprehend the course in a better way.

Introduction to numerical methods is a course of study in tertiary institutions. It exposes Computer Science students to mathematical computations ability and how to automate the mathematical computations programmatically in order to ease the process of solving the problems manually. This course is taught to students at 200 levels in NCE programme. At NCE level, the topics to be covered include interpolation, Newton Raphson iterative formula, trapezoidal rule, Simpson's rule and halving the square methods (National Commission for Colleges of Education — NCCE, 2008). Over the years, the performance of students in mathematics (Numerical Methods inclusive) has not been encouraging, especially the female ones (UNESCO, 2014). This can be attributed to the mathematical nature of the course and generally students have fears and anxieties for any related mathematical course. The poor performance of students in Numerical Methods is more pronouncing when conventional lecture method is adopted in imparting knowledge. Conventional lecture method here is the process of imparting mathematical computation knowledge to students with the use of chalk, chalkboard and hand-held calculator. Due to poor performance of students in mathematics and mathematics related courses, several studies have been conducted to look into the efficacy of the use of computer aided instruction software in Mathematics.

Computer aided instruction in Mathematics is a software developed to ease Mathematical computation abilities of students. An example of such software is Computer Algebra System (CAS). The use of computer-aided instruction/learning (CAI or CAL) in the field of Mathematics has been well documented. It has been reported that the use of CAI/CAL in the Mathematics related subjects aids students' assimilations and performances. Some researchers have also suggested that the computer provides an effective vehicle for improving students' achievement (Bahr & Rieth, 1989, Bangert-Drowns, 1985; Capper & Copple, 1985). In assessing the importance of CAI in students' achievement in Mathematics, Tienken & Wilson (2007) asserted that CAI provides one possible avenue for education leaders to overcome or address the problem of low achievement in Mathematics.

### **Statement of problem**

Generally, students have great difficulty in understanding, comprehending and assimilating any course relating to Mathematics when it is taught to them using conventional lecture method. In many times, all the teachers' efforts in putting them through proved abortive because they have poor background, fears and anxieties for

any mathematics related course with an exception of few of them. As a teacher who has been teaching and assessing students in Numerical Methods over the years at NCE level observed that in many occasions, half of the class pass the course with lower grades (i.e. Ds and Es), The female students are majority of those with these lower grades. Only few students obtained B and C grades. The problem of this study is therefore to assess the effect of using Microsoft Excel Spreadsheet Package in teaching and learning Numerical Methods course among N.C.E.II Computer Science students in College of Education, Azare.

### **Research Questions**

The following research questions were raised to guide this study:

- (1) Is there any effect in the use of Microsoft Excel Spreadsheet package in the teaching and learning of Numerical Methods course?
- (2) To what extent is the effect if there is any?
- (3) Does gender have any effect on the students' performance in numerical courses when using conventional lecture methods?
- (4) Does gender have any effect on the students' performance in numerical courses when using Microsoft Excel Spreadsheet package.

### **Hypotheses**

The following null hypotheses were formulated to guide this study:

**Ho1:** There is no significant difference in the mean scores of students' performance in the use of conventional lecture method and Microsoft Excel Spreadsheet package in Numerical Methods Test (NMT).

**Ho2:** There is no significant difference in the mean scores of male and female students' performance in Numerical Methods Test (NMT) when they were taught using conventional lecture method only.

**Ho3:** There is no significant difference in the mean scores of male and female students' performance in Numerical Methods Test (NMT) when they were taught using Microsoft Excel Spreadsheet package.

### **Methodology**

This is an experimental research design. Numerical Methods Test (NMT) was used in testing the students' performance. Five (5) NMT items were generated from past questions in the Numerical Methods course covering the NCCE syllabus in the course, NMT instrument used in assessing students' performance was thoroughly validated by two experts in the field. One is from College of Education, Azare and the other is from Abubakar Tafawa Balewa University — ATBU, Bauchi. Firstly, students were taught for eight (8) weeks covering the NCCE syllabus in the course using conventional lecture method. Thereafter, they were tested and scored. Later on, they were exposed to the use of Microsoft Excel Spreadsheet package for solving Numerical Methods problems in six (6) weeks. They (students) were also tested using NMT and scored.

