

Assessing the Effectiveness of Microlearning on Primary School Pupils' Academic Performance in Mathematics in Mangu Local Government Area, Plateau State

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ABSTRACT

This study assessed the effectiveness of micro learning on primary school pupils' academic performance in mathematics in Mangu Local Government Area; Plateau State. The design adopted for the study was a descriptive survey design with four research questions and one hypothesis formulated to guide the study. The population consisted of 1,432 public primary five pupils. A sample of 190 respondents was selected to participate in the study using stratified random sampling technique. A questionnaire titled Effectiveness of Micro Learning on Public Primary School Pupils' Academic Performance in Mathematics Questionnaire (EMLPPSAPMQ) was used for data collection. The reliability of the research instrument was obtained using Cronbach alpha method with reliability coefficient of 0.87. The research questions were answered using the mean score, while hypothesis was tested using chi-square at 0.05 level of significance. Results indicated that micro learning reduced study time and improves mathematics performance by enhancing understanding of mathematical concepts, developing problem-solving skills and critical thinking and increasing pupil motivation and engagement. Arising from these findings; it was recommended that Ministry of Education should integrate micro-learning into the primary school mathematics curriculum, to leverage digital resources for enhanced learning outcomes and Government should allocate necessary funds to ensure adequate digital infrastructure and resources for micro-learning in all primary schools.

Keywords: Micro Learning, Mathematics Performance, Primary Schools, Mangu Local Government Area, Plateau State.

BACKGROUND TO THE STUDY

Mathematics education plays a vital role in the development of critical thinking, problem-solving, and analytical skills in primary school pupils (National Mathematics Advisory Panel, 2008 & Falade, Dalong & Gyot 2020). The rapid advancement of technology and shifting learning landscapes has necessitated innovative approaches to education, particularly in primary education where foundational knowledge is laid (Huang et al., 2020). However, mathematics remains one of the most challenging subjects for primary school pupils in Nigeria (Adebayo & Okorie, 2016). The Mangu Local Government Area of Plateau State is no exception, where pupils' mathematics performance has been a concern for educators and stakeholders.

Research has consistently shown that Nigerian pupils perform poorly in mathematics compared to their international counterparts (Olorunnisola, 2017). According to the 2019 National Common Entrance Examination results, mathematics was identified as one of the weakest subjects among primary school pupils in Nigeria (NECO, 2019). This trend is alarming, considering mathematics' importance in science, technology, engineering, and mathematics (STEM) education.

Micro learning is an instructional approach involving short, focused learning sessions (usually 3-10 minutes), has gained popularity due to its potential to enhance learning outcomes (Shukor et al., 2019). Micro learning caters to diverse learning styles, promotes engagement, and reduces cognitive overload (Gaskell, 2017). Studies have demonstrated micro learning's effectiveness in improving academic performance in various subjects, including mathematics (Kim et al., 2018).

Micro learning is an instructional approach that involves short, focused learning sessions, has gained popularity in recent years due to its potential to enhance learning outcomes (Shukor et al., 2019). In primary education, mathematics is a fundamental subject that lays the foundation for future academic success. However, many pupils in Nigeria struggle with mathematics, leading to poor academic performance (Adebayo & Okorie, 2016). The Mangu Local Government Area of Plateau State is no exception, where pupils' mathematics performance has been a concern for educators and stakeholders. Micro learning offers a promising solution, as it caters to diverse learning styles and promotes engagement (Kim et al., 2018).

Micro learning has been successfully implemented in various educational contexts, including corporate training (Gessler, 2017) and higher education (Kim et al., 2018), yielding improved learning retention (Cebeci & Tekdal, 2015), increased learner satisfaction (Gutiérrez, 2018), and reduced study time (Gessler, 2017), it can improve mathematics performance by enhancing understanding of mathematical concepts, developing problem-solving skills and critical thinking and increasing pupil motivation and engagement (Shukla, 2019). Micro learning is an innovative instructional approach, has been proposed as a potential solution (Kim et al., 2018). However, its effectiveness in primary education, particularly in Nigerian contexts, remains understudied (Afolabi et al., 2020).

