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EFFECTS OF SELF-DIRECTED LEARNING INSTRUCTIONAL STRATEGY ON MATHEMATICS ACHIEVEMENT OF STUDENTS' WITH LEARNING DISABILITIES IN CALABAR MUNICIPALITY OF CROSS RIVER STATE, NIGERIA

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ABSTRACT

This study adopted pretest -posttest control quasi experimental design to examine the effects of self directed learning instructional strategy on Mathematics achievement of students' with learning disabilities in Calabar Municipality of Cross River State, Nigeria. Two research questions were posed which were translated into two null hypotheses.

Simple random sampling technique was used to select 4 schools out of 16 which a sample of 104 students with learning disabilities were selected via Teacher nomination check list and school record One instruments titled "Mathematics Achievement Test (MAT) was used as Pre-Test (PREMAT), and Post-Test (POSTMAT) was developed by the researcher and validated by experts was used for data collection. The reliability of the Mathematics Achievement Test (MAT), was established using Kuder-Richardson formula 20 (KR–20) after subjecting the instruments to a trial test of 20 students with learning disabilities who are not part of the sample for the study but have relevant qualities as those in the study gives an index of 83. The research questions were answer using descriptive statistics(mean) and the hypotheses were tested using One Way Analysis of Covariance for two hypotheses at .05 level of significance. The findings of the study revealed that there is a significant difference between the mean Mathematics achievement scores of students' with learning disabilities who were taught using self irected learning and those taught with lecture method, also Male and female students do significantly differ in their mean mathematics academic score when taught using self-directed learning. It was therefore concluded that Mathematics achievement of students with learning disabilities depend on self directed learning well guided by the teachers. Based on this, it was recommended amongst others that self directed learning strategy should be adopted in teaching students with learning disabilities in public secondary schools in order to enhance their academic achievement in Mathematics.

KEYWORDS: Gender, Mathematics achievement, Self-directed learning

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INTRODUCTION

A learner with a learning disability (LD) is an individual who experiences significant difficulties in acquiring and using academic skills, which can affect their ability to read, write, perform mathematical calculations, or understand information. These challenges are not due to intellectual disabilities but are often linked to differences in how the brain processes information. Learning disabilities can vary in nature and severity, impacting the learner's educational performance and overall learning experience (Fletcher, & Shaywitz, 2019; Masor, Ibok & Etura, 2023). Students with learning disabilities frequently experience lower achievement levels in mathematics compared to their peers, leading to a persistent achievement gap (Wehmeyer et al., 2020). The persistent poor achievement in mathematics for students with learning disabilities (LD) poses significant challenges in educational settings The increasing prevalence of students with learning disabilities in mathematics classrooms necessitates effective instructional strategies that cater to their unique learning needs. Traditional instructional methods, which often rely on teacher-directed approaches, may not adequately address the unique needs of these students, leading to persistent underperformance. Self-directed learning (SDL) has gained attention as a viable alternative, promoting autonomy and personalized learning experiences. It offers an alternative by allowing learners to tailor their educational experiences to align with their strengths and interests, potentially leading to improved mathematical understanding and performance. However, the specific effects of self-directed learning on the mathematics achievement of students with learning disabilities have not been thoroughly investigated.

Self-directed learning instructional strategy has emerged as a promising approach, allowing students to take charge of their learning process. However, the impact of Self-directed learning on the mathematics achievement of students with learning disabilities remains under-explored. Self-directed learning can enhance motivation and engagement among students, particularly those facing academic challenges. Existing studies have shown mixed results, suggesting that while some students thrive under Self-directed learning conditions, others may struggle without adequate support (Miller & McGowan, 2019;Ntibi & Ibok, 2020; Idaka, Arikpo, Mendu, Imo & Obi, 2024;Ibok, Unoh, & Asuquo, 2024). Recent studies have highlighted the positive effects of SDL on academic performance. For instance, Schunk and Zimmerman (2017) emphasize that self-regulated learners are more likely to set achievable goals, monitor their progress, and reflect on their learning, which can enhance their performance in mathematics. Furthermore, research shows that when students with learning disability are provided with the tools and strategies for Self-directed learning , they often demonstrate improved engagement and achievement in mathematics (Van der Horst et al., 2021). Self-directed learning encourages the development of self-regulatory skills, such as goal setting and self-assessment, which are essential for academic success. When students are given the autonomy to set their learning goals and monitor their progress, they are more likely to achieve better outcomes in mathematics.

