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Research Article

Modelling the Effects of Goal Orientation on the Connection between Cognitive and Metacognitive Learning Strategies and Academic Performance of Students in Nigeria

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Abstract: The study examined predictions of a model explaining mediated effects, direct and indirect, and total effects of goal orientation on the connection between cognitive and metacognitive learning strategies and academic performance in a sample of 317 Senior Secondary School Students [age range = 15-20]. The data for cognitive and metacognitive learning strategies was collect via questionnaire while terminal scores in Mathematics and English language were collected from participating schools and used to measure student academic performance. The data collected was analysed by software: AMOS version 24. The results strongly supported the model indicating that cognitive and metacognitive learning strategies indirectly predict academic performance of students with goal orientation as the mediator. In the study sample, the predictor variable account for 51% variance in overall academic performance and specifically explained 57% of the variance in mathematics and 77% variance in English language. Therefore, goal orientation suggests a significant mediating role in the interaction between cognitive and metacognitive learning strategies and students' academic performance in English language and Mathematics.

Keywords: Academic performance, Cognitive-learning strategies, Goal orientation Metacognitive-learning strategies.

INTRODUCTION

One of the most disturbing problems in student's education is academic failure. Identifying factors that connect to student academic achievement or failure and pay attention to these factors is a stride toward academic success (Mohammadi, T.S. & Tavan, 2017). In view of this, the quest to explore factors that can improve the poor academic accomplishment by learners and the falling educational standards in institutions of learning, which have always bedeviled education systems all over the world have continued to dominate educational research (Patchen, 2004; Slabbert, de Kock & Hattingh 2009; Steyn, Steyn & De Waal 2001). The evidence that national development and prosperity are tied to educational success of the individuals compels such a quest (Wobmann 2002).

For instance, in Nigerian schools and classrooms, teachers are working assiduously to raise the achievement of all students to a greater level. However, often absent in this effort about how to increase academic performance is the way in which student learns. On many occasions, it has become routine for parents to attribute the causes of failure of learners to factors like; lack of resources, lack of parental support, teachers' and school ineffectiveness and teaching approaches, but hardly does it occur to many that learners goal orientation and the learning strategy used by the learner to learn is also a predicting factor. Recent years though, have witnessed a growing interest in exploring the role of learning strategies in student learning (Lai, 2009). This is because there is an increasing evidence about the importance of learning strategies as they predict performance (Zimmerman, 2000). Evidential research showed that effective use of learning strategies is an important factor for successful learning, and that students may need a range of strategies to regulate their own learning (Marsh, Hau, Artelt, Baumert, & Peschar, 2009). Aside learning strategies, motivation plays an important role because it is a major predictor of academic performance (Gasco *et al.*, 2014). It is an essential recipe for academic achievement as it helps student in originating, altering, and maintaining information.

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Therefore, since students are the focus of learning process, a study exploring their learning strategy and goal orientation is necessary as they play pivotal roles in advancing their own learning and gaining improved academic achievement (Gbollie & Keamu, 2017). This study, therefore, tested a model seeking to explore the relationship between cognitive and metacognitive learning strategy and academic performance while taking into account the mediating role of goal orientation.

Literature Review

Cognitive learning strategies are those that work directly on the incoming information while it is being transformed into knowledge. They affect the way in which learners select, acquire, organize or assimilate new information so that it can become meaningful and applicable. The strategies including rehearsal, elaboration, organization, critical thinking, and metacognition ensure the retrieval of knowledge from where it was stored as long-term memory; so that it can be applied in an individual's life (Alderman 1999; Kruger & Adams 2010; Mayer, 2008; Monteith, 1997). Cognitive strategies such as elaboration and organization engage the contents at deeper level and are likely to remember information and retrieve it later, and succeed in the studies (Pintrich, Roeser, & de Groot, 1994).