In spite of the importance of primary education in laying the foundation for future academic success, students in primary schools in Mangu Local Government Area of Plateau State, Nigeria face significant challenges in achieving optimal learning outcomes (UNICEF, 2019). According to Bui et al. (2016), traditional teaching methods, characterized by lengthy lessons and dense curricula, often lead to: Decreased attention spans, low retention rates, and diminished student engagement. While micro learning has been implemented in various educational settings globally, its adoption in Nigerian primary schools is limited. Studies have highlighted the potential benefits of micro learning in Nigerian education (Oguntoyinbo, 2017), but research on its effectiveness in primary mathematics education is scarce.

Despite micro learning's growing popularity, empirical research on its effectiveness in primary education is scarce. There is a need for research investigating micro learning's effectiveness on primary school pupils' mathematics performance in Nigeria. This study aims to address the knowledge gap by assessing the effectiveness of micro learning on primary school pupils' academic performance in mathematics in Mangu Local Government Area of Plateau State, Nigeria. The findings will provide insights into micro learning's potential as a supplementary instructional approach to improve mathematics education in Nigeria. The main objective of the study is to assess the effectiveness of micro learning in improving learning outcomes among primary school pupils in Mangu Local Government Area of Plateau State.

The specific objectives of the study are to:

1. Investigate the impact of micro learning on public primary school pupils' engagement and retention rates in mathematics in Mangu Local Government Area of Plateau State.
2. Examine the effectiveness of micro learning on pupils' academic performance in mathematics among public primary schools in Mangu Local Government Area of Plateau State.
3. Identify pupils' attitudes towards micro learning in mathematics at the public primary schools in Mangu Local Government Area of Plateau State.
4. Determine the challenges and opportunities faced by teachers in implementing micro learning in mathematics at the public primary schools in Mangu Local Government Area of Plateau State.

Hypothesis

There is no significant impact of micro learning in enhancing pupils’ academic performance in public primary schools in Mangu Local Government Area of Plateau State.

Research Questions

1. To what extent does micro learning enhance public primary school pupils’ engagement and retention rates in mathematics in Mangu Local Government Area of Plateau State?
2. What is the effectiveness of micro learning on pupils’ academic performance in mathematics among public primary schools in Mangu Local Government Area of Plateau State?
3. What are pupils' attitudes towards micro learning in mathematics at the public primary schools in Mangu Local Government Area of Plateau State?
4. What challenges do teachers face in implementing micro learning in public primary schools in Mangu Local Government Area of Plateau State?

METHODS

Descriptive survey research design was adopted for the study. Survey as defined by Anikweze and Danladi (2021) involve a detailed and critical examination of a topic or situation with a view to finding out what is and how it is. Descriptive survey was involved in the study to obtain information from pupils on the opinions about the impact of the effectiveness of micro learning on public primary school pupils' academic performance in mathematics in Mangu Local Government Area, Plateau State.

The population consisted of 1,432 public primary five pupils. A sample of 190 respondents was selected to participate in the study using stratified random sampling technique. A questionnaire titled Effectiveness of Micro Learning on Public Primary School Pupils’ Academic Performance in Mathematics Questionnaire (EMLPPSAPMQ) was used for data collection which was weighted on a four point’s scale of Strongly Agreed, (SA), Agree (A), Disagree, (D), Strongly Disagree (SD) and rating are 4, 3, 2 and 1 respectively. The reliability of the research instrument was obtained using Cronbach alpha method with reliability coefficient of 0.87. The questionnaire was administered to the sampled respondents. The research questions were answered using mean score, while hypothesis was tested using chi-square at 0.05 level of significance.

RESULTS

Research Question One

To what extent does micro learning enhance public primary school pupils’ engagement and retention rates in mathematics in Mangu Local Government Area of Plateau State?

Table 1: Mean Score of Micro learning that enhance Public Primary School Pupils’ Engagement and Retention Rates in Mathematics

S/n	Micro learning Pupils’ Engagement and Retention Rates Scale (MPERRS)	SA	A	D	SD	Mean	Decision
		4	3	2	1		
1	Micro learning helps me understand mathematics better.	64	98	24	4	3.17	Accepted
2	Micro learning is more engaging than traditional teaching methods.	62	96	22	10	3.11	Accepted
3	Micro learning reduces my stress when learning mathematics.	53	90	33	14	2.95	Accepted
4	Micro learning improves my retention of mathematical concepts.	56	98	28	8	3.06	Accepted
5	Micro learning is easy to use.	98	73	9	10	3.36	Accepted

Table 1 above indicated that item; 1, 2, 3, 4 and 5 with mean score of 3.17, 3.11, 2.95, 3.06 and 3.36 respectively, greater than the criterion score of 2.5 were accepted. This implies that micro learning helps pupils to understand mathematics better, more engaging than traditional teaching methods, reduce stress when learning mathematics, improve retention of mathematical concepts and easy to use.