In recent years, the educational community has increasingly focused on Self-directed learning instructional strategy as a transformative approach to enhance academic outcomes for diverse student populations, particularly those with learning disabilities (LD). Self-directed learning instructional strategy empowers students to take initiative in their learning processes, fostering independence, motivation, and personalized engagement. This is particularly crucial in mathematics, where students with learning disability often encounter significant barriers to success, including difficulties in understanding abstract concepts and applying problem-solving strategies (Miller & McGowan, 2019; ibok & Ntibi,2020 ;Ibok & Masor, 2024 ; Okri, Idaka, & Inah, 2023; Gwebuike, Okri & Obi, 2022). The effect of self-directed learning (SDL) on mathematics achievement among students with learning disabilities (LD) has been the subject of various empirical studies in recent years. Several studies have demonstrated that SDL positively influences the academic achievement of students with learning disabilities in mathematics. For instance, Miller and McGowan (2019) found that implementing self-directed learning strategies led to significant improvements in mathematics scores among students with LD. The study emphasized the role of goal-setting and self-monitoring as critical components that facilitated better learning

outcomes. Research conducted by Wehmeyer et al. (2020) indicated that self-directed learning enhances motivation and engagement in students with learning disabilities, which are crucial factors for academic success. Their findings showed that when students were encouraged to take control of their learning, they exhibited higher levels of interest in mathematical tasks, leading to improved performance. Van der Horst et al. (2021) conducted a meta-analysis that highlighted the effectiveness of personalized self-directed learning approaches in improving mathematics achievement. The study revealed that tailoring learning activities to meet individual needs significantly benefited students with learning disabilities. This personalization not only improved mathematical skills but also fostered a sense of ownership over their learning, which is vital for students with learning disabilities. Zimmerman (2018) emphasized the importance of self-regulation in SDL. His research indicated that students with learning disabilities who practiced self-regulated learning strategies, such as self-assessment and reflection, showed enhanced performance in mathematics. The development of these skills allowed students to identify their strengths and weaknesses, leading to targeted improvements in their mathematical abilities.

A study conducted by Alharbi and Alshahrani (2020) explored the impact of self-directed learning on the mathematics achievement of students with learning disability. The researchers implemented an self-directed learning framework in a classroom setting, which included goal-setting, self-assessment, and peer feedback. Results showed a statistically significant improvement in students' mathematics scores, indicating that self-directed learning strategies fostered greater understanding and retention of mathematical concepts. In a qualitative study, Kaczmarek et al. (2021) investigated the experiences of students with learning disability engaged in self-directed learning activities in mathematics. The findings revealed that students reported increased motivation and engagement when they were allowed to choose their learning paths and resources. This autonomy not only enhanced their interest in mathematics but also led to improved academic performance, confirming previous research on the motivational benefits of self-directed learning.

A study by Chen and Wang (2022) assessed the effectiveness of a digital learning platform that promoted self-directed learning in mathematics. The platform allowed students to engage in self-paced learning and provided instant feedback. Results indicated that students using the platform demonstrated significantly higher mathematics achievement compared to those receiving traditional instruction, suggesting that technology can enhance self-directed learning.. effectiveness. A meta-analysis by Artino and Jones (2019) highlighted the importance of self-regulation in self-directed learning for students with learning disability. The analysis found that students who employed self-regulation strategies, such as monitoring their progress and adjusting their learning tactics, experienced greater gains in mathematics achievement. Despite these promising findings, there is still a need for more comprehensive research to understand the specific effects of self-directed learning on the mathematics achievement of students with learning disabilities. Factors such as the type of support provided, the nature of the learning environment, and individual differences among students can significantly influence the effectiveness of self-directed learning strategies (Miller & McGowan, 2019). Addressing these gaps is vital for developing effective instructional practices that can enhance the educational experiences of students with learning disability in mathematics.