Kellogg (2003) viewed rehearsal as a strategy used to keep information in the short-term memory usually via repetition. Rehearsal could be maintenance or elaborative in nature (Eysenck, 2001), basic rehearsal or complex rehearsal (Alderman, 1999). Maintenance rehearsal, like basic rehearsal for tasks, involves the recycling or repetition and recitation of information to keep it within the short-term memory. It is connected with rote learning and often with no understanding of the learning content; it is ineffective in encoding and storing information. Even so, it aids students to obtain the basic knowledge, which could be built to more advanced knowledge (e.g., sequencing events and items, multiplication tables, and letters of the alphabet). Examples of the maintenance rehearsal strategies include copying verbatim notes, and repeating or reciting information (Van der Vyver 2000).

Elaborative rehearsal is a relatively more effective strategy for the facilitation of maintenance, and for the understanding of acquired information. Examples of elaborative rehearsal include the re-reading of text, using mnemonic devices, and highlighting, underlining and spontaneous note taking, or the summary of notes. In elaborative rehearsal strategy, the learner participates actively by making internal connections between the information processed and their prior knowledge, which exists in the long-term memory as the learner rehearsed. Due to the linkage, the newly gained information acquires a deeper meaning and becomes more comprehensible, easy to retain, and to retrieve from the memory through this elaboration process (Eysenck 2001; Kellogg, 2003). Elaboration-strategies can be used for basic tasks in the form of imagery and paired associated learning (Alderman 1999; Eysenck 2001; Howe 1998). Elaboration for complex tasks or deeper-level processing, diagrams, paraphrasing, summarizing, generative note-taking, analogies, comparing and contrasting, as well as problem-solving are some of the elaboration strategies teachers can use to integrate the new information with knowledge stored already in the learners' long-term memory. It helps learners to gain a deeper level of understanding of the information (Anderson 2000; Lopez 2000; Kellogg 2007).

Kruger and Adams (2010) state that strategic learners rearrange information into another format that is easier to understand by using organization strategies. Thus, the new information becomes part of the existing network or knowledge-schema in the long-term memory, and easily accessible for recall. Examples of organization for basic tasks are chunking, clustering and ordering (Lehman *et al.*, 1998). Some strategies for the organization of information for complex tasks include functions such as outlining, identifying the main ideas in a text, creating concept hierarchies, maps and line diagrams (Anderson 2000; Gunning, 2005; Van Loggerenberg, 2000).

Individual's thoughts, knowledge and beliefs about own cognitive processes, as well as about personal, contextual and task characteristics is Meta-cognitive strategy (Mayer 2008; Woolfolk, 2010). Learners have to manage all the categories of knowledge in order to help create a favorable emotional and motivational climate set learning goals, plan, monitor (including comprehension monitoring) their learning progress, and take the necessary corrective action and to cue retrieval of information from memory. From this knowledge, learners can direct and coordinate their cognitive, motivational and affective processes (Chan & Moore 2006; Hacker 1998). Research conducted over years, acknowledged the important role of learners' knowledge and use of cognitive and meta-cognitive strategies as an essential ingredient for active, autonomous and successful learning. Theory of motivation (intrinsic and extrinsic) posits that the intentional and effortful nature of strategic learning requires that learners should be well motivated if they are to succeed (Chan & Moore 2006; Schunk 2003; Pintrich & Schunk, 2002; Watkins & Coffey 2004).

Goal orientation is the student's perception of the reasons why he/she is engaging in a learning task. The reason could be intrinsic or extrinsic and the value of an academic task is what energizes learners. Intrinsic goal orientation explains the extent a student perceives herself to be participating in a task for reasons, which include; challenge, curiosity, and mastery. Having an intrinsic goal orientation towards an academic endeavor

suggests that the student's participation in the task is an end to itself, instead of being a means to an end (Hofer & Yu, 2003; Pintrich, 2003; Pintrich, McKeachie, & Lin, 1987). Extrinsic goal orientation supports intrinsic goal orientation, and explains the extent a student perceives herself to be participating in educational task for purposes such as grades, rewards, performance, evaluation by others, and competition. When a student is high in extrinsic goal orientation, he sees learning task as the means to an end. The main concern the student has is related to issues that are not directly related to participating in the task itself (such as grades, rewards, comparing one's performance to that of others) (Hofer & Yu, 2003; Pintrich, 2003; Pintrich, McKeachie, & Lin, 1987). Task value differs from goal orientation. Value entails the student's evaluation of the how interesting, important, and useful the task is. It is the students' perceptions of learning in terms of interest, importance, and utility.