Research Question Two

What is the effectiveness of micro learning on pupils' academic performance in mathematics among public primary schools in Mangu Local Government Area of Plateau State?

Table 2: Mean Score of Effectiveness of Micro learning on Pupils' Academic Performance in Mathematics among Public Primary Schools

S/n	Mathematics Academic Performance Scale (MAPS)	SA 4	A 3	D 2	SD 1	Mean	Decision
1	I perform well in mathematics tests.	63	82	23	22	2.98	Accepted
2	I understand mathematical concepts easily.	98	73	9	10	3.36	Accepted
3	I enjoy learning mathematics.	71	96	14	9	3.21	Accepted
4	Mathematics is relevant to my future career.	60	89	33	8	3.06	Accepted
5	I am confident in my mathematics abilities.	0	0	109	81	1.59	Rejected

Table 2 above revealed that items 1, 2, 3, and 4 with mean scores of 2.98, 3.36, 3.21 and 3.06 respectively, greater than the criterion score 2.5 were accepted while item 5 with mean score of 1.59 less than the criterion score of 2.5 was rejected. This shows that micro learning improves pupils' academic performance in mathematics in primary schools.

Research Question Three

What are pupils' attitudes towards micro learning in mathematics at the public primary schools in Mangu Local Government Area of Plateau State?

Table 3: Mean Score of Pupils' Attitudes towards Micro learning in Mathematics among Public Primary Schools

S/n	Attitude towards Micro-learning Scale (AMS)	SA 4	A 3	D 2	SD 1	Mean	Decision
1	I enjoy learning mathematics through micro-learning.	55	96	29	10	3.03	Accepted
2	Micro-learning makes mathematics easier to understand.	49	83	40	18	2.86	Accepted
3	Micro-learning is more engaging than traditional teaching methods.	63	98	9	20	3.07	Accepted
4	I prefer micro-learning to traditional teaching methods.	72	98	14	6	3.24	Accepted

Table 3 above showed that all the 4 items were accepted since all the mean scores are greater than the criterion score of 2.5. This implies that pupils enjoy learning mathematics through micro learning, it makes mathematics easier to understand, it is more engaging than traditional teaching methods and they prefer micro learning to traditional teaching methods.

Research Question Four

What challenges do teachers face in implementing micro learning in public primary schools in Mangu Local Government Area of Plateau State?

Table 4: Mean Score of Micro learning Implementation Challenges in Mathematics among Public Primary School Teachers

S/n	Micro-learning Implementation Challenges Scale (MICS)	SA 4	A 3	D 2	SD 1	Mean	Decision
1	I have access to reliable internet connectivity for micro-learning.	63	98	9	20	3.07	Accepted
2	My school has sufficient devices (e.g., computers, tablets) for micro-learning.	45	99	24	22	2.88	Accepted
3	Our school's digital infrastructure supports micro-learning effectively.	55	96	29	10	3.03	Accepted
4	I have received adequate training on micro-learning pedagogy.	49	83	40	18	2.86	Accepted
5	The school administration provides sufficient support for micro-learning.	72	98	14	6	3.24	Accepted
6	I have access to relevant digital resources for micro-learning.	0	2	89	99	1.49	Rejected
7	I have enough time to prepare micro-learning materials.	53	90	33	14	2.95	Accepted
8	The curriculum allows for flexible integration of micro-learning.	0	0	86	104	1.45	Rejected
9	Micro-learning fits within the existing teaching schedule.	56	98	28	8	3.06	Accepted
10	I experience frequent technical issues during micro-learning sessions.	82	69	23	16	3.14	Accepted

Table 4 above revealed that items 1, 2, 3, 4, 5, 7, 9 and 10 with mean scores of 3.07, 2.88, 3.03, 2.86, 3.24, 2.95, 3.06 and 3.14 respectively, greater than the criterion score 2.5 were accepted while items 6 and 8 with mean score of 1.49 and 1.45 respectively less than the criterion score of 2.5 were rejected. This shows that teachers face challenges in implementing micro learning in public primary schools in Mangu Local Government Area of Plateau State.