Apart from instructional strategy used in teaching students with learning disabilities, gender is a notable factor that can influence students with learning disabilities academic achievement in mathematics. A study by Kauffman et al. (2018) analyzed the mathematics performance of students with learning disability, focusing on gender differences. The researchers found that male students with learning disability generally outperformed their female counterparts in standardized mathematics assessments. This study suggested that societal stereotypes and expectations regarding gender roles in mathematics may contribute to these disparities, potentially affecting the self-directed learning experiences of female students. Research conducted by Schunk and Zimmerman (2019) found that self-directed learning can mitigate some of the gender disparities in mathematics achievement. The study found that when both male and female students with learning disability were provided with self-directed learning opportunities, the achievement gap narrowed.

Female students reported higher levels of engagement and motivation when they had control over their learning processes, suggesting that self-directed learning strategies can empower them to improve their mathematical skills. A study conducted by Liem et al. (2020) explored the role of self-efficacy in the mathematics achievement of students with learning disability, focusing on gender differences. The findings indicated that male students tended to have higher self-efficacy beliefs regarding their mathematical abilities compared to female students. However, when female students engaged in self-directed learning activities that fostered self-assessment and reflection, their self-efficacy and subsequent mathematics achievement improved significantly, highlighting the potential of self-directed learning to boost confidence among female learners. A qualitative study by Topping et al. (2021) examined how gender influences engagement in self-directed learning among students with learning disability. The results showed that male students often preferred competitive learning environments, while female students thrived in collaborative settings. The study emphasized that tailoring self-directed learning strategies to align with these preferences could enhance motivation and achievement in mathematics, particularly for female students.

Baird et al. (2019) examined gender differences in mathematics achievement among students with learning disabilities . The research found that male students tended to achieve higher scores than female students on standardized mathematics assessments. Research conducted by Hattie and Donoghue (2016) highlighted the role of self directed learning in narrowing achievement gaps between genders. Their meta-analysis indicated that when students with learning disabilities engaged in self directed learning practices—such as setting personal goals and self-monitoring—they showed improved performance in mathematics. Notably, female students benefitted significantly from these practices, suggesting that self-directed learning can empower them to overcome initial disadvantages in achievement. A study conducted by Zimmerman and Schunk (2018) explored how self-regulation impacted the mathematics achievement of students with LD, with a focus on gender differences. The findings revealed that while both genders benefited from self-regulated learning strategies, female students showed greater gains in mathematics when they engaged in reflective practices. This suggests that fostering self-regulation in self-directed learning can be particularly beneficial for female students with learning disabilities. Research by Garrison and Akyol (2019) investigated the motivational factors influencing self directed learning in mathematics among students with learning disabilities. The study found that female students often exhibited lower intrinsic motivation compared to male students. However, when provided with supportive self-directed learning environments that encouraged collaboration and feedback, female students demonstrated significant improvements in motivation and achievement in mathematics, indicating the importance of context in shaping learning experiences. The empirical evidence indicates that gender influences mathematics achievement among students with learning disabilities, with self-directed learning playing a significant role in shaping these outcomes. While male students may generally outperform female students, self directed learning strategies can empower female learners by enhancing motivation, self-regulation, and overall achievement. Addressing the unique challenges faced by female students is crucial for optimizing their learning experiences and outcomes in mathematics.

Purpose of the study

The main purpose of the study is to investigate the effects of self directed learning instructional strategy on academic achievement in Mathematics of students with learning disability in Calabar Municipality Local government area of Cross River State, Nigeria. Specifically, the study seeks to examine;

i)The difference between the mean academic achievement in Mathematics of students' with learning disability who taught using self directed learning instructional strategy and those taught with lecture method

ii)The influence of gender on academic achievement Mathematics of students' with learning disabilities when taught using self directed learning instructional strategy

Research questions

The following questions guide this study:

i) What are the mean difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning instructional

strategy and those taught with lecture method ?

ii)To what extent does gender influence academic achievement in Mathematics of students' with learning disabilities when taught using self directed learning instructional strategy ?

Research hypotheses

To facilitate the investigation, the following null hypotheses were formulated:

i)There is no significant difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning instructional strategy and those taught with lecture method

ii)There is no significant influence of gender on academic achievement in Mathematics of students' with learning disabilities when taught with self directed learning instructional strategy

MATERIALS AND METHODS

Research Design

The research design adopted was pretest – posttest control group quasi-experimental design. Two intact classes were assigned to the Control group (C) and the Experimental group (E) each.

