

RELATIONSHIP OF COGNITIVE AND META-COGNITIVE SELF-REGULATED LEARNING STRATEGIES ON MATHEMATICS PERFORMANCE AMONG SENIOR SECONDARY SCHOOL STUDENTS IN KATSINA

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Abstract

This study investigated the Relationship of Cognitive and Meta-cognitive Self-regulated Learning strategies on Mathematics performance among senior secondary school students in Katsina Zonal Education Quality Assurance, Katsina State. The study was guided by two research objectives and corresponding research questions and hypotheses. The study adopted a correlational survey research design. The population of the study consist of 17,328 students offering Mathematics in all the twenty-five Senior Secondary Schools in Katsina Zonal Education Quality Assurance, Katsina State, out of which 370 students were randomly selected as sample of the study. The Self-regulated learning strategies questionnaire was adapted from Pintrich, et al (1991) which include cognitive, metacognitive, and Mathematics WASSCE and NECO past questions was used to collect the data. Pearson product moment correlation coefficient (PPMCC) was used to test the hypotheses. Results show significant relationship of Cognitive Self-Regulated Learning Strategy on Mathematics Performance. This means that students who self-regulated their learning cognitively have a tendency of scoring higher marks than those who don't use the learning strategy. There is significant Influence of Meta-Cognitive Self-Regulated Learning Strategy on Mathematics Performance, this clearly shows that the use of meta-cognitive strategy to learn performed better than their counterpart. Based on the findings the researcher recommended that teachers in schools should teach students the self-regulatory skills such as planning, monitoring, and evaluating their learning processes as it is important in their academic performance.

Keywords: Cognitive, Meta-Cognitive, Self-regulated learning, Mathematics performance.

Introduction

Human knowledge is cumulative and participatory in nature. It doubles every five years in an era characterized by enormous revolution of information, which has in turn produced a strong tendency towards giving more and more attention to developing students integrated learning processes. So, the goal of educational process is no longer limited to providing students with knowledge and facts, but extend to developing their thinking and analytical abilities, and providing them with higher mental skills to deal with emerging information and knowledge efficiently and effectively. According to Organization for Economic Cooperation and Development (OECD) report (2003), the world is moving towards knowledge-based economies, and this imposes new requirements and demands upon the education systems to expand and enhance learners' knowledge, skills, and attitudes. Hence, it is necessary to think deeply about education systems; many learning theories provide interpretations, applications and models to create student who are able to meet challenges of this era. Among the most important models that have emerged in this field is the "Self-Regulated Learning (SRL) model. This new curve of learning, which has become one of the most important topics and interest in education,

focuses attention on how to empower students to perform learning practices by themselves. Self-Regulated Learning (SRL) depends heavily on students' proactive role in their learning outcomes, it has been one of the most widely debated topics in the field of academic learning (Dent & Koenka, 2015).

In recent years, the concept of SRL has become the focus of applied educational studies as an important variable in boosting academic performance and bringing about success (Tanriseven & Dilmac, 2013). Although western academia has paid great attention to measuring the cognitive, motivational, and behavioural constructs of SRL and their impact on academic achievement, surprisingly, the Nigeria research environment still lacks such attention to this valuable phenomenon and its role in learning context, especially in Katsina, the current study tries to explore the relationship that SRL has with academic performance in mathematics.

Recently, there has been increasing interest among researchers in the field of educational psychology in how students can improve their academic performance through regulation of their learning processes and strategies. In this respect, it can be argued that the concept of SRL marks a shift in educational research from considering students' learning capabilities and environments as fixed entities, to focusing on students' learning processes and responses, which are dynamic in nature, and influence their academic success.

Mathematics improves critical thinking skills; helps solving real life problems and understanding the fact of life. Most students, during their secondary school education, think that mathematics is very complex. As a result, they cannot benefit from the advantages of the learning of Mathematics throughout and long after their education. One of the reasons might be ineffective teaching methods, materials and activities. Mathematics teaching should include three purposes. First, students should have conceptual knowledge of mathematics. Second, they should have procedural knowledge of mathematics. Finally, they should understand the relationship between conceptual and procedural knowledge. These three purposes may serve relational understanding. Relational understanding means understanding the concepts and connections of mathematics, using symbols of mathematics and knowing the relationships between concepts, symbols, and methods.

Among various curricular topics in the educational system that students often find difficulty is the field of mathematics which leads them into lack of learning concept well and acquiring a negative outlook towards it (Akbari, Khayer, & Abedi, 2014). Weakness of students in solving problems and particularly mathematics problems is among topics that have in recent years gained the attention of specialist in education and development. Skills of students with mathematical difficulty are less than regular students in use of self-regulated learning strategies (Mohammadi, 2007).