Hypothesis

There is no significant impact of micro learning in enhancing pupils' academic performance in public primary schools in Mangu Local Government Area of Plateau State.

Table 5: Summary Table for Chi-Square Test of Independence Analysis

Cell	Fo	Fe	Df	-cal	crit	α	Decision
1	132	146.5					
2	58	43.5	1	12.54	3.84	0.05	Ho Rejected
3	161	146.5					
4	29	43.5					

Table 5 above revealed that at $df=1$, $\alpha=0.05$ level of significance, the chi-square calculated value of 12.54 is greater than the chi-square critical value of 3.84 ($-cal. = 12.54 >crit. = 3.8$). Therefore, the null hypothesis (H_0) is rejected (not retained), and the alternative hypothesis (H_a) is accepted (retained). This implies that there is sufficient evidence to conclude that there is a significant impact of micro learning in enhancing pupils' academic performance in public primary schools.

DISCUSSION OF FINDINGS

The findings in Research Question 1 revealed that micro learning helps pupils to understand mathematics better, more engaging than traditional teaching methods, reduce stress when learning mathematics, improve retention of mathematical concepts and easy to use. This finding aligns with the findings of Gessler (2017) and Shukla (2019); micro learning reduced study time and improves mathematics performance by enhancing

understanding of mathematical concepts, developing problem-solving skills and critical thinking and increasing pupil motivation and engagement.

The findings of Research Question 2 indicated that micro learning improves pupils' academic performance in mathematics in primary schools. This is in line with Shukor et al., (2019) Micro learning is an instructional approach involving short, focused learning sessions (usually 3-10 minutes), has gained popularity due to its potential to enhance learning outcomes .

The findings in Research Question 3 showed that pupils enjoy learning mathematics through micro learning, it makes mathematics easier to understand, it is more engaging than traditional teaching methods and they prefer micro learning to traditional teaching methods. This finding agrees with Bui et al. (2016), traditional teaching methods, characterized by lengthy lessons and dense curricula, often lead to: Decreased attention spans, low retention rates, and diminished student engagement.

Findings in Research Question 4 revealed that teachers face challenges in implementing micro learning in primary schools. This finding agrees with Adebayo and Okorie (2016) mathematics remains one of the most challenging subjects for primary school pupils in Nigeria. However, many pupils in Nigeria struggle with mathematics, leading to poor academic performance.

The result of the research hypothesis indicated that there is sufficient evidence to conclude that there is a significant impact of micro learning in enhancing pupils' academic performance in public primary schools. This finding is in agreement with Gaskell (2017) and Kim et al. (2018) micro learning caters to diverse learning styles, promotes engagement, and reduces cognitive overload and effective in improving academic performance in various subjects, including mathematics.

CONCLUSION

This study investigated the effectiveness of micro-learning on public primary school pupils' academic performance in mathematics in Mangu Local Government Area of Plateau State, Nigeria. The findings revealed that micro-learning has a positive impact on pupils' academic performance in mathematics, improving their understanding, retention, and application of mathematical concepts.

The study also identified challenges faced by teachers in implementing micro-learning, including inadequate digital infrastructure, insufficient training, and technical issues. Despite these challenges, teachers and pupils reported increased engagement, motivation, and interest in mathematics through micro-learning. The study's results have implications for education policy, practice, and research, highlighting the potential of micro-learning to enhance mathematics education in primary schools.

RECOMMENDATIONS

1. Ministry of Education should integrate micro-learning into the primary school mathematics curriculum, to leverage digital resources for enhanced learning outcomes.
2. Government should allocate necessary funds to ensure adequate digital infrastructure and resources for micro-learning in all primary schools.
3. State Education Board should establish a mandatory professional development program, providing regular training and support for teachers on micro-learning pedagogy.
4. To enhance mathematics education, schools should develop and utilize context-specific micro-learning materials that align with the local curriculum and cater to diverse learning styles.
5. Teachers are encouraged to design and implement collaborative micro-learning activities, fostering peer-to-peer engagement and teamwork among pupils to promote deeper understanding of mathematical concepts.
6. The school administration should organize regular workshops and training sessions for teachers, focusing on micro-learning pedagogy, digital resource integration, and best practices for classroom implementation.

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