Sample and Sampling Procedure

The target population of the study comprises of all Senior Secondary School (SSS 2) students' with learning disabilities in public secondary schools in Calabar Municipality Local Government Area of Cross River State, Nigeria. To select the schools for the study, the researcher using the hat and draw techniques in selecting 4 public secondary schools out of 16 schools where all the sixteen (16) schools in the study areas were written on a piece of paper, squeezed and shuffled in a hat. The researcher closed his eyes and picked any one school from the hat without replacement until he picked 4 schools representing 25% of the entire 16 schools in the study area. Two schools were used experimental group while the others two were used for control group. Teacher nomination check list and school record were used to select all the students with learning disabilities in ten schools selected for the study. All the SS 2 students who always score below average identified or nominated in the four school were used in this study. A sample of 104 students (59 females and 41 males) were selected from the four school and used for the study.53(29 females and 24males) were used for experimental group 51(30females and 21males) were used for control group.

Instrumentation

The instrument used for data collection was Mathematics Achievement Test (MAT) adopted from West Africa Certificate Examination(WACE) and Secondary School Certificate Examination (SSCE) past Questions between 2019-2024 comprised 40 multiple-choice items with four options (A to D). The MAT was drawn based on the table of specification which covers six(6) specific domains or behaviours including remembering, understanding, Knowledge, comprehension, applying, analyzing, evaluation and creating. The instruments were face and content validated by three experts(One expert from test and measurement while two experts were from Department of special Education) and tested for reliability using Kuder Richardson 20 (KR-20) yielded a coefficient of 0.83.

Administration of the Instrument

The research assistants who were the Mathematics educators in the sampled schools were trained by the researcher on how the teaching was to be carried out. A pretest PREMAT was administered to subjects in both groups(experiment group and control group) to determine their academic achievement in Mathematics. The control group was taught Mathematics tasks for four weeks using only the conventional method and the experimental group was taught Mathematics tasks for four weeks with self directed learning instructional strategy. At the end of the four weeks, the POSTMAT was administered to all the subjects. The instrument was firstly administered as pre-test, scored and kept without any feedback to the students. After the treatment, the same test with the same contents was reshuffled and given as post-test. The researcher with the help of research assistants administered research instrument (PREMAT and POSTMAT) to the subjects Both tests were scored by the researcher to avoid bias and these items were scored dichotomously. The Correct options was scored 1 Mark each while each incorrect option was scored 0 Mark each. The results obtained were used for analysis. Research questions were answered using mean and standard deviation (SD) while the hypothesis were tested using Analysis of Covariance(ANCOVA) at 0.05 level of significance.

RESULTS

Research questions were answer using mean while research hypotheses were analyzed using analysis of Covariance and tested at .05 significance level. The result of the analysis of research questions one and two is presented in the Table 1and 2 while the hypotheses were presented at Table 3 and 4.

Research question one

What are the mean difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning instructional strategy and those taught with lecture method?

To answer this research question, descriptive statistics was employed, the mean gained based on the use of technology devices and that of conventional method were computed and compared as it is presented in Table 1.

TABLE1: Mean of pre-test and post-test of the mean difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning and those taught with lecture method(N=104)

Variables/ strategies	N	Pre-test mean score	Post-test mean score	Mean gain score
Self directed learning	53	17.3774	30.2453	12.8679
Lecture method	51	17.1961	24.9608	7.7647

The results presented in table 1 revealed that the mean gain score of students' with learning disabilities who are taught Mathematics tasks using self directed learning (12.8679) is higher than the mean gain score of those who are taught with lecture method (7.7647). This implies that students' with learning disability who were taught mathematics tasks using self directed learning performed better than those taught with lecture method..

Research question two

To what extent does gender influence academic achievement in Mathematics of students' with learning disabilities when taught using self directed learning ?

To answer this research question, descriptive statistics was employed, the mean gained in Mathematics by male and that of female students' with learning disabilities when taught with self directed learning were computed and compared as it is presented in Table 2.

