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Maple Software and Undergraduate Mathematics Students' Performance and Attitude in Calculus in Bayelsa State

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ABSTRACT

This study investigated the effects of Maple software on Mathematics students' performance and attitude in Calculus in Bayelsa State. The study adopted quasi-experimental and descriptive survey research designs with non-equivalent groups. Four objectives and four research questions guided the study. The population of the study was 208 students, with a sample size of 99 students including 65 males and 34 females representing 65.7 % and 34.3 % respectively through purposive sampling technique. The reliability coefficient of the Students' Performance Test on Calculus was established at 0.79 using Pearson's Product Moment Correlation, while Cronbach alpha was used to obtain 0.78 for the Students' Attitude Towards Calculus Inventory. Data obtained from the instruments were analysed using mean and standard deviation. From the findings, students taught Calculus with Maple outperformed their colleagues taught with the lecture method. Furthermore, students' attitudes towards Calculus using Maple were positive; the male year one undergraduate Mathematics students' had a higher positive attitude than the female students in learning Calculus with Maple software. It was recommended among others that Lecturers should employ Maple software for teaching and learning to enhance the performance and attitude of undergraduate Mathematics students.

Keywords: Maple, students' performance, attitude, gender and Calculus.

INTRODUCTION

The compulsory nature of Mathematics in curricula worldwide has confirmed its usefulness in the development of the scope of professions and in the making of individuals because its importance determines the career options available to young people (Abe & Gbenro, 2014; Okereke, 2006). The selection of content for students' Mathematical knowledge development is based on relevance, application and collegial need. Mathematics content includes but is not limited to Arithmetic, Algebra, Trigonometry, Statistics, Probability, Differentiation, Integrals Calculus, Numerical Solutions of Linear Equations, Vector Analysis, Linear Programming and many others. Undergraduates in different disciplines offer Mathematics courses at different levels. For example, Calculus is studied by students in Engineering, Mathematical Sciences, Physics, Chemistry, Biological Sciences, Management Sciences, Economics, Architecture, to mention but a few. These undergraduates are posed with some difficulties that deterred the attainment of optimal scores in the course of Calculus.

Calculus is a branch of Mathematics which has a wide application in other areas such as statistics, analytical geometry, algebra and almost all disciplines, such as Physics (motion, electricity, heat, light, harmonics, acoustics, astronomy and dynamics), Engineering (gravity and planetary motion, fluid flow, ship design, geometric curves, and bridge engineering), Medicine (determining how medications interact with the body), Economics (demand and supply, optimization, forecasting, prediction, elasticity, and maximum potential profits), Chemistry (rate of radioactive decay, growth rate, growth range, birth and death rate, etc.), Geography, Computer Science and information systems (autonomous driving of cars, photography, artificial intelligence, robotics, video games, and even movies). It is an area of Mathematics perceived as the main source of failure among undergraduates because of its nature, which are abstract and complex ideas. Others are un-engaging

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

teaching methods and inadequate course design, ineffective study techniques, and the classroom environment (Saha, Akhi, & Saha, 2024; Chand, Chaudhary, Prasad & Chand, 2021).

Calculus, as described by Ellis, Kelton, and Rasmussen (2020), is a fundamental university-level course encompassing limits, derivatives, integrals, and the foundational theories of calculus. Particularly prevalent among students in Science, Technology, Engineering, and Mathematics (STEM) fields (Rasmussen & Ellis, 2013), the study of calculus faces challenges in instructional methods, especially in transitioning from Calculus I to Calculus II (Rasmussen & Ellis, 2013). This difficulty is compounded by a perception among students and educators alike that calculus is complex and may lack relevance in real-world applications (Rasmussen & Ellis, 2013).

The instructional shortcomings in calculus are multifaceted, with factors such as poor integration of information and communication technology (ICT) and demographic characteristics influencing students' experiences (Rasmussen & Ellis, 2013). Indeed, a significant portion of STEM majors enrolled in calculus courses express dissatisfaction with instructional methods (Rasmussen & Ellis, 2013). Additionally, undergraduate students' perceptions of calculus teaching and its applicability in quantitative fields have diminished, contributing to challenges in Mathematical Education despite the discipline's importance in fostering rational thinking and analytical skills (Heck & Van Gastel, 2006).