Self-regulation has valuable consequences on the process of learning, teaching, and even success in life and is one of the concepts considered in contemporary education and development. The main framework of self-regulation learning theory is based on how individual with regards to cognitive, metacognitive, motivational, behavioural beliefs organize their learning. Self-regulated learners are active learners in terms of metacognition, motivation and action control. For example, they focus on enhancing their learning performance, employ self-regulatory strategies, give themselves feedback and improve their learning based on that feedback. As a result, they change their sense of self or learning strategies. Montalvo and Torres (2004) claim that self-regulated learning research has emerged since the mid-1980s within psychological literature, and become one of the essential axes of educational practice.

Cognitive strategies cover sub-strategies of rehearsal, elaboration, and organizational strategies. Cognitive strategies are useful tools in assisting students with learning problems. The term cognitive strategy in its simplest form is the use of the mind (cognition) to solve a problem or to complete a task. Metacognitive strategies involve predicting, planning, monitoring, and evaluation, which help individuals' control and regulate their own cognitive processes. Metacognitive strategies in Cohen's (2008) terms are undirected strategies used to monitor the self while engaged in an activity such as reading.

Statement of the Problem

The problem of academic performance among senior secondary students in Katsina is degrading and in Nigeria at large. Academic performance of mathematics which is measured by end of term examination is unbecomingly disappointing, and the education system is shrinking under pressure. It is assumed that only a student who is willing to learn will device self-regulated strategy to learn which will in turn improve the Mathematics performance of the student.

It has been observed by the researchers that some learners fail mathematics because of lack of cognitive strategies the ability to organize the information which teachers pass on to them and nowadays it is not all students that practice what they have been taught in mathematics after school hours and mathematics is a subject which needs drill and practice. Also, most students lack the ability to plan, control and evaluate their learning themselves. Some students these days cannot manage and control their learning materials, they tend to waste time doing nothing instead of reading or practicing what they have learned in school. Most students in Katsina fail to rehearse, elaborate and organize their learning to enhance their cognition which helps student pay attention to the lesson they receive. It is most at times challenging for students to thoroughly and reliably observe their cognitive operations. Metacognitive strategy which includes the way a learner regulates their cognitive strategies through planning, monitoring and evaluation is not practiced by most students nowadays because they lack commitment in their learning.

According to Bergin (2005) where a link was explored between the use of self-regulated learning strategies & academic achievement it was concluded that there exists a positive relationship of students' use of strategies, such as meta-cognitive and resources management strategies. Similarly, Ozlem & Miray (2013) conducted a study on The Relationship between Self-efficacy, Self-regulated Learning Strategies and Achievement, where they found out that there is direct relationship of student's use of rehearsal, elaboration, organization and critical thinking with academic Achievement.

This study therefore aims at finding out the extend to which cognitive and meta cognitive self-regulated learning strategy are related to mathematics performance among senior secondary school students in Katsina.

Objectives of the Study

The objectives of this study are:

1. To find out the relationship between cognitive self-regulated learning strategy and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance.
2. To ascertain the relationship between meta-cognitive self-regulated learning strategy and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance.

Research Questions

The following research questions guided the study:

1. What is the relationship between cognitive self-regulated learning strategy and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance?
2. What is the relationship between meta-cognitive self-regulated learning strategy and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance?

Research Hypotheses

The following hypotheses guided the study:

H₀₁: There is no significance relationship between cognitive self-regulated learning strategy and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance.

H₀₂: There is no significance relationship between meta-cognitive self-regulated learning strategy and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance.

Methodology

For the purpose of studying the relationship between cognitive self-regulated and metacognitive self-regulated learning strategies to mathematics performance among senior secondary school students in Katsina a correlational research design was used, correlational research design measures the relationship between two variables without the researcher controlling either of them. It involves the collection of data through the use of questionnaire in order to test hypothesis or to answer questions concerning the current status of the subject of the study.

The target population of this study covered all senior secondary school two (SS II) students' offering mathematics in Katsina Zonal Education Quality Assurance. The assessable population of the study consists of all SS II students in the public schools. They were selected because they share similar characteristics. The students comprise of both male and female gender from different, religion, culture and socio-economic background.

There is a total of twenty-five (25) senior secondary located in Katsina Zonal Education Quality Assurance with the population of seventeen thousand three hundred and twenty-eight (17,328) senior secondary school (SS II) students' offering Mathematics. Three hundred and seventy (370) students were sampled.

For the purpose of this study the following instruments was used;

Self-regulated learning strategies questionnaire, adapted from Pintrich, McKeachie, Garcia, and Smith (1991). This instrument was used to gather data on students Self-Regulated learning strategies which include cognitive and metacognitive components. A teacher made test on Mathematics was used as academic performance of students in Mathematics using Mark Collection Form (MCF).

A test is valid when it measures what it intends to measure. However, for the purpose of this research study, the research supervisors checked the instrument, made possible modifications and then gave advice on the test to make sure that it suits the study. So also, professionals in the fields of educational psychology and some lecturers in the Department of Education validated the instrument and found it appropriate for the study.