Internal and external goal orientations and task value are factors, which stimulate desire and energy in students to sustain interest and commitment to their study or make efforts towards accomplishing the academic target. Alderman (2004) posits that students who have optimum level of goal orientation have an advantage because they have adaptive attitudes and strategies, such as sustaining intrinsic interest, goal setting, and self-monitoring. Students who are self-regulating, set goals or plans, and who try to monitor and control their own cognition, motivation, and behavior predicated upon these goals are more likely to do much better and progress in school (Zimmerman & Martinez-Pons, 1990).

Methods

Design

The study used the correlational research design to explores cause and effect.

Participants

Table-1. Descriptive analysis of participant's characteristics

Gender	*Frequency*	*Percent*	χ^2	*p*
Male	199	62.8	20.697	.000
Female	118	37.2		
Total	317	100.0		
Age range				
15-17	218	68.8		
18-20	99	31.2	44.671	.000
Total	317	100.0		

The research sample was 317 senior secondary school students from the three senatorial districts of Kaduna state, Nigeria comprising of 199 [62.8%] male and 183 [37.2%] female students. The difference in the sample based on gender is significant, χ^2 (1) = 20.697, $p < .001$. The respondents differ significantly in age, χ^2 (1) = 44.671, $p < .001$, as over 68% were between ages 15-17, while 31.2% were between ages 18-20.

OUTCOME MEASURE

Cognitive and Metacognitive Learning Strategy Questionnaire.

Cognitive and metacognitive learning strategy was a 30-item instrument used to measure the independent variable. The instrument consists of rehearsal; assessed by four items, elaboration; six items, organization; four items, critical thinking; five items, and metacognitive self-regulation, assessed by eleven items. Pintrich *et al.,* (1991), motivated strategies for learning questionnaire provides the items used to form the instrument. The response was a five-point Likert pattern ranging from strongly agree to strongly disagree, and was coded 5 – 1. A pilot test of the scale carried out yielded a Cronbach alpha of .793. The reliability coefficient was adequate (Creswell, 2002).

Goal Orientation Questionnaire

Goal Orientation Questionnaire consists of 14 items with four items each measuring intrinsic goal orientation and extrinsic goal orientation, while six items measure task value. Pintrich *et al.,,* (1991), motivated strategies for learning questionnaire provides the items used to form the goal orientation instrument. The response was a five-point Likert pattern ranging from strongly agree to strongly disagree, and was coded 5 – 1. A pilot test of the scale carried out yielded a Cronbach alpha of .831. The reliability coefficient was adequate (Creswell, 2002).

Student Academic Performance.

To determine student academic performance, the researcher used the scores of terminal examination of the senior secondary school students. The subject scores collected were Mathematics and English language.

Data Collection

The instruments were administered to the subjects on days approved by the school authorities for the exercise. Two research assistants assisted the investigator in the administration and collection of the instruments. Overall, data collection lasted for three days. All the three hundred and seventeen questionnaires distributed were properly filled in, returned and considered useful for research purpose.

Data Analysis

All data analyses were performed using AMOS ver. 24. (Arbuckle, 2016). A P value < 0.05 was considered statistically significant. Continuous variables are shown as Mean±SD and Pearson's correlation coefficient was used to examine zero order relationship among cognitive and metacognitive learning strategy, academic goal orientation, and academic performance.