There is a need for reevaluation of university mathematics curricula due to perceived deficiencies in student preparedness, particularly among non-STEM majors (Flegg, Mallet & Lupton, 2012). Individual factors such as anxiety, self-efficacy, and motivation, alongside institutional factors like teaching materials and classroom management, significantly influence students' attitudes and performance in Mathematics (Mata et al., 2012).

Furthermore, Mabena, Mokgosi and Ramapela (2021) stated that many high school students have a weak grasp of the mathematical concepts; sudden and repeated loss of interest in the subject, negative disposition, and lack of relational understanding affect their performance. Calculus has traditionally been one of the most difficult concepts for students to understand and master with deficiency in conceptual application. Idris (2009) blamed students for poor relational and logical understanding which has affected their performances in semester examinations involving Calculus. For example, in the dy/dx of 1-x2/x2 relational understanding teach students to re-arrange equation as y = - 1 before integrating. Relevant ideas in Calculus can be improved through constant problem solving and modifications to arrive at better solutions. However, in order to acquire proper understanding of the abstract Mathematics content of Calculus, Kemp (1976) in Idris 2009 suggested the use of writing activities and deep thinking, use of Mathematics vocabulary, understanding interpretation and evaluation of mathematical ideas.

Supianti (2017) stated that high order critical thinking should be adopted by students if their performance in Calculus would improve. For example, using the Maple based Calculus would involve identification of the potential problems, data collection design of product, evaluation, product tryout and final product revision. The author stated that the Maple increases critical thinking and improved performance in Calculus. Mathematics content domain of Calculus can be resolved through integration of information and Communication Technology (ICT) that enables problem solvers to acquire problem solving skills, communication skills, searching and information management skills (Das, 2019). Computer provides tools to assist students and enhance their skills, resolve their abstraction and problem solving.

Krishman (2016) suggested students' improvement in performance by using a blended learning strategy involving in-teaching in hybrid courses in the educational classroom with technology, noting that students demonstrate highly positive response to learning and improve performance in a blended learning approach to Calculus. The acquisition and transfer of Mathematics (Calculus) knowledge to students' specializations or fields of study is a distinction that has significantly influenced students' Calculus performance. It is easier to acquire mathematical knowledge, but students face different categories of difficulties due to a lack of understanding and interpretation of Mathematics concepts (Krishman, 2016).

In Calculus, especially integral Calculus, students have relied on rote memorization (Hari Persad, 2011). In this topic students are more concerned about understanding the topic, hence they face difficulty in learning,

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

especially the Calculus-related concept. Saleh and Zakaria (2016) opined that, students adapt to technology-based learning strategies because of their flexibility and positive impact on understanding. To improve undergraduate students' understanding and performance in Calculus, the abstract nature of the course must be simplified using appropriate technology such as Maple programs as an identified meaningful teaching approach to improve relational and conceptual knowledge, teaching effectiveness, learner engagement, and appropriate problem-solving skill acquisition.

Maple is a Mathematics software/app that integrates the world's most powerful math engine with an interface that allows analyzing, exploring, visualizing, and solving mathematical problems a breeze. Maple is a versatile math instrument that is used in robotics, medical science, aerospace, renewable energy ventures, education, and a number of other areas.

Maple contains over 5000 functions that cover almost every field of Mathematics, including calculus, arithmetic, differential equations, statistics, linear algebra, geometry, and much more (www.maplesoft.com).

Recently, the use of technology in teaching and learning has widened the application of Information and Communication Technology (ICT) in teaching and learning. It has afforded teachers and learners the support and positive impact capable of enriching students` learning and motivation, which is an effective social Behaviour that promotes learning. The importance of teaching and learning is to determine appropriate instructional materials that can help students reach their competences. Therefore, there is need to consider Maple, if it would improve Mathematics students' performance and enhance mathematics students' attitude in Calculus.

