

EFFECT OF METACOGNITIVE PLANNING STRATEGY ON TEST ANXIETY AMONG LOW ACHIEVING SECONDARY SCHOOL STUDENTS IN MATHEMATICS IN JIGAWA STATE, NIGERIA

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Abstract

A quasi experimental design involving pretest-posttest control group was adopted for the study. Simple random sampling technique was used in selecting two schools out of ten schools in the study area. Samples of twenty students out of those identified with low achievement in mathematics were used to serve as treatment and control groups. The treatment group was exposed to six weeks training of metacognitive planning strategy while the control group did not receive any treatment. The instrument used was Westside Test Anxiety Scale. The hypothesis was tested using independent t-test. The finding of the study revealed that significant difference exist between the treatment group that received metacognitive planning strategy training and the control group that received no treatment, the ($t = 3.374, p = 0.003$). Significant difference also exist in the effect of metacognitive planning strategy in reducing test anxiety among male and female low achieving secondary school students in mathematics ($t=2.885, p=0.010$). It was recommended that school counselors and teacher should be exposed to metacognitive planning strategy in order to reduce the test anxiety of secondary school students in mathematics.

Keywords: Metacognition, planning strategy, low achieving, test anxiety, mathematic

Introduction

Planning refers to the appropriate selection of strategies and the correct allocation of resources that affect task performance. Students often use planning skill in order to regulate their learning and have an experience of mastery of a particular learning material, in order to achieve the desired learning aims and objectives. The use of meta-cognitive strategies by students in order to regulate their learning is widely considered to be the most elaborated form of learning and is often assumed to be one of the strongest predictors of optimal learning (Wang; Haertel, & Walberg, 1990). In educational research, it is hypothesized that students' self-regulatory efforts toward their learning goals should have a direct impact on subsequent achievement, and further, mediate linkages between dispositional factors such as cognitive abilities or contextual characteristics such as the classroom environment and achievement (Boekaerts & Corno, 2005).

Flavell (1987) cited in Etem (2013) described planning strategy as related to identification of objectives by the learner, analyzing the task to be achieved and reviewing possessed knowledge. These are the kind of strategies that a person

employs while getting prepared for learning and the things related to the planning of this process. Planning involves the selection of appropriate strategies and the allocation of resources that affect performance. Examples include making predictions before reading, strategy sequencing, and allocating time or attention selectively before beginning a task (Miller, as cited in Schraw & Moshman, 1995).

An in-depth analysis of how good and poor writers plan their writing has been presented by Bereiter and Scardamalia (1987). One finding is that the ability to plan, and knowledge about this process, develops throughout childhood and adolescence, improving dramatically between the ages of 10 and 14. Older, more experienced writers engage in more global as opposed to local planning. In addition, more experienced writers are better able to plan effectively regardless of text "content," whereas poor writers are unable to do so. These findings are typical of the developmental sequence found when studying other types of regulatory metacognition (Baker, 1989; Garner & Alexander, 1989). Older, more experienced learners possess more knowledge about cognition and use that knowledge to regulate their learning *before* they undertake a task (Schraw & Moshman, 1995).

Test anxiety is a worried, restless, agitated distress that results from tests of performance or academic ability. It affects everyone; from athletes, to students, to executives. Test anxiety can either enhance performance or hinder it, depending on whether the triggering event requires physical or intellectual performance (Salkind, 2008). Test anxiety refers to a combination of physiological, emotional, and cognitive components that are caused by the stress of taking exams and may interfere with one's concentration, planning, and academic performance (Plotnik & Kouyoumdjian, 2011). Students who experience test anxiety must deal with two components (Plotnik & Kouyoumdjian, 2011). The first component is increased physiological arousal, which is the emotional component. The second component is the cognitive component, which is excessive worrying, usually about doing poorly on exams. Excessive worrying about your performance can interfere with your ability to read accurately, understand what you are reading, and identify important concepts (Cassady & Johnson, 2002, cited in Plotnik & Kouyoumdjian, 2011). Thus, it is easy to see how excessive anxiety and worrying can decrease students' confidence and impair their studying and academic performance (Plotnik & Kouyoumdjian, 2011).

Theories about test anxiety, as noted by Salkind (2008), included cognitive interference; low performance ability and poor study habits; disabilities in processing and organizing information combined with difficulty in remembering or recalling information; unrealistic parental expectations combined with school failure; emotionality (meaning bodily reactions such as an increase in heart rate or rapid breathing) versus worry (troubled or off-task thoughts); varying levels of physical, or physiological, reactions to anxiety that either facilitate or hinder test performance; and the tendency of test-anxious children to have an anxiety reaction to specific situations (or trait anxiety) in addition to state anxiety or comorbid disorders. Comorbid disorders means that multiple disorders are experienced at the same time.

Two components of test anxiety; excessive worrying and increased physiological responses were said to impair with student's performance on exams.

Moreover, students with high test anxiety are much more likely to procrastinate than students with low test anxiety (Milgram, 1992 cited in Plotnik & Kouyoumdjian, 2011). Researchers estimate that about 20% of adults are chronic procrastinators and from 80 to 95% of students procrastinate or deliberately delay completing assignments or studying for exams (Gura, 2008b; Hoover, 2005; Steel, 2007 cited in Plotnik & Kouyoumdjian, 2011). Some of the more obvious reasons students give for procrastinating includes being lazy or undisciplined, lacking motivation, and not knowing how to organize their time or set deadlines (Ariely & Wertenbroch, 2002 cited in Plotnik & Kouyoumdjian, 2011).