The population for this study was all N.C.E.II Computer Science Education students of College of Education, Azare, Katagum local government area of Bauchi state of 2012/2013 academic session. Fifty-two (52) students consisting of 20 females and 32 males partook in the test. No sample was taken because the students' population is small and all were used in the study. The two set of scores, (i.e. conventional lecture and Microsoft Excel Spreadsheet package) obtained from the Numerical Methods Test were analyzed using means and standard deviations to answer all the research questions while t-test statistics was used in testing three null hypotheses formulated in this study.

## **Results**

### **Research Questions**

The following tables 1 - 3 answered the four (4) research questions raised in this study one after the other.

**Table 1 : Means and standard deviations (SD) of students performance in the use of Conventional Lecture Method and Microsoft Excel Spreadsheet package in Numerical Methods Test**

Group	N	X	SD
Conventional Lecture Method	52	21.33	5.99
Microsoft Excel Spreadsheet Package	52	34.10	5.69

Note: N = number of students, X = Mean score. SD = Standard Deviation.

In Table 1 above, Mean and SD for the use of conventional lecture method are 21.33 and 5.99 respectively, while the use of Microsoft Excel Spreadsheet, package yielded 34.10 and 5.69 respectively. From these mean values, it is clearly shown that Microsoft Excel Spreadsheet package has high mean value compared to conventional lecture method, which indicates that Microsoft Excel Spreadsheet package has effect in the teaching and learning of Numerical Methods course. This answers research question 1 in this study. Besides, mean difference calculated to be 12.77. This mean gap is high enough and it has shown the extent of the difference in the use of compared two methods which answers research question 2.

**Table 2: Means and standard deviations (SD) of male and female students' performance in the use of Conventional Lecture Method in Numerical Methods**

Test	N	X	SD
Male	32	23.34	5.73
Female	20	18.10	5.00

Note: N = number of students. X = Mean score. SD Standard Deviation.

In the Table 2 above. Mean and SD of male students' performance in the use of conventional lecture method are 23.34 and 5.73 respectively, while the female students' performance yielded 18.0 and 5.00 respectively. From these mean values, it is clearly observed that male students have high mean value compared to their female counterparts which indicates that male students perform better than female students in

Numerical Methods Test. The difference in their mean values is 524. This assertion answers research question 3 in this study.

Table 3: Means and standard deviation (SD) of male and female students' performance in the use of Microsoft Excel Spreadsheet Package in Numerical Methods Test

Gender	N	X	SD
Male	32	33.34	5.22
Female	20	33.85	5.99

Note: N= number of students, X = Mean score. SD = Standard Deviation.

In the Table 3 above, Mean and SD of male students' performance in the use of Microsoft Excel Spreadsheet package are 33.34 and 5.22 respectively, while female students' performance yielded 33.85 and 5.99 respectively. From these mean values, it is noted that female students has mean value little bit high compared to their male counterparts which indicates that female students perform a little bit better than male students in the use of Microsoft Excel Spreadsheet Package. The difference in their mean values is 0.51. This assertion answers research question 4 in this study.

### Hypothesis 1

Table 4

Table 4: T-test analysis of mean scores of Conventional Lecture Method and Microsoft Excel Spreadsheet package in students' performance in Numerical Methods Test

Group	N	X	SD	t cri.	T-cal.	Df	Decision
Conventional Lecture Method	52	21.33	5.99	1.98	11.14	102	Significant
Microsoft Excel Spreadsheet	52	34.10	5.69				

P<0.05, Note:df = degree of freedom

The results in Table 4 revealed that the calculated t-value of 11.14 is greater than critical t-value of 1.98 at 0.05 level of significance of 102 degree of freedom. The null hypothesis 1. which stated that there is no significant difference in the mean scores of the use of' conventional lecture method and Microsoft Excel Spreadsheet package in Numerical Methods Test (NMT) was rejected meaning that there is significant difference in the mean scores of the use of conventional lecture method and Microsoft Excel Spreadsheet package in Numerical Methods Test (NMT). Thus students' performance in the use of Microsoft Excel Spreadsheet Package is better when compared with conventional lecture method.

**Hypothesis 2**

Table 5: T-test analysis of mean scores of male and female students' performance in the use of Conventional Lecture Method in Numerical Methods Test

Gender	N	SD	t cri	t-cal	Df	Decision
Male	32	23.34	5.73	2.01	3.48	50
Female	20	18.10	5.00			

P<0.05. Note: df degree of freedom.

