RESEARCH ARTICLE

Metacognition as a Correlate of Academic Achievement Among High School Students in Nairobi County, Kenya

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Abstract

Academic success stands as a pivotal indicator of achievement globally. However, the prevalence of subpar academic performance persists in numerous educational institutions. Numerous studies have identified correlation of metacognition with academic success among high school students. Interestingly, there exists a notable gap in research within Nairobi City County, regarding this subject matter. Therefore, the present study endeavor to explore the relationship between metacognition and learners' academic achievement. The theoretical foundation of the study was cognitive monitoring model. The study employed a correlational research design. The sample involved 376 (188 boys and 188 girls) form two students. Pearson product moment correlation was used to test the null hypothesis that there is no relationship between metacognition and academic achievement. Results of the study showed a significant relationship between metacognition and academic achievement r (363) =.13, p <.05. The multiple regression was used to test predictive index of metacognitive knowledge and regulation. The sub-scale of metacognitive knowledge and metacognitive regulation had a positive predictive index of (β=.07) and (β=.09) on academic achievement. The results of this study are important and form basis upon which policy makers can contribute to the creation of a more informed, evidence-based educational system that prioritizes metacognitive skills development for improved academic achievement.

Keywords

Metacognition; Metacognitive Knowledge; Metacognitive Regulation; Academic Achievement

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Introduction

Globally, academic achievement is considered the most important determinant of success (Olivier, Archambault, De clercq, & Galand, 2019). Formal education systems revolve around academic achievement and reflect students' overall holistic development. Thus, learner's academic achievement is a priority for educators, researchers, psychologists and policy makers. Overall, high school serves as a formative period in students' lives, shaping their thinking, academic abilities, and personal development. The skills and experiences gained during high school greatly influence their success in university and future endeavors. Researchers and educators have continued to explore various academic achievement mediators among secondary school learners with the goal of improving academic achievement. However, the escalating trend of academic underachievement within Nairobi County, Kenya, has sparked considerable concern among education stakeholders. For instance, in 2017, 2018, and 2019 learners who achieved a C+ or higher upon entering a university were 11.38%, 13.77% and 18 %, respectively. In 2020 and 2021 candidates who attained university entry grade of C+, the least grade for entry in public university in Kenya declined from 19.03% to 17.49% respectively (Kenya National Examination Council, 2020). These statistics underscore a troubling pattern of academic underperformance among students in Nairobi County, suggesting systemic issues that require urgent attention and intervention from education authorities and policymakers.

Previous research on factors influencing academic achievement has primarily focused on external factors, such as facilities (e.g., insufficient library resources, inadequacies in

laboratories), teachers' roles (e.g., lack of proper guidance, ineffective teaching strategies, inadequate support), and environmental conditions (e.g., noise levels, lighting, temperature, and overall learning space comfort). However, it is increasingly recognized that affective factors intrinsic to the learner may also significantly impact academic outcomes. One such factor that has garnered attention among researchers in developed nations is metacognition. The studies conducted in Western populations cannot be generalized to other population such as Kenya due to cultural diversities. Researchers hypothesize that the relationship between metacognition and academic achievement may vary based on the geographical location and academic discipline of study (Nongtodu *et al*., 2017).

Several studies have attributed academic achievement of secondary school learners to various aspects of metacognition in the learning environments (Guo & Leung, 2021). The awareness and observation of one's own thoughts and performance on tasks is referred to as metacognition (Shamir *et al*., 2009). Metacognition (metacognitive knowledge and metacognitive regulation) gives learners the ability to direct their own learning, making it a strong predictor of academic achievement (Amzil & Stine, 2013). When learners' have information about their own thinking, they can use it to control their learning. Learners who achieve high scores are believed to employ metacognitive strategies in learning tasks (Guo & Leung, 2021). Learners with high level of metacognition are conscious of their role as learners, understand the demands of the tasks, and utilize effective strategies to assess their progress and overcome any deficiencies (Perry, Lundie, & Golder, 2019). Metacognition helps learners to plan their academic activities carefully, monitor their learning progress and evaluate academic outcomes at the end of a learning session. Metacognitive knowledge and metacognitive regulation are the two interrelated domains of metacognition. Metacognitive regulation refers to the capacity to control one's thought processes. Some of the terms used to describe metacognition include metacognitive awareness, metacognitive beliefs, metacognitive skills, and metacognitive experiences. Metacognitive knowledge is the understanding of how certain factors influence the progress and outcome of cognitive endeavors.