Statement of the Problem

Research interests aimed at improving students' active participation in learning Mathematics suggests the use of inquiry-based learning strategy, collaborative method, flipped classroom learning environment, use of multimedia learning approach involving use of mathematical software, among others. Mathematical software's are structural tools based on appropriate software used in ameliorating student difficulties in problem solving in Mathematics. Common among them in the teaching of Calculus are GeoGebra, Mathematics Laboratory (MATLAB), Magma, Maple, Microsoft Mathematics, Mathematics Calculus, Mastery software, Mathway, Sage, Derive, Geometer Sketchpad, CAS, Mathematica and many others. The increase in students' interest in ICT-based learning strategies depends on their effectiveness, the teacher`s use of technology, and the resolution of numerous problems using the modes. Mainstream Calculus refers to the courses designed to prepare students for the study of Engineering, Mathematics and the Physical sciences. Students' perception of pedagogy in Calculus differs.

Maple, as a symbolic computing system, provides an interactive environment where calculus students can explore and visualize mathematical concepts, which potentially enhances their understanding and performance.

Gender also plays a role in students' attitudes toward Mathematics, with boys often exhibiting higher achievement and confidence levels compared to girls (Scafidi & Bui, 2010). Studies utilizing the Fennema-Sherman Mathematics Attitudes Scales have identified specific attitudes associated with Mathematics learning, emphasizing the importance of conceptual understanding over procedural knowledge (Huang, 2010).

To address these challenges, innovative instructional approaches incorporating interactive learning technologies have been proposed, including graphic software and computer algebra systems (Lavicza, 2010). These technologies offer students alternative avenues for learning and problem-solving, potentially improving attitudes and performance in calculus (Lavicza, 2010; Duran, Perez & Varona, 2014).

Moreover, the advent of e-learning and tutorial software, such as Maple and Mathway, presents opportunities to enhance students' mathematical comprehension and engagement through interactive problem-solving and exploration (Alonso et al., 2019). Maple, for instance, provides a versatile platform for mathematical analysis and visualization, while Mathway supports students across various mathematical domains, from pre-calculus to advanced calculus, fostering a deeper understanding of mathematical concepts (Alonso et al., 2019).

This study will explore the impact of Maple on first-year undergraduate Mathematics students' performance,

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

their attitude towards calculus, a subject crucial for many STEM degree paths and their overall perception of the calculus learning experience. The aim is two-fold: to assess the effectiveness of the mathematical tool (Mathway) in improving academic outcomes and to understand how they shape students' attitudes, potentially enabling educators and curriculum planners to make informed decisions about how best to integrate technology into teaching strategies.

Purpose of the Study

The purpose of this study was to:

1. determine the effect of the use of Maple software on the mean performance scores of years one undergraduate Mathematics students in Calculus

2. compare year one undergraduate Mathematics students' overall performance scores in Calculus using Maple software and Lecture method (LM) based on gender.

3. assess the attitude of undergraduate Mathematics students toward Calculus using Maple software.

4. assess the attitude of undergraduate Mathematics students toward Calculus using Maple software based on gender.

Research Questions

1. How does the use of Maple software affect the mean performance scores of years one undergraduate Mathematics students in Calculus?

2. What is the gender difference in the mean performance scores between year one undergraduate Mathematics students' taught Calculus using Maple software and the lecture method?

3. What is the attitude of year one undergraduate Mathematics students towards Calculus when using Maple software?

4. What is the attitude of undergraduate Mathematics students towards Calculus when using Maple software based on gender?

METHODOLOGY

Two designs were used to conduct this study. A quasi-experimental design of a non- equivalent control group with a pretest and posttest was used. It also employed a descriptive survey design where an attitudinal questionnaire was utilized to determine the level self-confidence, value, enjoyment and motivation when using Maple software to learn calculus. The population of the study comprised all 208 2022/2023 academic session students of Mathematics departments in five (5) National Universities Commission approved universities in Bayelsa State. The sample of this study includes 99 first-year undergraduate Mathematics students comprising 65 males representing 65.7% and 34 females representing 34.3% from two intact classes by purposive sampling. These instruments used were: Students' Performance Test on Calculus (SPTC) and Students' Attitude Towards Calculus Inventory (SATCI). The reliability coefficient for SPTC was determined using the Pearson product-moment correlation coefficient and a value of 0.79 was obtained. While a reliability coefficient of 0.78 was determined for SATCI using Cronbach`s Alpha test. The research questions were answered using descriptive statistics of mean and standard deviation.

