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Efficacy of Contextualized Learning Modules in Enhancing Mathematics Self-Confidence Among Basic Students: Age-Related Differences in Makurdi, Benue State, Nigeria

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Abstract

This study investigated the efficacy of Contextualized Learning Modules on self-confidence of Basic students in Mathematics, while examining the influence of age on students' self-confidence. Quasi-experimental pretest–posttest non-equivalent control group design was used. Two research questions and two null hypotheses guided the study. The population was 1,986 basic II students. Intact class was used to sampled 172 participants. Data was collected using Mathematics Self-Confidence Questionnaire. Three experts validated the instruments. Cronbach's Alpha was used to obtained reliability index of 0.84. Research questions were answered with Mean and standard deviation. Null hypotheses were tested by Analysis of Covariance at 0.05 level of significance. Findings revealed that CLM instructions motivate students' self-confidence in Mathematics. The study concludes that CLM is an effective instructional strategy for improving students' self-confidence in Mathematics. It recommends that school authorities should ensure that Mathematics teachers adopt CLM instructional approaches in teaching students.

Keywords: Age, Basic Education, Contextualized Learning Modules, Mathematics, Self-confidence

Introduction

Mathematics education at the elementary level plays an important role in developing learners' cognitive competence, problem-solving, confidence, and motivational skills necessary for lifelong learning. Despite continuous instructional efforts, many students still demonstrate low outcomes and lack confidence in the subject. These challenges often arise from abstract teaching approaches that disconnect learners from practical experiences. A study conducted by Achor and Teryima (2022) in zone B Educational Zone, Benue State shows that students' low self-confidence in Mathematics can promote Mathematics avoidance behaviors that discourages active engagement and participation thereby resulting to poor academic outcomes. In view of this, the researcher emphasizes instructional resources that can promote learner-centered and context-based approaches capable of improving students' active participation and academic outcomes such as Contextualized Learning Module (CLM).

Contextualized Learning Modules is an instructional resource that connect mathematical concepts to learners' everyday experiences, cultural environment, and life situations. This approach enables students to engage in practical activities rather than merely memorizing procedures. Findings show that CLM enhances students' engagement, attitudes, and logical reasoning skills, thereby promoting effective problem-solving since learning becomes more relevant and meaningful within familiar contexts (Esteves et al., 2026). When students apply Mathematics in solving life problems, it motivates and encourages self-confidence level.

Self-confidence can be viewed as human positive belief in their abilities, judgment, and overall performance. Within the context of Mathematics, it includes courage, comfort, and motivation required to

apply mathematical skills effectively. Students who demonstrate self-confidence often achieved higher academic performance and are better prepared to apply the knowledge to life situations. Byiringiro (2024) observes that self-confidence is the attitude and belief individuals hold regarding their capacity to manage both favorable and challenging outcomes. It promotes positive thinking and a healthy academic mindset. Wourms (2022) notes that learners with low self-confidence often experience doubt, fear, and anxiety, which make them struggle with academic tasks that result to poor performance. Conversely, self-confident students tend to show readiness, courage, determination, and active participation in the class. Activity-based instructional approaches such as CLM can improve students' self-confidence and interest through interaction, use of manipulatives, and activity-based learning (Capinding, 2022). This approach can encourage students' confidence, logical reasoning and analytical skills irrespective of age differences

Age is another important factor influencing students' responses to instructional strategies. At the basic education level, learners undergo rapid cognitive, emotional, and social development that shapes how mathematical concepts are understood. Age differences may affect students' state of mind, ability to think, act and even confidence level academically, implying that instructional resource should align with learners' developmental stages. Studies examining learning environments indicate that supportive and creative classroom contexts positively influence students' self-confidence in Mathematics across different age groups (Çelik and Güler, 2021). Understanding students' confidence levels and age-related factors could help teachers apply appropriate and relevance instructional resources that can improve students' self-confidence and academic excellence in Mathematics.

Most existing research such as Achor and Teryima (2022), assesses anxiety and achievement, Wourms (2022), examined achievement and students' interest. Others like Esteves et al (2026), investigates attitude and problem solving, Çelik and Güler, (2021) focused on attitude and performance. Some studies had focused on comparative learning strategy, correlation approach, survey approach and gender studies. Other research were conducted outside the country. These studies neglected, self-confidence, basic education, experimental approach and age-related differences. Hence the current study tries to filled the research gap by investigating the effect of CLM on students' self-confidence in Mathematics at basic schools in Benue State. It also tries to find out whether age related factors may influence how students perceive Mathematics and response to instructions.