Different scholars (Abdelrahman, 2020; Tibken, Richter, Schmiedeler, & Schneider, 2022; Osuafor, & Obimezie, 2021; Jalelel, 2016) have proposed and tested hypothesis relating to metacognition and academic achievement and their mediating variables among leaners in order to provide insight to educators into the underlying cognitive processes and practical tools that may contribute to successful learning. (Chai, King, Law, & Mclnerney, 2019) sought to investigate the correlation between metacognition and academic achievement within the context of Hong Kong. The Researchers used a research survey that included 6,290 respondents. Insights gleaned from the analysis confirmed results of (Abdelrahman, 2020; Tibken, Richter, Schmiedeler, & Schneider, 2022) underscoring the positive association between metacognition and academic achievement.

Elsewhere, (Osuafor, & Obimezie, 2021) investigated impact of metacognitive learning cycle on learners' mathematics achievement in Nigeria high schools. Researchers employed a quasi-experimental design and selected 150 participants using simple and purposive sampling techniques. Analysis demonstrated a notable disparity in the average achievement scores of students who were taught mathematics using the metacognitive learning cycle.

Jalelel (2016) explored metacognition of learners attending high school in India. The author surveyed 180 participants. Research outcome revealed non-significant association between metacognition and academic achievement. Importantly, the author's research had a smaller sample size in contrast to the 376 learners involved in the present research. Larger sample sizes assist researchers to reduce the possibility of reporting false-negative or false-positive results. The bigger the number of samples, the greater the precision of the results (Cresswell, 2009).

The majority of literature concerning the nexus between metacognition and academic achievement predominantly originates from studies conducted within Western populations. Consequently, the findings derived from such studies may not be readily generalizable to other populations, such as Kenya, where cultural diversities significantly influence educational dynamics. It is hypothesized that the association between metacognition and academic achievement may be contingent upon various factors including locale, level of study, and academic field of study (Nongtodu & Bhutia, 2017). Therefore, the significance of a study like this lies in its capacity to facilitate comparative analyses of results across diverse cultural and educational contexts.

Theoretical Framework

John Flavell coined the cognitive monitoring model in the 1970s. It encompasses all of the procedures used to control our thought processes. Components of metacognition include meta-cognitive knowledge and metacognitive regulation. Metacognitive knowledge is the understanding of how certain factors influence the progress and outcome of cognitive endeavors. Metacognitive knowledge helps learners to manage their expectations, set realistic goals and career path as well as avoiding frustrations. Learners understanding of their strength help them to risk even in learning tasks that may be challenging hence, developing growth mindset.

Flavel (1979) suggests that meta-cognitive regulation is the ability to control thought processes, for instance remembering past experiences and using them as resources to address present-day cognitive challenges.

A good learner may use successful strategies employed in past, to plan for more deep learning strategies that can lead to higher academic achievement. Metacognition is a valuable tool in learners learning as it encourages reflection on one's knowledge, identity, aspirations, and strategies for reaching specific goals (Flavel, 1979).

This model was relevant to this study since it increased understanding of how metacognitive knowledge, metacognitive experiences, goal and strategy interact to facilitate the high academic achievement of learners. Additionally, the model offers educators a theoretical foundation for understanding the intricacies of learning and memory, as well as how the model can be applied to instructional design to create a more effective learning environment. (Tripathi, & Tiwari, 2023; Pradhan, & Das, 2021; Abdelrahman, 2020; Celik, 2022) utilized the theory to investigate the research hypothesis concerning the relationship between metacognition and academic achievement. Despite variations in research design, study locale, and participants, the findings of these studies contributed to understanding the role of teachers in the learning process. Learners' comprehension of their strengths and weaknesses aids in the selection of individualized learning strategies.

Materials and Methods

Design

In current research a correlational research design was utilized. As per (Fraenkel, & Hyun, 2012), a correlational research design is used to assess strength of association between multiple variables without altering them, making it a suitable choice for this research.

Research Methodology

This study used quantitative methods whereby questionnaires were used to collect data. Quantitative research involves gathering and examining numbers to characterize phenomena, identify relationships or test hypotheses. This method is relatively fast, cheap and in a short amount of time a lot of data can be gathered (Mackay, 2014).

