RELATIONSHIP BETWEEN METACOGNITION AND ACHIEVEMENT GOALS OF SENIOR SECONDARY TWO STUDENTS IN GEOMETRY AT LANGTANG NORTH, PLATEAU STATE, NIGERIA

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Abstract
The study investigated the relationship between metacognition and achievement goals of students in the concept of geometry. Two research questions guided the study and two hypotheses were tested at 0.05 level of significance. One hundred senior secondary two students were sampled from a population of 1086 students using three-stage cluster sampling technique. Two instruments were used for data collection. Metacognitive scale in geometry (MSG), and Achievement Goals in Geometry (AGG). The instruments were adapted from Zepeda (2015) and Elliot and McGregore's (2001) 2x2 achievement goals questionnaire respectively. Reliability using Cronbach Alpha were 0.77 and 0.73 for MSG and AGG respectively. Data were analysed using Pearson Product Moment Correlation (PPMC) in Statistical Package for Social Science (SPSS). The results revealed that there were positive relationships between: (i) metacognition and performance approach goals in geometry, (ii) metacognition and mastery approach goals in geometry. However, further analysis showed that these findings were not significant. It was recommended that teachers should encourage students to develop metacognitive skills towards enhancing their performance approach goals and metacognition mastery approach goals.

***Keywords**: Performance approach goals, Mastery approach goals, Metacognition, Geometry, Achievement Goals.*

Introduction

Metacognition deals with how students think when doing academic activities. According to Amin and Sukestiyarno (2015), it involves reflecting, drawing conclusions on the analysis, and putting what has been taught in or out of school into practice. These processes enable students to think at the metacognitive level as they change both their understanding and strategies when solving a mathematical problem especially geometry (Millis, 2016). Metacognition describes the processes that are involved when students plan, monitor, evaluate, and make changes on their own learning behaviour. Its strategies help in management, planning and monitoring learning activities (Das, 2015). It is worthy of note that metacognitive thoughts do not come from students' immediate external reality but it comes from their internal mental representations of that reality which include what they know about that internal representations, how it works, and how they feel about it (Barbacena & Norina, 2015). Therefore, metacognition is an intrinsic motivational force which enables students to develop strategies or skills that would enhance their understanding of concepts in geometry towards attainment of set goals.

There is no doubt that motivation is necessary for the realisation of students' achievement goals. If a student does not set achievement goals he or she would lack the motivation to study hard in school. Sometime a student just struggles in relation with other students. That is, he or she struggles not to be left behind other students (Performance approach). There are times when a student works harder in order to gain better understanding of concepts not minding what other students are doing (Mastery approach). But a student may not bother to carry out the learning activities (Performance avoidance) or not aspiring to attain excellence in learning contents of Mathematics (Mastery avoidance). There are studies that showed a positive relationship between students' metacognition skills and mastery approach goals orientation (Zepeda & Richer, 2015; Galoor, 2016; & Alotaibi, 2016). Other studies revealed a significant relationship between performance-approach goals and metacognitive skills (Peklaj & Pecjack, 2011; Kadioglu & Uzuntiryaki-kondakci, 2014).

Metacognition as a self-monitory process helps students to gain achievement orientation, either mastery or performance, which in turn result in academic success (Gul & Shehzad, 2012; Oyuga, Aloka & Raburu, 2016). Research findings in the area of metacognition and Mathematics achievement showed that there is a strong relationship between metacognition thinking and Mathematics achievement (Hessels & Schwab, 2015; Nepal, 2016). This is an indication that metacognition plays a critical role in enhancing students achievement in Mathematics (Izzati & Mahmudi, 2018; Howe, 2019). Other findings suggested that a positive relationship exist between learning styles, attitude towards Mathematics and metacognition (Baltaci, Yildiz & Özcakir, 2016; Ajisuksmo & Saputri, 2017).

There are studies such as Magi, Lerkkanen, Poikkanens, Rasku-Puttonen and Kikas, 2010; Badiee, Babakhani and Hashemian, 2014; and Abd-El-Fatta, 2018 that found a positive relationship between achievement goals and academic achievement. Some studies showed that a significant positive relationship exist between mastery goal orientation and academic achievement (Zare, Rastegar & Hosseini, 2011; Guwam, 2018). However, some studies (Rodriguez, Pineiro, Gomez-Taibo, Regueiro, Esteuez & Valle, 2017; Steinmayr, Weidinger, Schwinger, & Spinath, 2019) showed no positive relationship between goal orientation and Mathematics achievement. From the available literature, studies on the relationship between metacognition and achievement goals in Mathematics are rare. So, the study investigated the relationship between metacognition and achievement goals in geometry.

Statement of the Problem

Metacognition is an intrinsic motivation force that spur students to think, not only when solving problems in geometry, but also in the course of setting achievement goals in geometry. Unfortunately, students' motivation to learn Mathematics dwindles as they see the subject as a stressor that should be avoided (Ajisuksmo & Saputri, 2017). In fact, students would like that if there is any subject that should be removed from the curriculum, then it should be Mathematics because they consider it difficult to understand than other subjects. It is not surprising that students are facing considerable difficulty in the development of reasoning skills required in dealing with problems of geometric nature (Lee & Chen, 2015). What is then the relationship between students' metacognition and achievement goals in geometry?

Objectives of the Study

The study investigated the relationship between metacognition and achievement goals of senior secondary two students in geometry. In specific terms, it sought to:

1. Find the relationship between the metacognition and performance approach goals of senior secondary two students in geometry.
2. Find the relationship between the metacognition and mastery approach goals of senior secondary two students in geometry.