In addition, path analysis was conducted to test the validity of the model. To determine the fit of the hypothesized path model, the chi-square test was used. A no significant p-value of the chi-square represents a good model fit. The χ^2 statistic is dependent on sample size. Therefore, with increasing sample size, good models might be rejected (Schermelleh-Engel & Moosbrugger, 2003; Ding *et al.*,, 1995; Gerbing & Anderson, 1992). Four other goodness-of-fit indices were also used: The Comparative Fit Index (CFI), Goodness of Fit Index (GFI), the Tucker-Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA). For the model to fit, the CFI, GFI and TLI should be ≥ 0.95 and the RMSEA preferably lower than 0.05 (Kleijn, van Heck, & van Waning, 2000; Schermelleh-Engel & Moosbrugger, 2003; Ding *et al.*,, 1995; Gerbing & Anderson, 1992). The value of RMSEA shows a fit close to good when it produces a value between 0.05 and 0.08. An RMSEA value falling between the range of 0.08 - 0.10 are stated to indicate a fit, which is neither good nor bad. Hu and Bentler (1999) stated that RMSEA index smaller than 0.06 would be a criterion that will suffice. A number of researchers stated RMSEA was a fit index, which is also affected by sample size (Marsh *et al.*, 2004; Schermelleh-Engel and Moosbrugger, 2003; Cangur, & Ercan, 2015). In this study, the interrelationships of the different variables in the model were stated in terms of standardized regression weights. The regression weights denote the strength of a relationship, while taking into account the other relationships supposed in the model. The regression weights' understanding is, for each point increase in a z-score of the causal variable, the consequence variable will increase or decrease by the standardized regression weight.

Results

Table-2.Input data (zero-order correlation, mean and standard deviation) for analysis of a non-recursive path model of relationship among cognitive metacognitive learning strategies, goal orientation, and academic performance

VAR.	*MET*	*THK*	*TAS*	*EXT*	*INT*	*MAT*	*ENG*	*ORG*	*RE*	*ELA*	$\bar{X}$ *SD*
MET	1.000										52.738±6.744
THK	.605	1.000									22.319±2.848
TAS	.691	.652	1.000								25.202±3.315
EXT	.613	.560	.942	1.000							16.533±2.275
INT	.758	.745	.858	.733	1.000						17.562±2.347
MAT	.387	.233	.374	.353	.443	1.000					61.704±6.256
ENG	.875	.522	.607	.539	.678	.387	1.000				52.830±6.810
ORG	.598	.526	.685	.597	.820	.440	.557	1.000			17.767±2.244
RE	.694	.566	.742	.644	.816	.491	.646	.740	1.000		17.637±2.121
ELA	.615	.462	.600	.556	.552	.389	.569	.408	.516	1.000	25.669±3.331

Note: MET = Metacognitive Self-Regulation; THK= Critical Thinking; TAS = Task value; EXT = Extrinsic; INT = Intrinsic; MATH = Mathematics; ENG = English language; ORG = Organization; RE = Rehearsal; ELA = Elaboration

Table 2 shows zero-order correlation among variables entered into the path model. It shows significant strong positive zero-order correlation between metacognitive learning strategies and academic performance in English language, r = .875, p < .0001, and performance in mathematics, r = .387, p < .0001. Critical-thinking strategy correlate significantly with academic performance in English language, r = .522, p < .0001, and Mathematics, r = .233, p < .0001. Task value significantly correlated positively with academic performance in English language, r = .607, p < .0001, and Mathematics, r = .685, p < .0001. In addition, extrinsic goal orientation positively and strongly correlated with a student academic performance in English language, r =.539, p < .0001, and Mathematics, r = .353, p < .0001. Further results showed strong correlation between intrinsic goal orientation and performance in Mathematics, r = .443, p < .0001, intrinsic goal orientation and performance in English language, r = .678, p < .0001. There was also a

significant relationship between organization and performance in Mathematics, r = .440, p < .0001, and in English language, r = .557, p < .0001, rehearsal and performance in Mathematics, r = .491, p < .0001, and in English language, r = .646. Elaboration strategy also significantly correlated with performance in mathematics, r = .389, p < .0001, and in English language, r = .569, p < .0001. Generally, all the variables correlate strongly and positively with R-values ranging from .233 (critical thinking & and Mathematics) to .942. (task value and extrinsic goal orientation).