The results in Table 5 revealed that the calculated t-value of 3.48 is greater than critical t-value of 2.01 at 0.05 level of significance of 50 degree of freedom. The null hypothesis 2, which stated that there is no significant difference in mean score of male and female students' performance in Numerical Methods Test (NMT) when they were taught using conventional lecture method was rejected meaning that there is significant difference in mean scores of male and female students performance in Numerical Methods Test (NMT) when they were taught using conventional lecture method. Thus male students outperformed their female counterparts in Numerical Methods Test using conventional lecture method.

**Hypothesis 3**

Table 6: T-test analysis of mean scores of male and female students' performance in the use of Microsoft Excel Spreadsheet package in Numeric Methods Test

Gender	N	X	SD	t cri	t-cal	Dr	Decision
Male	32	33.34	5.22	2.01	0.32	50	NS
Female	20	33.85	5.10				

P<0.05, Note: Df= degree of freedom NS Not Significant

The results in Table 6 showed that the calculated t-value of 0.32 is less than critical t-value of 2.01 at 0.05 level of significance of 50 degree of freedom. The null hypothesis 3, which stated that there is no significant difference in mean scores of male and female students' performance in Numerical Methods Test (NMT) when they were taught using Microsoft Excel Spreadsheet package was accepted meaning that students' performance does not differ with the use of Microsoft Excel Spreadsheet package. Therefore, the use of Microsoft Excel Spreadsheet package aids both male and female students' performance significantly.

**Discussion of findings**

This study found that in using conventional lecture method in teaching Numerical Methods course, male students performed better than their female

counterparts in the Numerical Methods Test (NMT). This difference in their performances is statistically significant. This result is in agreement with the findings of Herbert & Stipek (2005). Else-Quest, Hyde & Linn (2010) and UNESCO (2014), which concluded that females are less confident than their male counterparts in mathematical abilities. Zhu (2007) also reported that male students perform better in mathematics problem solving than females in standardized mathematics tests and these gender differences are generally obvious in high schools and in colleges and vary across mathematical tasks.

Also, in an attempt to compare students' performance in NMT using conventional lecture method and Microsoft Excel Spreadsheet package, it was found that the difference exists and was statistically significant. This is in consonance with the finding of Yushau (2006) which concluded that there was no significant change in students' attitudes towards mathematics and computer. This result is also in line with the findings of Travnor (2003) as cited in Tienken & Wilson (2007) that CAI (computer aided instruction) in mathematics improved mathematics achievement of students.

Meanwhile, there was no significant difference in the performance of male and female students in Numerical Methods Test while Microsoft Excel Spreadsheet package was adopted in teaching and learning of Numerical Methods course. This implies, the use of Microsoft Excel Spreadsheet package has great effect in making students comprehend the mathematical computations of Numerical Methods course. This view is in support of the findings of Bayturan & Kesan (2012) which revealed that teaching mathematics with a computer assisted instruction method increased student success significantly in mathematics lesson.

### **Conclusion**

This paper assessed the use of conventional lecture method and Microsoft Excel Spreadsheet package on students' performance in numerical methods course. The major findings are that in using conventional lecture method, male students performed better than the female students. Comparing students' performance in conventional lecture method and Microsoft Excel Spreadsheet package, there was significant difference in students' performance in Numerical Methods course. While comparing male versus female students' performance in Numerical Methods Test, there was no significant difference in their performance while using Microsoft Excel Spreadsheet package. Thus, the use of Microsoft Excel Spreadsheet package has great effect in making students comprehend the mathematical computations of Numerical Methods course.

### **Recommendations**

Based on the findings in this study, the following recommendations are proffered:

- Teachers should adopt the use of Microsoft Excel Spreadsheet package in teaching and learning process of Numerical Methods course to complement the conventional lecture method to enable students comprehend the course in a better way.



- Enough computer systems should be provided by the government through the school management to ease the students' accessibility and engagement in the practical use of the Microsoft Excel Spreadsheet package.
- Provision of standby generator by the college administrator is very crucial for effective utilization of computers provided in the computer laboratories.
- Competent laboratory attendant who has technical-know-how in Microsoft Excel Spreadsheet should be employed to manage the laboratories effectively.

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