RESULTS AND DISCUSSION

Research question one:

How does the use of Maple software affect the mean performance scores of years one undergraduate

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

Mathematics students in Calculus?

Table 1: Mean and standard deviation on the mean performance scores of students in Calculus using Maple software and lecture method

Group	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Gain
Maple	32.37	10.4	67.91	9.21	35.37
LM	32.57	7.53	55.89	8.26	23.32

Results from table 1 shows a pre-test mean score of 32.37 with a standard deviation of 10.40 and a corresponding post-test mean of 67.91 with a standard deviation of 9.21 resulting into a mean gain of 35.54 for students that used Maple for learning Calculus while a pre-test mean of 32.57 with a standard deviation of 7.53 and a post-test mean of 55.89 with a standard deviation of 8.26 and a corresponding mean gain of 23.32 was recorded for the group that used lecture method for learning Calculus. The result revealed that the mean gain of Maple group (M=35.54) is higher than that of lecture method (M=23.32). The effect size of 12.22 implies that the students taught with Maple were favoured more than those taught with lecture method.

Research question two:

What is the gender difference in the mean performance scores between year one undergraduate Mathematics students' taught Calculus using Maple software and the lecture method?

Table 2: Mean and standard deviation on mean performance Scores of male and female year one undergraduate Mathematics students in Calculus using Maple software and lecture method

Group	Gender	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Gain
Maple	Male	31.67	10.26	66.45	10.22	34.78
	Female	33.41	10.1	70.41	6.7	37
Lecture Method	Male	32.89	7.87	57.25	7.1	24.36
	Female	31.88	6.95	53	9.92	21.12

From table 2 above, Maple group had the highest mean gain for both male and female students, followed by the Lecture Method group. The results revealed that male students using the Maple software had a mean gain of 34.78, while female students had a mean gain of 37.00. Male students using the Lecture Method had the lowest mean gain of 24.36, while female students had a mean gain of 21.12. The Maple software seemed to be the most effective method for both male and female students based on the mean gain. Female students generally performed better than male students across the two methods.

Research question three:

What is the attitude of year one undergraduate Mathematics students in Calculus when using Maple software?

Table 3: Descriptive of Attitudes of Undergraduate Mathematics Students Toward Calculus Using Maple

Item	Statement	Mean	SD	Remark
1	I believe that I can successfully learn Calculus using the Maple software.	3.24	0.77	Positive

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

2	I have confidence in my ability to understand Calculus concepts with Maple.	3.28	0.75	Positive
3	I feel capable of solving complex Calculus problems when using Maple software.	2.93	0.77	Positive
4	I am confident that I can excel in Calculus with the support of Maple software.	3.28	0.62	Positive
5	Maple software enhances the beliefs in my Calculus skills.	2.96	0.7	Positive
6	The Maple software sometimes makes me question my ability to grasp Calculus concepts.	2.67	0.87	Positive
7	I doubt my ability to learn Calculus effectively even with Maple software.	2.24	0.92	Negative
8	I trust that I can achieve my Calculus learning goals by using Maple software.	3.02	0.88	Positive
9	I sometimes feel uncertain about my Calculus skills when using Maple software.	2.65	0.95	Positive
10	I lack confidence in my capacity to excel in Calculus with Maple software sometimes.	2.15	0.89	Negative
Attitude Sub-Scale Mean		2.84	0.81	Positive

Value of learning Calculus with Maple Software

No.	Statement	Mean	SD	Overall Attitude
11	Learning Calculus with the Maple software is valuable for my academic growth.	3.26	0.77	Positive
12	I find Calculus with the Maple software to be a worthwhile skill for my future career.	2.93	0.83	Positive
13	Knowledge of Calculus through the Maple software enhances my understanding of real-world problems.	2.93	0.93	Positive
14	Calculus with Maple software adds value to my overall educational experience.	2.89	0.92	Positive
15	I believe that mastering Calculus with Maple software contributes to my personal development.	2.85	0.87	Positive
16	Calculus using Maple software is an important subject to me.	2.8	0.96	Positive
17	Calculus with Maple software doesn’t significantly enrich my overall educational experience.	2.43	0.86	Negative
18	Knowledge of Calculus with Maple software doesn’t seem to have practical applications.	2.04	0.87	Negative