Participants of the Study

The desired number of participants was determined using Yamane (1967) formular. A total of 376 form two students were purposively selected. There were 10 secondary schools involved in the study, with 2 boarding girls', 2 girls' day, 2 boarding boys', 2 boys' day and 2 mixed schools.

Data Collection Instruments

Researcher adapted self-report questionnaires to collect data. Metacognitive Awareness Inventory (MAI) (Schraw, & Dennison, 1994) was adapted. In determining whether multiple items that aimed to measure the same general construct resulted in similar scores, the internal consistency method was crucial. The Instruments had a Cronbach alpha of .90. Instruments that have a Cronbach alpha of .8 or higher, are reliable to be used in studies (Cresswell, 2009).

The instrument consisted of 52 items with true or false statements. Every “true” answer was scored as 1 (one) point while every “false” answered was scored as 0 (zero) point. A high score demonstrated a high level of metacognition awareness, whereas a low score demonstrated a low level of metacognitive awareness. This tool had a total score range of 0 to 208.

The researcher reviewed the achievement records for midterm and end of term one for the year 2023 to obtain the academic achievement of the students in form two. The Pearson product moment correlation coefficient was used. This test is employed when assessing the

correlation between two variables, assuming that both variables follow a normal distribution. Additionally, a t-test for independent samples was used to test gender differences in metacognition. Further, multiple regression was used to test the predictive weight of metacognitive subscales on academic achievement. This test is employed in examining the correlation between a sole dependent variable and multiple independent variables.

Data Collection

The researcher explained the broad purpose of study, sought consent and assured participants confidentiality of the information they provided. The participants were allowed to fill your questionnaire during the prep time (supervised study time) and it took 40 minutes. The researcher also took measures to ensure research did not subject participants to any risks.

Results

Research primary goal was to investigate how metacognition functions as a correlate for academic achievement among form two leaners in public secondary schools.

Descriptive Statistics

Descriptive statistics serve as a fundamental tool for data exploration, laying the groundwork for meaningful inferential analyses. Table 1 presents the descriptive statistics of metacognition.

Table 1. Descriptive Statistics for Metacognition.

N	*Range*	*Min*	*Max*	*Mean*	*SD*	*Sk*	*Kur*
363	176	82	258	185.32	32.70	-.56	.32

Note. *N*=363, *MIN*=Minimum, *MAX*=maximum, *SD*=Standard deviation, *SK*=Skewness

Findings as shown in Table 1 indicated minimum and maximum scores for the scale was 82 and 258, respectively with a range of 176. The mean score was 185.32 (SD= 32.70), while the coefficient of skewness was -.56. This implies that students rated themselves high on this scale. This meant that many students had high self-awareness on their learning and demands in various learning tasks. The kurtosis score was .32 which reflected leptokurtic distribution of the scores indicating that the scores concentrated around the mean. Table 2 highlights gender differences in academic achievement.

Table 2. Gender Differences in Academic Achievement.

	Gender	*N*	*Mean*	*Std Deviation*
Academic Achievement	Boys	168	31.12	11.19
	Girls	195	29.98	8.09

Note. N=363

As shown in Table 2, mean for the academic achievement t-score for boys and girls was 31.12 (SD=11.19) and 29.98 (SD=8.09), respectively. Therefore, this meant that boys performed better compared to girls. Table 3 presents gender differences in metacognition.

Table 3. Gender Differences in Metacognition.

	Gender	*N*	*Mean*	*Std Deviation*
Metacognition	Boys	168	179.81	34.83
	Girls	195	164.29	30.12

Note. N=363.

As indicated in Table 3, boys had greater mean 179.81 (SD = 34.83) than the girls 164.29 (SD= 30.12) in metacognition. As a result, the findings could be used to explain why boys were performing better than the girls.

Results on the relationship between metacognition and academic achievement are presented in Table 4.

Table 4. Correlation between Metacognition and Academic Achievement.

		Metacognition	
Academic Achievement	Pearson Correlation	1	.13*
	Sig. (2-tailed)	.00	

* Correlation is significant at the .05 level (2-tailed).

As shown in Table 4, there was a significant relationship between metacognition and academic achievement r (363) =.13, p <.05. This meant that that there is a meaningful association between metacognitive abilities (the capacity to monitor, regulate, and evaluate one's own learning processes) and academic achievement (the level of success attained in educational pursuits). In other words, individuals who demonstrate higher levels of metacognitive skills tend to perform better academically. The implication of this significance underscores the pivotal role of metacognitive skills in the learning process and underscores the potential for targeted interventions to support student success.