Research Questions

Two research questions guided the study:

1. What is the relationship between the metacognition and performance approach goals of senior secondary two students in geometry?
2. What is the relationship between the metacognition and mastery approach goals of senior secondary two students in geometry?

Hypotheses

Two hypotheses were tested at 0.05 level of significance:

H_{01} There is no significant relationship between the metacognition and performance approach goals of senior secondary two students in geometry.

H_{02} There is no significant relationship between the metacognition and mastery approach goals of senior secondary two students in geometry.

Methodology

The study adopted causal comparative research design. The population was 1086 from senior secondary two (SS2) students of registered private schools with at least two arms in Langtang North Local Government Area of Plateau State. A sample of 100 SS2 students was drawn using the three-stage cluster sampling technique. This is a technique in which a researcher obtains a sample from a population by taking a simple random sample of clusters. The technique was used to sample one school from the private schools in the study area using the following clusters: State Constituencies, Districts and Private Schools. Two instruments were used for data collection. Metacognition Scale in Geometry (MSG) was adapted (Zepeda, 2015) and Achievement Goals in Geometry (AGG) was also adapted (Elliot & McGregore, 2001). The reliability of each of the instruments was obtained using Cronbach Alpha. MSG was administered to 30 students and a reliability of 0.77 was obtained. While the reliability of AGG was 0.73. Data collected were analysed using Pearson Product Moment Correlation (PPMC) in Statistical Packages for Social Sciences (SPSS) version 20.

Results

Research Question 1

What is the relationship between the metacognition and performance approach goals of senior secondary two students in geometry?

Table 1: **Mean ($\bar{x}$), Standard Deviation (SD) and Relationship (R) of Metacognition and Performance Approach Goals**

Variable	n	$\bar{x}$	SD	R
Metacognition	100	77.8200	9.6624	

				0.096
Performance Approach Goals	100	89.1200	14.6345	

Table 1 shows the mean score and standard deviation of students' metacognition were 77.8200 and 9.6624 respectively. While those of their performance approach goals were 89.1200 and 14.6345 respectively. The correlation coefficient of 0.096 indicates that the relationship between senior secondary two students' metacognition and their performance approach goals was positive.

Research Question 2
What is the relationship between the metacognition and mastery approach goals of senior secondary two students in geometry?

Table 2: Mean ($\bar{x}$), Standard Deviation (SD) and Relationship (R) of Metacognition and Mastery Approach Goals

Variable	n	$\bar{x}$	SD	R
Metacognition	100	77.8200	9.6624	
				0.044
Mastery Approach Goal	100	92.8700	10.5281	

Table 2 shows the mean score and standard deviation of students' metacognition were 77.8200 and 9.6624 respectively. While those of their mastery approach goals were 92.8700 and 10.5281 respectively. The correlation coefficient of 0.044 indicates that the relationship between senior secondary two students' metacognition and their mastery approach goals was positive.

Hypothesis One
There is no significant relationship between the metacognition and performance approach goals of senior secondary two students in geometry.

Table 3: Pearson Product Moment Correlation Coefficient of Metacognition and Performance Approach Goals

Variable	n	$\bar{x}$	SD	r-cal	r-tab	Decision
Metacognition	100	77.8200	9.6624			
				0.096	0.205	No Sig
Performance Approach Goals	100	89.1200	14.6345			

Table 3 shows that the calculated Pearson Product Moment Correlation Coefficient (r-cal = 0.096) is less than the critical coefficient (r-crit = 0.205). This means that the null hypothesis was retained. Thus there was no significant positive relationship between senior secondary two students' metacognition and performance approach goals in geometry.

Hypothesis Two
There is no significant relationship between the metacognition and mastery approach goals of senior secondary two students in geometry.

Table 4: Pearson Product Moment Correlation Coefficient of Metacognition and Mastery Approach Goals

Variable	n	$\bar{x}$	SD	r-cal	r-tab	Decision
Metacognition	100	77.8200	9.6624			
				0.044	0.205	No Sig
Mastery Approach Goals	100	92.8700	10.5281			

Table 4 indicates that the calculated Pearson Product Moment Correlation Coefficient
(r-cal = 0.044) is less than the critical coefficient (r-crit = 0.205). This means that the null hypothesis was retained. Therefore, there was no significant positive relationship between senior secondary two students' metacognition and mastery approach goals in geometry.

Discussion

It was revealed that the relationship between senior secondary two students' metacognition and their performance approach goals was positive, but it was not significant (Tables1&3). This conforms with the view of Gul and Shehzad (2012) who found a moderate positive relationship between metacognition and goal orientation. However, it contradicts the findings that a significant relationship exists between performance-approach goals and metacognitive skills (Peklaj & Pecjack, 2011; Kadioglu & Uzuntiryaki-kondakci, 2014). The study showed a positive relationship between senior secondary two students' metacognition and their mastery approach goals, but it was not significant (Tables 2&4). This finding appears to support those of Zepeda and Richer (2015), Galoor (2016), and Alotaibi (2016) who reported that metacognition skills predict mastery approach goals orientation.

Conclusion

The study showed that the relationship between senior secondary two students' metacognition and their performance approach was positive, but it was not significant. Also, the findings showed that the relationship between senior secondary two students' metacognition and their mastery approach was positive, but it was not significant.

Recommendation

The following recommendations were made based on the findings of the study:

1. Teachers should encourage students to develop metacognitive skills to enhance their performance approach goals in geometry.
2. They should encourage students to improve their metacognitive skills towards enhancing their mastery approach goals in geometry.

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