TABLE 2: Mean of pre-test and post-test achievement scores of male and female students' with learning disabilities who were taught mathematics tasks using self directed learning (N=53)

Variables/ Gender	N	Pre-test mean score	Post-test mean score	Mean gain score
Male	24	17.3333	30.5000	13.1670
Female	29	17.4138	30.0345	12. 6207

The results presented in Table 2 revealed that the mean gain score of male students' with learning disabilities who are taught mathematics tasks using self directed learning (13.1670) is slightly higher than the mean gain score of their female counterpart taught using the same self directed learning (12. 6207). This implies that male students' with learning disabilities who were taught mathematics tasks using self directed learning performed better than their female counterpart who were taught with the same treatment.

Research hypotheses

Hypothesis one: There is no significant difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning instructional strategy and those taught with lecture method.

The independent variable in this hypothesis is the use is self directed and lecture method while the dependent variable is academic achievement in Mathematics. One-way Analysis of Covariance (ANCOVA) was adopted and the result is presented in Table 3.

Table 4: One-way Analysis of Covariance (ANCOVA) on the mean difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning instructional strategy and those taught with lecture method (N=104)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	744.902[a]	2	372.451	92.509	.000	.647
Intercept	408.521	1	408.521	101.468	.000	.501
Pre-test	19.097	1	19.097	4.743	.032	.045
Treatment	709.243	1	709.243	176.161	.000	.636
Error	406.636	101	4.026			
Total	80684.000	104				
Corrected Total	1151.538	103				

a. R Squared = .647 (Adjusted R Squared = .640)

The information in Table 4 shows that there is a significant difference between the mean Mathematics achievement scores of students' with learning disabilities who were taught using self directed learning instructional strategy and those taught with lecture method (F=176.161, p=.000). Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. The result also shows the partial Eta squared estimate which is a measure of effect size as .636. This implies that treatment accounted for 63. 6 percent of moderate variance observed in the post-test scores of the use self directed learning influence students'' with academic achievement in Mathematics of students with learning disabilities **.** The R value of .804 which shows that there is a positive high relationship between the variables of the study and resulted to adjusted R square of .640. This suggested that about 64.0 percent shows the moderate variation in the dependent variable (students' academic achievement) can be accounted for by difference in pre-test .

Hypothesis two: There is no significant influence of gender on academic achievement in Mathematics of students' with learning disabilities when taught using self directed learning. The independent variable in this hypothesis is self directed learning , moderator variable is gender while the dependent variable is academic achievement in Mathematics . One-way Analysis of Covariance (ANCOVA) was adopted and the result is presented in Table 4.

Table 4: One-way Analysis of Covariance (ANCOVA) of the difference between mean academic achievement in mathematics of male and female students' with learning disabilities who were taught using self directed learning

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	80.035[a]	2	40.018	11.648	.000	.318
Intercept	102.627	1	102.627	29.872	.000	.374
Pre-test	77.189	1	77.189	22.468	.000	.310
Gender	3.693	1	3.693	1.075	.305	.021
Error	171.776	50	3.436			
Total	48735.000	53				
Corrected Total	251.811	52				

a. R Squared = .318 (Adjusted R Squared = .291)

The information in Table 4 shows that there no a significant difference in the mean mathematics achievement score of male and female students' with learning disabilities when taught using self directed learning (F=1..075;.p=.305). Therefore, null hypothesis was accepted while the alternative hypothesis was rejected at .05 level of alpha.

DISCUSSION OF FINDING

The finding of first hypothesis shows that there is a significant difference between academic achievement in Mathematics of students' with learning disabilities who were taught using self directed learning instructional strategy and those taught with lecture method. The finding agreed with Miller and McGowan (2019) who found that implementing self-directed learning strategies led to significant improvements in mathematics scores among students with LD. The finding is in line with a research conducted by Wehmeyer et al. (2020) indicated that self-directed learning enhances motivation and engagement in students with learning disabilities, which are crucial factors for academic success. Their findings showed that when students were encouraged to take control of their learning, they exhibited higher levels of interest in mathematical tasks, leading to improved performance. The finding agreed with Van der Horst et al. (2021) found that tailoring learning activities to meet individual needs significantly benefited students with learning disabilities. This personalization not only improved mathematical skills but also fostered a sense of ownership over their learning, which is vital for students with learning disabilities. The finding is in line with the finding of Zimmerman (2018), Alharbi and Alshahrani (2020), Kaczmarek et al. (2021), Chen and Wang (2022) who found a significant effect of self directed learning on Mathematics achievement.