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

19	I don't see much value in acquiring Calculus skills through the Maple software.	2.04	0.89	Negative
20	Learning Calculus with Maple software seems unimportant for my academic growth.	2	0.99	Negative
Attitude Sub-Scale Mean		2.62	0.89	Positive

Enjoyment of learning Calculus with Maple Software

No.	Statement	Mean	SD	Overall Attitude
21	I find learning Calculus with the Maple software enjoyable.	2.87	1.02	Positive
22	Learning Calculus with the Maple software feels tedious and boring.	2.13	1.05	Negative
23	Calculus with Maple software is interesting and engaging for me.	3.07	0.9	Positive
24	Calculus using Maple software is more of a chore than an enjoyable activity.	2.5	0.91	Positive
25	I don't find much pleasure in studying Calculus with Maple software.	2.26	0.91	Negative
26	I look forward to studying Calculus with the Maple software.	3	0.84	Positive
27	Learning Calculus with Maple software is a fun experience.	3.04	0.84	Positive
28	I enjoyed the challenges that Calculus with Maple software presents.	2.65	0.97	Positive
29	I dislike the process of learning Calculus with Maple software.	2.28	0.89	Negative
30	I enjoy the solution strategy of Maple.	3.13	0.75	Positive
Attitude Sub-Scale Mean		2.69	0.91	Positive

Motivation towards studying Calculus with Maple Software

No.	Statement	Mean	SD	Overall Attitude
31	I am excited to use Maple software for learning Calculus.	3.28	0.83	Positive
32	Using Maple software makes me feel motivated to learn Calculus.	3.07	0.9	Positive
33	I struggle to stay motivated when using Maple software for Calculus.	2.43	1.15	Positive
34	I feel sometimes that using the Maple software for Calculus is a waste of time.	2.13	0.89	Negative

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

35	I feel distracted when learning Calculus with Maple software.	2.22	0.92	Negative
36	I am amazed with the experience of using the Maple software for Calculus-related problems.	3.17	0.74	Positive
37	I am highly motivated by the step-by-step solutions and instant answers provided by Maple software.	3.17	0.85	Positive
38	The use of Maple software in Calculus class sparked my curiosity in the subject matter.	3	0.76	Positive
39	I am desirous to understand more Calculus concepts by using Maple software.	3.11	0.95	Positive
Attitude Sub-Scale Mean		2.84	0.89	Positive
Grand Mean		2.75	0.88	Positive

Table 3 shows different subscales of attitude towards Calculus using Maple software. Based on table 3, the mean value of items 1, 2, 3, 4, 5, 6, 8 and 9 suggest a positive attitude, while the mean value of items 7 and 10 indicates a negative attitude for self-confidence. Similarly, items 11, 12, 13, 14, 15, and 16 demonstrate a positive attitude with values above the criterion mean of 2.5 as mean value of items 17, 18, 19, and 20 falls below the criterion mean which suggest a negative attitude for the sub-scale of value. Also, items 21, 23, 24, 26, 27, 28, 30, 31, 32, 33, 36, 37, 38, and 39 had mean values above the criterion mean indicating a positive attitude for the sub-scales of enjoyment and motivation, whereas, items 22, 25, 29, 34, and 35 are reported to demonstrate negative attitude for the sub-scales of enjoyment and motivation. However, the sub-scales of self-confidence, value, enjoyment, and motivation had weighted mean values of 2.84, 2.62, 2.69, and 2.84 which imply an overall positive attitude towards Calculus using Maple software.