Theoretical Review

Piaget (1950) theory of cognitive development argue that Mathematical concepts can be taught more effectively when learners are exposed to practical and familiar environmental learning resources. This help students to understand abstract concept from practical teaching approach. CLMs facilitate this progression by providing life contexts that help students connect concrete experiences with abstract mathematical ideas.

Dweck (200) Theory of Mindset stress that intelligence and abilities can be developed through stable mindset, dedication, practice, and continuous learning. Learners with a stable mindset are more likely to embrace challenges, persist through difficulties, and regard mistakes as valuable learning experiences. The theory encourages students to develop love and affections in their Mathematics ability so as to build more effort, skills, persistence, and commitment to learning instead of focusing solely on natural talent.

Empirical Review

McMurran et al. (2023) investigated the impact of CLM on students' self-confidence and ability to solve difficult Mathematics problems at university level. Data were collected using an achievement test. Result indicates that students who received instructions with CLM approach obtained higher mean scores and demonstrated greater confidence. However, students that received instructions with traditional teaching methods obtained low mean scores and low confidence in the subject. The study was conducted at university level whereas the present study was conducted at basic II education schools. In the formal study data was collected using an achievement test but the current study employed Likert scale questionnaire for data collection. The current study also includes age related factors.

Desi (2023) investigated how self-confidence can influenced students' performance in Mathematics through quantitative research method. Findings reported that self-confidence assist students to understand Mathematics since it motivate stable mind. The former study investigates self-confidence and students' performance while the current study assesses effect of CLM on students' self-confidence and examines age difference. The former study employed

quantitative approach but the current study involved experimental research approach.

Appiah et al, (2022) assessed the influence of teacher–student interactions, self-confidence and students' perceptions on Mathematics outcomes. Survey research was employed. The study revealed that students' self-confidence encourages higher academic scores in Mathematics and ginger moderate teacher–students' relationship. This research employed a survey approach, but the current research adopts a quasi-experimental research approach. In addition, the earlier study focused on teacher–student, self-confidence and students' perceptions on Mathematics outcomes while the current study examines how CLM influences students' self-confidence in Mathematics.

Çelik and Güler (2021) analyzed the impact of students' age and attitude on Mathematics understanding and performance. Findings revealed that older students demonstrated stronger abstract reasoning abilities, while younger students performed better when learning through concrete materials and manipulatives. The forma study assessed age, attitude, concept understanding and performance but the current study employed the effect of CLM on students' self-confidents and age-related difference in Mathematics.

Efeludu and Ossai (2023) investigated the relationship between students' academic outcomes and age difference in Mathematics at secondary school level in Delta State using a correlational research design. The result shows no relationship between students' academic outcomes and age difference in Mathematics. This study was conducted in Delta State, whereas the present study was carried in Makurdi, Benue State. The study adopted a correlational research approach, whereas the current study uses a quasi-experimental research method.

Statement of the Problem

Mathematics is very useful in our daily life hence any daily activity required critical reasoning. Giving its importance to humanity, students' performance and disposition toward the subject continue to raise concern. In Makurdi and other parts of Benue State especially, many pupils at the basic level struggle with mathematical concept. Most pupil viewed it as a difficult and abstract subject. Ajio, et al (2025) observed that most students in Benue State dislike Mathematics which influences them to avoid Mathematics-related courses. This result to fear of failure and low self-confidence. It also encourages low interest, skeletal class attendance, poor academic outcomes and students drop out. Part of the reason for this is the predominant use of teaching approaches that present mathematical ideas in abstract forms by some teachers.

To address this, Contextualized Learning Modules (CLM) have been suggested as an alternative instructional approach that can be used in teaching Mathematics in a practical, familiar and locally relevant situations. This gives the expectation that the approach could make learning more meaningful and can motivate students' self-confidence. However, there is inadequate empirical data especially in Makurdi, Benue State, on how CLM improving students' mathematical self-confidence. Most of the existing studies concentrated on academic achievements, conceptual understanding, attitude and procedural skills among others.

In addition, pupils within basic education are not of the same age. Cognitive differences associated with age may influence how pupils respond to contextualized instruction. It is not clear whether younger and older basic pupils will benefit from the module to the same extent, or whether age will determine the degree of improvement in their mathematical self-confidence. These discussions worried the researcher seeks to examine the effectiveness of CLM in enhancing mathematical self-confidence among basic school, and to ascertain whether there are age-related differences in the impact of the module among pupils in Makurdi, Benue State.