Some copies of the self-regulated learning questionnaire which was adopted and later adapted was

administered in Government Science Secondary School Batagarawa which is not part of the study area. The researcher used Cronbach's alpha technique to determine the reliability of the self-regulated learning questionnaire and the result were 0.794 for cognitive strategy, and 0.710 for meta-cognitive strategy.

Results

H₀₁ There is no significant relationship between cognitive self-regulated learning and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance.

Table 1. Result of PPMC on cognitive self-regulated learning and Academic Performance in Mathematics

Variable	N	Mean	SD	r-value	p-value
Cognitive strategy	370	20.46	2.970		
Academic performance.	370	19.73	3.284	.468	.000 significant (rejected)

Table 1 shows the result of a correlation of cognitive self-regulated learning and academic performance in Mathematics among senior secondary school students in Katsina Zonal education quality assurance. The result indicates cognitive self-regulated learning as Mean= 20.46, SD= 2.970, and that of Academic performance as Mean= 19.73, SD= 3.284, r-value= .468, that resulted p-value to 0.00 which is less than 0.05 significant level. The null hypothesis that state there is no significance relationship between cognitive self-regulated learning and academic performance in mathematics is therefore rejected this means; there is significant relationship between cognitive self-regulated learning and Mathematics Performance among Senior Secondary School Students of Katsina Zonal Education Quality Assurance.

H₀₂: There is no significant relationship between meta-cognitive self-regulated learning and academic performance in Mathematics among senior secondary school students in Katsina zonal education quality assurance.

In testing hypothesis two, data of the students' meta-cognitive self-regulated learning and academic performance were used. Inferential statistics PPMC analysis were employed in testing the hypothesis. The detail of the result of correlation is presented in table 8 below: -

Table 2. Result of PPMC on meta-cognitive self-regulated learning and Academic Performance in Mathematics

Variable	N	Mean	SD	r-value	p-value
Meta-cognitive strategy	370	20.04	3.263		
Academic performance	370	19.73	3.284	.370	.000 significant (rejected)

Table 2 shows the result of a correlation of meta-cognitive self-regulated learning and academic performance in Mathematics among senior secondary school students in Katsina Zonal education quality assurance. The result indicates meta-cognitive self-regulated learning as Mean= 20.04, SD= 3.263 and that of Academic performance as Mean= 19.73, SD= 3.284, r-value= .370 that resulted p-value to .00 which is less than the alpha value .005 significant level. The null hypothesis that state there is no significance relationship between meta-cognitive self-regulated learning strategy and academic performance in mathematics is therefore rejected. This means there is significant relationship between

meta-cognitive self-regulated learning and Mathematics Performance among Senior Secondary School Students of Katsina Zonal Education Quality Assurance.

Discussion of the Findings

The findings of this study found significant relationship between Cognitive Self-Regulated Learning Strategy and Academic Performance among Senior Secondary School Students in Katsina Zonal Education Quality Assurance. This indicates that cognitive self-regulation strategy that students adopt in learning such as elaboration, rehearsal and organization have impact on academic performance. This study is in line with Ozlem and Miray (2013) where they found that, there exist direct relationship of student's use of rehearsal, elaboration, organization and critical thinking with academic Achievement. Similarly, the finding of this study indicates significant relationship between Meta-Cognitive Self-Regulated Learning Strategy and Academic Performance among Senior Secondary School Students in Katsina Zonal Education Quality Assurance. This means that meta-cognitive strategy which a student use in learning helps them oversee, regulate, or direct learning task also involve thinking about the learning process, a student who plan, monitor, and evaluate their learning process (Spoerer & Brunstein 2006) will perform well. This is in line with Bergin (2005) where a link was explored between the use of self-regulated learning strategies & academic achievement it was concluded that there exists a positive relationship of students' use of strategies, such as meta-cognitive and resources management strategies.

Conclusion

From the findings of this study, it has been concluded that there is significant relationship between cognitive self-regulated learning strategy and academic performance among Senior Secondary Students in Katsina Zonal Education Quality Assurance, and this came about as a result of the person product moment correlation (PPMCC). This indicates that students that have high cognitive self-regulated learning are likely to have higher grade in school.

Similarly, there is significant relationship between meta-cognitive self-regulated learning strategy and Academic Performance among Senior Secondary School Students in Katsina Zonal Education Quality Assurance in mathematics which means student can perform academically high by exhibiting meta-cognitive learning strategy unlike those that do not engage in cognitive learning strategy have significant relationship with Academic performance of Senior Secondary School Students in Katsina Zonal Education Quality Assurance in mathematics, that is to say students that engage in managing their resource in learning is likely to have high performance in their academics.

Recommendations

1. Teachers in schools should teach students the self-regulatory skills such as planning, monitoring, and evaluating their learning processes as it is important in students' academic performance.
2. Attention need to be paid to the use of self-regulated learning strategy, teachers therefore should be Train on how to inculcate self-regulatory skills.
3. Teachers should use the self-regulatory skills such as elaboration, organization, planning & evaluation and so on in the teaching-learning processes.

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