Table 4: Mean and standard deviation of undergraduate Mathematics students' attitude towards Calculus based on gender using the Maple Software

Self confidence in learning calculus with maple software

No.	Statement	Mean & SD (Males, n=29)	Mean & SD (Females, n=17)
1	I believe that I can successfully learn Calculus using the Maple software.	3.21 (0.82)	3.29 (0.69)
2	I have confidence in my ability to understand Calculus concepts with the help of Maple.	3.24 (0.79)	3.35 (0.70)
3	I feel capable of solving complex Calculus problems when using Maple software.	2.93 (0.80)	2.94 (0.75)
4	I am confident that I can excel in Calculus with the support of Maple software.	3.34 (0.55)	3.18 (0.73)
5	Maple software enhances the beliefs in my Calculus skills.	3.03 (0.68)	2.82 (0.73)
6	The Maple software sometimes makes me question my ability to grasp Calculus concepts.	2.69 (0.89)	2.65 (0.86)

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

7	I doubt my ability to learn Calculus effectively even with the Maple software.	2.41 (0.91)	1.94 (0.90)
8	I trust that I can achieve my Calculus learning goals by using the Maple software.	3.00 (0.96)	3.06 (0.75)
9	I sometimes feel uncertain about my Calculus skills when using the Maple software.	2.66 (0.90)	2.65 (1.06)
10	I lack confidence in my capacity to excel in Calculus with the Maple sometimes.	2.14 (0.88)	2.18 (0.95)
Attitude Sub-Scale Mean and Standard Deviation		2.87 (0.82)	2.81(0.81)

Value of learning calculus with maple software

No.	Statement	Mean & SD (Males, n=29)	Mean & SD (Females, n=17)
11	Learning Calculus with the Maple software is valuable for my academic growth.	3.10 (0.82)	3.53 (0.62)
12	I find Calculus with the Maple software to be a worthwhile skill for my future career.	3.00 (0.71)	2.82 (1.02)
13	Knowledge of Calculus through the Maple software enhances my understanding of real-world problems.	3.03 (0.91)	2.76 (0.97)
14	Calculus with Maple software adds value to my overall educational experience.	2.86 (0.88)	2.94 (1.03)
15	I believe that mastering Calculus with Maple software contributes to my personal development.	2.83 (0.81)	2.88 (0.99)
16	Calculus using Maple software is an important subject to me.	2.83 (0.93)	2.76 (1.03)
17	Calculus with Maple software doesn't significantly enrich my overall educational experience.	2.66 (0.90)	2.06 (0.66)
18	Knowledge of Calculus with Maple doesn't seem to have practical applications.	2.00 (0.96)	2.12 (0.70)
19	I don't see much value in acquiring Calculus skills through the Maple software.	1.97 (0.94)	2.18 (0.81)
20	Learning Calculus with Maple software seems unimportant for my academic growth.	2.10 (1.08)	1.82 (0.81)
Attitude Sub-Scale Mean and Standard Deviation		2.64 (0.89)	2.59(0.86)

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

Enjoyment of learning Calculus with Maple software

No.	Statement	Mean & SD (Males, n=29)	Mean & SD (Females, n=17)
21	I find learning Calculus with the Maple software enjoyable.	3.03 (0.98)	2.59 (1.06)
22	Learning Calculus with the Maple software feels tedious and boring.	2.10 (1.08)	2.18 (1.02)
23	Calculus with Maple software is interesting and engaging for me.	3.00 (1.00)	3.18 (0.73)
24	Calculus using Maple is more of a chore than an enjoyable activity.	2.72 (1.00)	2.12 (0.60)
25	I don't find much pleasure in studying Calculus with Maple software.	2.21 (0.86)	2.35 (1.00)
26	I look forward to studying Calculus with the Maple software.	2.76 (0.83)	3.41 (0.71)
27	Learning Calculus with Maple software is a fun experience.	2.97 (0.82)	3.18 (0.88)
28	I enjoyed the challenges that Calculus with Maple software presents.	2.59 (0.87)	2.76 (1.15)
29	I dislike the process of learning Calculus with Maple software.	2.52 (0.91)	1.88 (0.70)
30	I enjoy the solution strategy of Maple.	3.17 (0.71)	3.06 (0.83)
Attitude Sub-Scale Mean and Standard Deviation		2.71 (0.91)	2.67(0.87)