To examine the comprehensive (direct, indirect, and total) relationship between studied variables, a path model was fitted (Arbuckle, 2016), to assess how well the model fit the data. Figure 1 and 2 showed the standardized and unstandardized path coefficients for the relationships among the variables on the model. It also showed the goodness of fit indices. Based on the fit indices, the hypothesized model fit the data quite well. Goodness of Fit Index (GFI), the Comparative Fit Index (CFI), and Tucker-Lewis Index (TFI) indices reached optimal levels ≥.95 at .967, .988, and .972 respectively, while CMIN/DF = 2.991 < 3. Finally, the RMSEA value for the present model was .079 (90%CI = .057 - .103), clearly falling within optimal levels ≤ 0.08, which is an indicator of a good fit (Cangur, & Ercan, 2015). The χ^2 (20) = 59.818, p < .001 violate the rule of fit indices. However, this study used a large sample size of 317 and chi-square test is always sensitive to large sample size (Marsh *et al.*, 2004; Schermelleh-Engel and Moosbrugger, 2003; Cangur, & Ercan, 2015), so the model cannot be discarded because p value is < .0001. Other fit indices showed the model correctly fit the data.

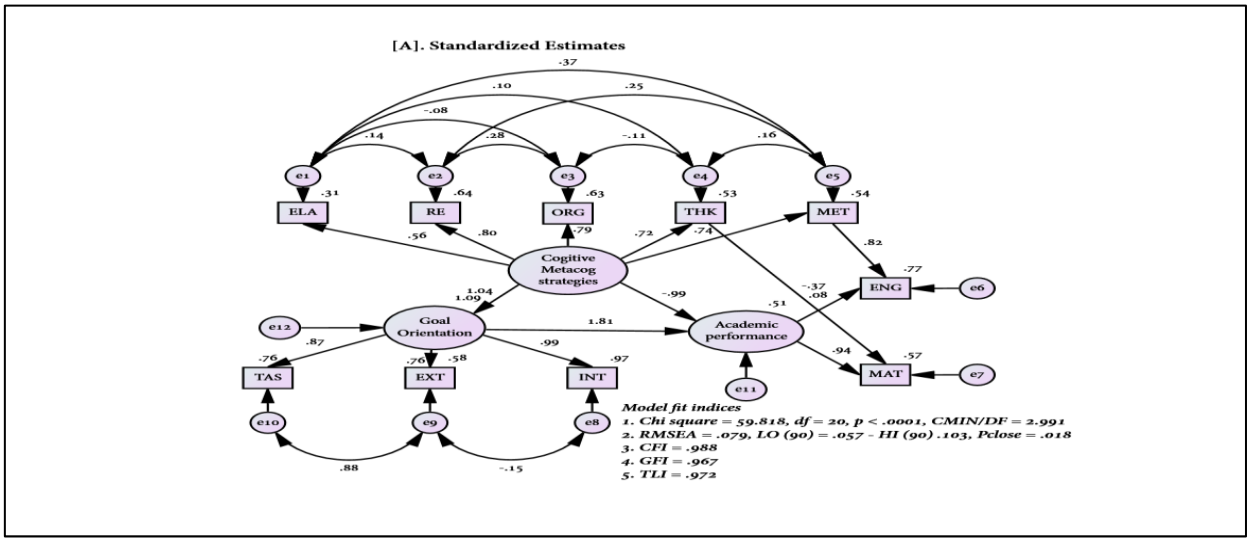

Figure-1. A non-recursive path model of standardized relationship among cognitive and metacognitive learning strategies, goal orientation, and academic performance