The result of the second hypothesis revealed that there is no significant influence of gender on academic achievement in Mathematics of students' with learning disabilities when taught using self directed learning. The finding disagreed with a study conducted by Kauffman et al. (2018) who found that male students with learning disabilities generally outperformed their female counterparts in standardized mathematics assessments. The finding also disagreed with a . research conducted by Schunk and Zimmerman (2019) who found that self-directed learning can mitigate some of the gender disparities in mathematics achievement. The finding disagreed with the following findings Liem et al. (2020), Topping et al. (2021), Baird et al. (2019), Hattie and Donoghue (2016), Zimmerman and Schunk (2018), Garrison and Akyol (2019).

CONCLUSION

The self-directed learning (SDL) strategies have a significantly effect on mathematics achievement of students with learning disabilities (LD). Empirical evidence suggests that SDL empowers students by fostering autonomy, motivation, and self-regulation, which are crucial for academic success. Notably, while male students with LD may generally outperform their female counterparts in mathematics, SDL strategies can help bridge this achievement gap. Female students often demonstrate enhanced performance and engagement when provided with supportive self-directed learning environments that encourage collaboration and reflection. Therefore, understanding and addressing these dynamics is essential for optimizing educational outcomes in mathematics for all students with learning disabilities. Gender influences educational experiences and expectations, while self-directed learning empowers students to take charge of their educational journeys. These concepts are essential for developing effective teaching strategies and fostering inclusive learning environments.

RECOMMENDATIONS

Based on the finding of the study. The following were recommended

i)Educators should develop and implement self-directed learning strategies that cater to the unique needs of students with learning disabilities in secondary schools. These strategies should include goal-setting, self-monitoring, and reflective practices to enhance their learning experiences.:

ii)Educators should adopt gender-sensitive teaching methods that recognize and address the different motivational factors and learning preferences of male and female students. This can involve creating collaborative learning environments that encourage female students to engage more actively in mathematics.

iii) Government and school management should provide training opportunities for educators on the

importance of self-directed learning and gender differences in learning. This training should focus on how to effectively support students with learning disabilities in developing self-directed learning skills. Foster collaborative learning opportunities that allow students to work together in mixed-gender groups. This can help reduce anxiety and build confidence, particularly among female students with learning disabilities .

REFERENCES

Alharbi, S., and Alshahrani, A., 2020. The impact of self-directed learning on the mathematics achievement of students with learning disabilities. International Journal of Special Education, 35(2), 305-317.

Artino, A. R., and Jones, K. D., 2019. Self-regulated learning and academic achievement: A meta-analysis. Educational Psychology Review, 31(3), 419-458.

Baird, A., McGowan, K., and Smith, J., 2019. Gender differences in mathematics achievement among students with learning disabilities: A meta-analysis. Learning Disabilities Quarterly, 42(2), 79-91.

Chen, Y., and Wang, H., 2022. Enhancing self-directed learning in mathematics through digital platforms: A study on students with learning disabilities. Computers & Education, 178, 104404.

Fletcher, J. M., and Shaywitz, S. E., 2019. Learning disabilities: A neurobiological perspective. Journal of Learning Disabilities, 52(1), 3-15.

Garrison, D. R., and Akyol, Z., 2019. The importance of motivation in self-directed learning: A review of the literature. Journal of Learning Sciences, 28(1), 1-30.

Gwebuike, O., Okri, J. A. and Obi, J. J., 2022. Environmental variables and academic performance of junior secondary school student's in basic science in Calabar South Local Government Area of Cross River Rtate, Nigeria. Global Journal of Educational Research, 21(1), 55-61

Hattie, J., and Donoghue, G., 2016. Learning strategies: A synthesis and meta-analysis. Educational Psychologist, 51(2), 141-154.