Motivation towards studying Calculus with Maple software

No.	Statement	Mean & SD (Males, n=29)	Mean & SD (Females, n=17)
31	I am excited to use Maple software for learning Calculus.	3.28 (0.80)	3.29 (0.92)
32	Using Maple software makes me feel motivated to learn Calculus.	3.00 (0.96)	3.18 (0.81)
33	I struggle to stay motivated when using Maple software for Calculus.	2.48 (1.21)	2.35 (1.06)
34	I feel sometimes that using the Maple for Calculus is a waste of time.	2.10 (0.90)	2.18 (0.88)
35	I feel distracted when learning Calculus with Maple software.	2.21 (0.94)	2.24 (0.90)
36	I am amazed with the experience of using the Maple software for Calculus-related problems.	3.17 (0.81)	3.18 (0.64)

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

37	I am highly motivated by the step-by-step solutions and instant answers provided by Maple software.	3.10 (0.86)	3.29 (0.85)
38	The use of Maple software in Calculus class sparked my curiosity in the subject matter.	2.93 (0.75)	3.12 (0.78)
39	I am desirous to understand more Calculus concepts by using Maple software.	3.14 (0.95)	3.06 (0.97)
Attitude Sub-Scale Mean and Standard Deviation		2.82 (0.91)	2.88 (0.87)
Grand Mean and Standard Deviation		2.76 (0.88)	2.74 (0.85)

Table 4 shows gender difference on sub-scales of attitude towards Calculus using Maple software. Based on table 4.6, the mean value of items 1, 2, 3, and 8 were slightly higher for females while the mean value of items 4, 5, 6, 7, 9, and 10 were slightly higher for males in self-confidence sub-scale of attitude. Similarly, items 11, 14, 18, and 19 had slightly higher mean values for females while items 12, 13, 15, 16, 17, and 20 had slightly higher mean values for males in the sub-scale of value. Also, males had slightly higher mean values on items 21, 22, 24, 39, and 30 while females had slightly higher mean values on items 23, 25, 26, 27, and 28 in terms of enjoyment sub-scale. And finally, males had slightly higher mean values on items 31, 33, 35, 36, and 39 while females had slightly higher mean values for items 32, 34, 37, and 38. However, the attitude sub-scales of self-confidence, value, and enjoyment slightly favoured the male students while that of motivation favoured the female students. In general, the response to items slightly favoured the male students with a grand mean of 2.76 as against 2.74 for females.

CONCLUSION

The data in table 1 revealed that Students taught with Maple were favoured more than those taught with lecture method. This finding corresponded with (Samuel, 2022; Kesavi, 2020) whose study found that Maple Software's experimental group outperformed the control group using the paper and pencil strategy or non-maple group. The analysis of the questionnaire data indicated that Maple Software has contributed to the success of students' achievement in the integral calculus by arousing and sustaining the student's interest. Also Sallah, Joshua, and Alex (2021) in a study to analyse student teachers' errors in differential calculus and the impact of Maple integration in teaching and learning of differential calculus at Evangelical presbyterian College of Education, Volta Region – Ghana indicated that there was a statistically significant difference between student teachers of the experimental group exposed to the use of Maple software in learning differential calculus to control groups exposed to traditional methods. Findings of this study revealed that the effectiveness of Maple software in teaching calculus cannot be overemphasized as groups taught with the tool significantly outperformed groups taught without the software. The findings of this study further revealed that the male year one undergraduate Mathematics students had a higher positive attitude than the female students in learning Calculus with Maple software. Also, both sexes had a better attitude towards calculus in Maple. However, the attitude sub-scales of self-confidence, value, and enjoyment slightly favoured the male students while that of motivation favoured the female students. In general, the response to items slightly favoured the male students with a grand mean of 2.76 as against 2.74 for females.

RECOMMENDATIONS

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

1. The government should provide Maple software across tertiary institutions in Bayelsa State to enhance lecturers' variation of teaching methods.
2. Lecturers should be trained on the use of Maple to enable them teach with the software's as computer assisted instructional facilities.
3. Lecturers' orientation on the use of Maple should also focus on building a good attitude and perception towards the software and its usage.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XI November 2024

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