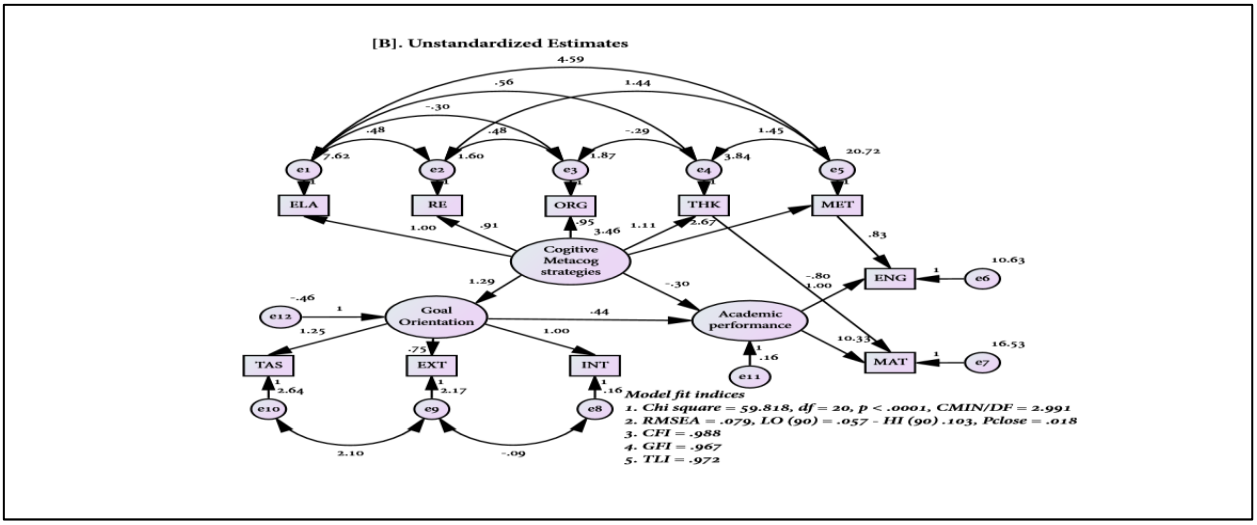

Figure-2. A non-recursive path model of unstandardized relationship among cognitive and metacognitive learning strategies, goal orientation, and academic performance

Table-3.Regression coefficients for structural equation model showing direct, indirect and total effects

Variable	*Cognitive Metacognitive strategies*			*Goal Orientation*			*Academic performance*		
	Direct	*Indirect*	*Total*	*Direct*	*Indirect*	*Total*	*Direct*	*Total*	R^2
GO	1.042		1.042						1.086
AP	-.993	1.883	.891	1.807		1.807			.512
MET	.737		.737						.544
THK	.725		.725						.525
TAS		.908	.908	.871		.871			.759
EXT		.793	.793	.761		.761			.579
INT		1.027	1.027	.985		.985			.971
MAT		.572	.572		1.699	1.699	.940	.940	.574
ENG		.679	.679		.151	.151	.083	.083	.770
ORG	.791		.791						.626
RE	.801		.801						.642
ELA	.559		.559						.313

Note: MET = Metacognitive Self-Regulation; THK= Critical Thinking; TAS = Task value; EXT = Extrinsic; INT = Intrinsic; MATH = Mathematics; ENG = English language; ORG = Organization; RE = Rehearsal; ELA = Elaboration; GO = Goal orientation; AP = Academic performance

Table 3 shows the regression coefficients for structural equation model indicating direct, indirect and total effects of cognitive metacognitive learning strategies on academic performance of secondary school students after moderating the role of academic goal orientation. The result shows cognitive metacognitive learning strategies directly predict academic performance negatively, $\beta = -.993$, $p < .001$, and indirect, $\beta = 1.883$. Total effects of cognitive metacognitive learning strategies on academic performance via goal orientation pathways is positively significant, $\beta = .891$, $p < .001$. The effects was less in mathematics, $\beta = .572$, $p < .001$, than in English language, $\beta = .679$, $p < .001$. The independent variable indirectly accounted for 51% variance in academic performance, 77% in English language and 57% in mathematics. All the predictor variables loaded high indicating significant contribution of each of the variable to the model. For instance, rehearsal strategy contributed 64.2% variance while intrinsic goal orientation account for 97.1% variance.