Research Questions

1. What is the effect of CLM on students' self-confidence in Mathematics?
2. How does the effect of CLM on students' self-confidence in Mathematics differ between learners aged 11 years and below and those aged 12 years and above?

Hypotheses

1. There is no significant difference in the mean self-confidence of students taught Mathematics using CLM and those taught using conventional instructional approach.
2. There is no significant difference in the effect of CLM on mean self-confidence of students aged 11 years and below and those aged 12 years and above.

Population

Population includes 1,986 basic II students from public schools within Makurdi

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metropolis. Stratified sampling metho was used to separate urban from rural schools. Simple random sampling was used to obtained three schools from each group given a total of six basic schools. Intact class was used to choose 172 students. The experimental group has 90 students while the control group has 82 students. Three schools were assigned to experimental group and another three schools assigned to control group with three trained research assistances in each group. This was to helped maintain normal classroom conditions across groups.

Methodology

Mathematics Self-confidence Questionnaire (MASQ) that contain 80 items was an instrument used for data collection so as to minimizes measurement error and random variance of the instruments. It was rated with five-point Likert scales. Both positive and negative statements were used in developing the instruments, while the scoring was reversed for negative statements. Pre-test and post-test were given to students before and after treatments that lasted for one academic term (12 weeks). The pre-test was given to students one week before treatment. After the treatment items were reshuffled and given to students again as post-test to reduce memorization effects. Items were developed based on students' feelings, love affection and perceptions on Mathematics. Ten lesson plans were developed for experimental group to teach Mathematics using the CLM instructional approach that emphasizes the application of Mathematics to life situations. The selected topics were whole and decimal numbers, prime numbers, Lowest Common Multiples, Highest Common Factor and polygon. Another ten lesson plans were prepared for the control group using Guide Discovery Instructional Approach (GDIA) that uses teacher-guided verbal explanations and demonstrations. The same subject content was used for both groups to ensure comparability.

Validity of Instruments

Instrument was validated for face, content and construct validity by three experts. The construct validity ensures that the instrument actually measures the theoretical psychological construct it claims to measure, rather than something else. Cronbach Alpha; was used to obtained reliability index of 0.84. Research questions were answered through Mean and standard deviation. The null hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Research Question One

What is the effect of CLM on students' self-confidence in Mathematics?

Table 1

Summary of Descriptive Statistics by Groups.

Group	N	Pre-test		Post-test		Mean
		Mean	Std. dev	Mean	Std. dev	gain
Experimental Grp	90	2.96	0.32	3.13	0.36	0.17
Control Grp	82	3.07	0.51	3.33	0.42	0.26
Mean Gain		0.11		0.20		0.09

In the pre-test, mean of 2.96 and standard deviation of 0.32 was recorded from experimental group. Mean of 3.07 and standard deviation of 0.51 was also found from the control group. The mean difference of 0.11 was found in favor of the control group. For post-test, mean of 3.13 and standard deviation of 0.36 was found from experimental group. Again, mean of 3.33 and standard deviation of 0.42 was found from control group. The mean difference of 0.20 was in favor of the control group. Pre-test and post-test mean difference for experimental group was 0.17, that of the control group was 0.26. The mean gain difference between the two groups was 0.09, indicating that the control group demonstrated slightly higher self-confidence in Mathematics than the experimental group.

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Research Question Two

How does the effect of CLM on students' self-confidence in Mathematics differ between learners aged 11 years and below and those aged 12 years and above?

Table 2

Summary of Descriptive Statistics based on Age difference

Group	N	Pre-test		Post-test		Mean
		Mean	Std. dev	Mean	Std. dev	gain
≤ 11 yrs	19	2.97	0.25	3.44	0.48	0.47
≥ 12 yrs	71	2.97	0.33	3.05	0.28	0.08
Mean gain		0.00		0.39		0.39

In the pre-test, students aged 11 years and below recorded mean of 2.97; standard deviation of 0.25. Aged 12 years and above also obtained a mean of 2.97; standard deviation of 0.33 with no mean gain. In the post-test, aged 11 years and below had mean of 3.44; standard deviation of 0.48, whereas aged 12 years and above recorded mean of 3.05; standard deviation of 0.28. The mean gain of 0.39 favored aged 11 years and below. The difference between the pre-test and post-test for aged 11 years and below was 0.47, while that of aged 12 years and above was 0.08. The difference in mean gains between the two groups was 0.39, meaning students aged 11 years and below showed higher level of self-confidence in Mathematics.

Hypothesis One

There is no significant difference in the mean self-confidence of students taught Mathematics using CLM and those taught using the conventional instructional approach.