Additional analysis was conducted to identify which of the two sub-scales predicted academic achievement better. Research findings are presented in Table 5.

Table 5. Beta coefficients for the Prediction of Academic Achievement from Sub-scales of Metacognition.

Unstandardized Coefficients			Standardized Coefficients		
1	B	Std. Error	Beta	t	sig
(Constant)	27.04	3.181	-	8.499	.00
Metacognitive K	.06	.05	.07	1.12	.27
Metacognitive R	.04	.03	.09	1.51	.13

a Dependent Variable, Academic Achievement

The prediction equation was developed as follows:

$\hat{y}$ =27.04+.07 MK +.9 MR

Data in Table 5 showed the two sub-scales of metacognition were positively and significantly correlated with academic achievement. The sub-scale of metacognitive regulation had the highest correlation of (r (363) =.12, p <.05 while metacognitive knowledge had the least correlation of (r (363) = .11, p <.05. This meant that students who effectively manage their learning strategies, set appropriate goals, monitor their progress, and adjust their strategies as needed are more likely to achieve higher levels of academic success. This implies that, by teaching learners how to plan their learning, monitor their understanding and regulate their study behaviors may ultimately lead to improved academic outcomes.

Discussions

Research findings showed there was a significant relationship between metacognition and academic achievement. The study supported Flavell's 1979 model, in emphasizing role of metacognition in enhancing academic achievement. The model suggests that self-awareness of one's thoughts and ability to apply various learning strategies such as mnemonic aids lead to more profound learning and performance as was witnessed in the respondents' academic achievement.

The positive predictive index of both metacognitive knowledge and metacognition meant that an increase in both subscales of metacognition led to increase in academic achievement. The understanding of how certain factors such as consistent achievement of good grades influence the progress and outcome of cognitive endeavor as well as ability to control thought processes have a positive impact on leaners academic success (Flavell 1979). Metacognitive knowledge aids learners in understanding strengths and flaws as well as allocating more time in various difficult learning tasks. This can lead to high academic achievement and increase learners' confidence.

The observed relationship between metacognition and academic achievement aligned with the findings of a prior study carried out by Chai *et al*. (2019) in Hong Kong. The study investigated how metacognitive strategies and academic achievement are related. These studies have revealed similar findings with current study regardless of the difference in the study designs and study population. While Chai *et al*.'s research utilized survey method to sample and collect data among university students, current research used correlational research design and respondents were high school learners. The implications of these outcomes are that, despite different schooling level, metacognition was significantly related to academic achievement.

Current research outcomes also agreed with Osuafor *et al*. (2021) research that looked at the effects of metacognition learning cycle on learners' achievement in Mathematics in Nigeria. The study used quasi-experimental design and research respondents was drawn from Nigeria. Research implication was that, despite the cultural differences among the students, metacognition was significantly related to the students' academic achievement.

In addition, outcome of the current study concurred with the findings of a previous research by (Onguti, & Nyakinda, 2019) in Kenya. The study examined metacognitive monitoring as a predictor of Mathematics achievement. Social Development Theory (Lev Vygotsky, 1978) was used while the current study used cognitive monitoring model (Flavell, 1979) to explain role of metacognition in students' academic achievement. The implication of the outcomes was, irrespective of different metacognition theories, metacognition was significantly related to academic achievement.

Limitations

This study exclusively involved form II students from selected high schools within Nairobi County. The data was collected using self-report questionnaires and this may affect the results through biased self-reports. The researcher employed a correlational research design without establishing a cause-effect relationship. It is therefore necessary to conduct similar research using different designs like experimental design to compare results.

Conclusions

The main objective of the study was to investigate the relationship between metacognition and academic achievement. Research analysis output indicated a significant relationship between metacognition and academic achievement. The metacognitive knowledge and regulation subscales had a positive impact on academic achievement. This meant that, the ability of the learner to understand task demands, set realistic goals as well as adapting realistic strategies may increase learners' academic performance. Instructors should use learners' knowledge of their experiences in the past to lay foundation of new knowledge. Knowledge should be taught from general to specific. Teachers should only guide learning to increase content retention among students. The cognitive monitoring model places a strong emphasis on the need for educators to strive to create flexible, creative classroom environments that prioritize strategic learning (Flavell,1979). This method helps learners to verify, clarify and expand the knowledge they have.

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