Discussion

The basic of the study is to examine a model explaining the mediating effects of goal orientation on the connection between cognitive and metacognitive learning strategies and academic performance of secondary school students in Nigeria. The study outcome showed there is a significant positive relationship between cognitive and metacognitive learning strategies and academic performance of secondary school students. Goal orientation was found to make a significant positive contribution on the connection between the explanatory variables and the observed variable. Generally, the model strongly predicts academic performance of students. Previous research suggests that students' learning strategies are related to academic performance (Barbara *et al.,* 2001; Deryakulu *et al.,* 2010; Hill 2012). It is a reasonable conjecture that effective study strategies usually result in greater learning. The concept of 'learning strategies' consists of a wide variety of behaviours and learning activities (Yip, 2013). For example, they include note-taking, organizing information, scheduling, the ability to concentrate, personal motivation, and ways of mentally storing information (Minnaert & Janssen, 1992). The relationship between learning strategies adopted by students and their academic performance is demonstrated by many studies (Yip, 2013; Akyol, Sungur, & Tekkaya, 2010; Weinstein, Husman, & Dierking, 2000). Yip (2013) found that there were clear differences in the learning strategies used by high school students with high academic performance, compared to those with low academic performance. Garg (2011) found that learning strategy was a good predictor for the academic performance of students. However, educational researchers believe that a good mixture of learning and study strategies should be taken into consideration. Yip *et al.,* (2013) in their previous studies, concluded that there were some important differences in the learning and study strategies between high academic achievers and low academic achievers, demonstrating the effects of learning strategy and academic performances of students (Yip, 2007, 2009, 2012; Yip & Chung, 2005). The use of learning strategies (cognitive, meta-cognitive and affective), enhances learner-achievement and learner self-efficacy perceptions, thus promoting learner autonomy and lifelong learning (Rickard 2004; Monteith 2010; and Muthukrisna 2010).

The outcome, in addition, shows that rehearsal strategy contributed higher than other learning strategies in predicting academic performance among the study sample. This was significantly aided by goal orientation of intrinsic nature. Gbollie and Keamu (2017) in their study reported that rehearsal strategies were found to be the most frequently used among the

study sample. Although, rehearsal-learning strategy indicates only shallow information processing, the result of this study is not surprising because memorization has been a major part of learning strategy in the study area. Therefore, the comparatively strong impact of memorization or rehearsal strategy may possibly have to do with the cultural setting. In the predominantly Hausa community in the northwestern part of Nigeria, culture places greater premium on heritage and tradition, and rehearsal or memorization is a traditional part of learning in the study area. Since most of the respondents were probably born and brought up in such a background, students may unsurprisingly use memorization commonly as the preferred method of learning in school. In this study sample, nonetheless, the rehearsal strategy aided academic performance through intrinsic goal orientation.

CONCLUSIONS

The study concludes that cognitive and metacognitive learning strategies positively affect the academic performance of students through goal orientation with rehearsal strategy and intrinsic goal orientation contributing higher variation to the model. It is therefore possible that students' academic performance will greatly improve if teachers encourage and emphasize in students, goal orientation of intrinsic nature, and rehearsal learning strategy, both basic and elaborative. It should be noted importantly however that the outcome of this study is not absolute since data collected were subjective and bias. Other variables may help explain the extent of the effects among the study sample. Therefore, further investigation using objective means to measure the explanatory variables may give more clarity on the mediating role of goal orientation.

Conflict of Interest

Author has declared that no competing interests exist.

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