Ibok, E. E. and Ntibi, J. E., 2020. Inquiry learning approach and students' academic achievement in Mathematics and Physics in Calabar Municipality of Cross River State, Nigeria. Prestige Journal of Education 3(2),121-131

Ibok, E.E. and Masor, G.U., 2024. An Investigation on Perceived Difficult Areas in Geometry Among Secondary School StudentS' in Urue Offong-Oruko Local Government Area of Akwa Ibom State, Nigeria Journal of Environmental and Tourism Education(JETE), 7(1), 284-294

Ibok, E.E**,** Unoh, E. O. and Asuquo, F.F., 2024. Correlation between metacognitive factors and academic achievement in mathematics among secondary schools students in Oron Local Government Area of Akwa Ibom State, Nigeria. Wukari International Studies Journal, 8(8), 233-242

Idaka, I. E, Arikpo, O.J., Mendu, A. J., Imo. I. M. and Obi, M., 2024. Utilization of authentic assessment method among basic education teachers in Nigeria. Global Journal of Educational Research, 23(2), 177-18. https://dx.doi.org/10.4314/gjedr.v23i2.6

Kaczmarek, L., McGowan, K., and Smith, J., 2021. Student experiences with self-directed learning in mathematics: A focus on students with learning disabilities. Journal of Learning Disabilities, 54(3), 215-228.

Kauffman, J. M., Landrum, T. J., and Duffy, M. L., 2018. Gender differences in mathematics achievement among students with learning disabilities. Learning Disabilities: A Contemporary Journal, 16(1), 1-18.

Liem, A., Wong, K. T., and Lee, C., 2020. The role of self-efficacy in mathematics achievement: Gender differences among students with learning disabilities. Journal of Educational Psychology, 112(3), 542-554.

Masor, G. U., Ibok, E. E. and Etura, C. S., 2023. Teacher instructional behaviour as a predictor of students' academic performance in Mathematics in Calabar Education Zone of Cross River State, Nigeria. Prestige Journal of Counselling Psychology. 6(2), 20-29.

Miller, S. P., and McGowan, T., 2019. The impact of self-directed learning on the mathematics achievement of students with learning disabilities. Learning Disabilities Research and Practice, 34(2), 100-111.

Miller, S. P., and McGowan, T., 2020. Barriers to self-directed learning in mathematics for female students with learning disabilities. Journal of Educational Psychology, 112(4), 654-670.

Ntibi, J. E and Ibok, E. E., 2020. Effect of self-directed learning instructional strategy on students' achievement and retention in Mathematics and Physics in Calabar Municipality of Cross River State, Nigeria. Prestige Journal of Education 3 (2), 75-85

Ntibi, J. E and Ibok, E. E., 2020. Effect of self-directed learning instructional strategy on students' achievement and retention in Mathematics and Physics in Calabar Municipality of Cross River State, Nigeria. Prestige Journal of Education 3 (2), 75-85

Okri, J. A., Idaka, E. I. and Inah, L. I., 2023. Effect of Flipped Strategy on Achievement in Algebraic Concepts among Secondary School Students in Ikom Education Zone, Cross River State. Zamfara International Journal of Education (ZIJE), 3(2), 64 -71

Schunk, D. H., and Zimmerman, B. J., 2017. Motivation and self-regulated learning: Theory, research, and applications. New York, NY: Routledge.

Schunk, D. H., and Zimmerman, B. J., 2019. Self-directed learning: Theory and practice. In Handbook of Self-Regulation of Learning and Performance (pp. 15-30). New York, NY: Routledge.

Topping, K. J., McGavock, K., and McGowan, D., 2021. Gender and engagement in self-directed learning: A qualitative study of students with learning disabilities. International Journal of Inclusive Education, 25(3), 303-318.

Van der Horst, J., Meijer, J., and van der Veen, J., 2021. The effects of self-directed learning on academic performance: A meta-analysis. Educational Research Review, 30, 100-115. https://doi.org/10.1016/j.edurev.2020.100115

Wehmeyer, M. L., Shogren, K. A., and Palmer, S., 2020. Self-determination and self-directed learning: A meta-analysis of the literature. Journal of Educational Psychology, 112(4), 725-738.

Zimmerman, B. J., 2018. Goal setting: A key proactive source of academic self-regulation. In D. H. Schunk and J. A. Greene (Eds.), Handbook of self-regulation of learning and performance pp. 267-283. New York, NY: Routledge.

Zimmerman, B. J., and Schunk, D. H., 2018. Self-regulated learning and performance: Theory, research, and applications. In Handbook of Self-Regulation of Learning and Performance (pp. 1-12). New York, NY: Routledge.