Table 3

One-way ANCOVA Result of Students' Self-confidence by Groups

Source	Type III Sum of Squares	df	Mean Square	F	p-value	Partial Eta Squared
Corrected Model	1.71[a]	2	0.86	5.51	0.01	0.06
Intercept	34.06	1	34.06	219.62	0.01	0.57
PRE_MSCQ	0.01	1	0.01	0.01	0.97	0.01
GROUPS	1.69	1	1.69	10.87	0.01	0.06
Error	26.21	169	0.16			
Total	1820.31	172				
Corrected Total	27.92	171				

a. R Squared = 0.061 (Adjusted R Squared = .050)

Table 3, F (1, 169) = 10.87; p = 0.01< 0.05. Meaning that CLM instructions assist students to build self-confidence in Mathematics, because the probability value was less than 0.05 level of significance. Hence, the alternative hypothesis was retained. Therefore, a significant difference was found in the mean self-confidence of students who received Mathematics instruction using CLM and those taught using conventional instructional approach

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Hypothesis Two

There is no significant difference in the effect of CLM on the mean self-confidence of students aged 11 years and below and those aged 12 years and above.

Table 4

One-way ANCOVA Result of Students' Self-confidence based on Age

Source	Type III Sum of Squares	df	Mean Square	F	p-Value	Partial Eta Squared
Corrected Model	2.319[a]	2	1.16	10.74	0.01	0.20
Intercept	8.911	1	8.91	82.53	0.01	0.49
PRE_MSCQ	.064	1	0.06	0.60	0.44	0.01
AGE	2.242	1	2.24	20.77	0.01	0.19
Error	9.394	87	0.11			
Total	895.125	90				
Corrected Total	11.713	89				

a. R Squared = 0.198 (Adjusted R Squared = 0.180)

Table 4, F (1, 87) = 20.77; p = 0.01 < 0.05. This shows a significant difference between age groups on students' self-confidence in Mathematics because the probability value was less than 0.05 level of significance. Therefore, the alternative hypothesis was retained. Since, the effectiveness of CLM differ significantly on mean self-confidence of learners among aged 11 years and below and those aged 12 years and above in Mathematics.

Discussion of Findings

Table one, Research Question one showed that CLM instruction improved students' self-confidence in Mathematics. Before treatment the experimental and control groups mean were relatively low, indicating limited prior understanding. However, after the intervention, experimental group recording higher mean gain, demonstrating the effectiveness of the CLM in improving students' self-confidence. Table three Hypothesis one further indicated that CLM had a significant effect of improving students' self-confidence in Mathematics because 0.05 level of significance was found in the probability value. Therefore, the alternative hypothesis was retained. This result agreed with the findings of McMurran et al. (2023), Dewi et al. (2024), and Appiah et al. (2022) who reported that students taught Mathematics using contextualized approach demonstrated greater confidence than those in the conventional teaching method.

Table two, research Question two shows that students from different age groups benefited from the CLM in improving self-confidence in Mathematics with students aged 11 years and below demonstrated a substantially greater improvement than those aged 12 years and above This was because of the mean gain found after intervention. Table four, Hypothesis two revealed a significant difference between students aged 11 years and below and those aged 12 years and above in their self-confidence mean gain when taught Mathematics using the CLM. Because 0.05 level of significance was found from the probability value This finding is consistent with Çelik and Güler (2021) who reported that age can influence children's self-confidence and improved cognitive development in learning contexts. However, it contradicts the findings of Efeludu and Ossai (2023), who reported no significant difference between age and academic success in Mathematics.

Conclusion

From the study findings, it was clear that CLM is an effective instructional approach for enhancing students' self-confidence in Mathematics at basic II education level. This was because, students who were taught Mathematics using the CLM instructions demonstrated greater improvement in self-confidence mean value than those taught using the GDIA, indicating that CLM instruction positively influences learners' confidence in Mathematics. The significant difference observed between two age groups indicates that age influenced the extent to which students developed self-confidence in Mathematics. Therefore, integrating CLM into Mathematics instruction can serve as an effective strategy for improving students'

self-confidence while accommodating age-related variations among learners in basic education.

Recommendations

Recommendations for this study include:

1. School authorities should ensure that Mathematics teachers adopt CLM instructional approaches in teaching because it was found to promote active learning and enhance students' self-confidence across different ages.
2. Educational stakeholders should provide continuous professional development and training for Mathematics teachers on the effective implementation of CLM to improve classroom practice and student outcomes.

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