However, the psychoanalytic approach would look beneath these obvious reasons and try to identify unconscious personality problems that may underlie procrastination and test anxiety. Because unconscious reasons for procrastination and test anxiety are difficult to uncover, psychologists use a variety of standard personality tests in their research

Several authors used several teaching methods to reduce students' level of test anxiety in several subjects. Samira; Parastoo; Mozhdeh; and Naeimeh (2015) compared the effectiveness of metacognitive and cognitive strategies in alleviating exam anxiety and meta-anxiety among university students. They used quasi-experimental research method along with pre-test/post-test and control groups. Their statistical population comprised all the female students of Allameh Tabatabai University. Their sample population consisted of 30 students randomly selected and assigned in three groups using available sampling methods. Exam anxiety and anxious thoughts questionnaires were subsequently distributed among the three groups. The covariance method was used to analyze the collected data. The results obtained from the covariance analysis showed that there were significant differences between the three exam anxiety groups. Also, it was shown that metacognitive and cognitive strategies had similar effects in reducing exam anxiety, and that the effect of metacognitive strategies was mostly in reducing meta-anxiety among students.

Mohsen and Mansoor (2009) in their study investigated the relationship among test anxiety, gender, academic achievement, and years of study. Their investigation is a descriptive analytic study and was done on 110 undergraduate students from University of Isfahan. The Suinn's Test Anxiety Questionnaire with 48 questions was used to gather the data. For analysis of data correlation coefficient and chi square test were used. The findings revealed that female students have a higher level of test anxiety in contrast to male students. The average of test anxiety score among female students was higher. Also a statistically significant negative correlation was observed between test anxiety and academic achievement. There was no meaningful relationship between test anxiety and years of study.

Brunstein and Glaser (2011) studied the effects of self-regulation strategies on 117 grade four students using a pretest-posttest design with intact classrooms assigned to a treatment and comparison condition. The dependent variable measured characteristics of students' writing. Results showed that students in the treatment group scored higher across writing measures, such as story plans, text revisions, and story quality at a statistically significant level ($p < .001$).

Eight studies were analyzed to determine instructional methods that promote metacognitive thinking. Included among planning strategies were modeling, goal attainment, checklists, diagrams, mnemonics, graphic organizers, and guided practice. An average effect size of the three studies reviewed for metacognitive planning was .62. Among the monitoring strategies identified in the analysis were modeling, diagramming, and answer checking, and practicing. The average effect size was .91 for monitoring. Finally, strategies for evaluating thinking included modeling, independent practice, self-testing, and answer checking. An average effect size for evaluating was .71.

Reynolds and Perin (2009) used a pre-test-post-test design with intact classrooms assigned to treatment and comparison groups to study the effects of summarizing text.

The study was conducted with 121 students in grade seven social studies. They found that students in the treatment group scored higher on a test covering content-specific reading passages at a statistically significant level ($p < .01$).

The intervention, called *plan and write for summarization*, used a mnemonic to prompt students to take notes from text passages and then organize them for writing passage summaries. For example, one step directed students to “pick out the big idea and underline the important parts,” along with listing main ideas with supporting details (Reynolds & Perin, 2009, p. 283). In a fashion similar to previous studies, the strategies were presented to students with modelling, verbalizing, and multiple opportunities for guided practice. Students also used goal setting and diagrams to plan their summaries.

Similarly, Ramdass and Zimmerman (2008) studied the effects of training students to use self-correction strategies to improve mathematics achievement with 42 grades five and six students. The study employed a pre-test-post-test with random assignment to treatment and control groups. Results showed that students in the treatment group solved long-division problems more accurately in comparison to students in the control group at a statistically significant level ($p < .05$).

Over the years as observed by this research and other researchers, students' performance in mathematics at secondary schools has been dwindling. It was learned that students have put so much fear about mathematics up to the extent that they hate the subject, hate the teacher, and also hate mathematics session/periods. Some of the students even abscond classes. Now, this fear and failure in mathematics has to do with test anxiety. Test anxiety is a worried, restless, agitated distress that results from the test of performance or academic activity. It is obvious to see that mathematics students suffers test anxiety in such a way as experiencing a cognitive imbalance, physiological disturbance or emotional instability, which can of cause interfere with students concentration, planning or academic performance. It is in light of this that the researcher investigated the effects of meta cognitive planning strategy in reducing test anxiety among low achieving secondary school students in mathematics in Jigawa State, Nigeria.

Hypothesis

- HO₁: There is no significant difference in the level of test anxiety between the treatment and control group after the treatment of meta cognitive planning strategy.
- HO₂: There is no significant difference in the effect of metacognitive planning strategy in reducing test anxiety among male and female secondary school students in mathematics.

Method

This research employed pre-test post-test quasi experimental design in investigating the effects of metacognitive planning strategy in reducing test anxiety among low achieving secondary school students in mathematics in Jigawa metropolis. The design involve one (1) treatment group and one (1) control group, in which both groups received a pre-test of Westside Test Anxiety Scale, where t-test results shows that the two groups are homogenous at the beginning of the research. After the experimental sessions, both groups received a post-test in order to determine the effect of metacognitive planning strategy, such as modelling, goal attainment, Checklists, Diagrams, mnemonics, graphic organizes and guided practice. training that the treatment groups received on their levels of test anxiety. The mean scores of the post-test of the treatment group and the control group were compared.

The population of this study comprised 6,311, of all senior secondary two student as obtained from Jigawa State Ministry of Education. Out of this number 20 students were selected and assigned to the treatment group and control group. The selection was through simple random sampling techniques.

Westside Test Anxiety Scale was used for this study. It is a standardized instrument adopted from Richard (2004). The instrument has ten (10) items which are designed to identify students with anxiety impairments who could benefit from an anxiety reduction intervention. The scale items cover self-assessed anxiety impairment and cognitions which can impair performance. The instrument has a five point scale, from *extremely or always true* to *not at all or never true*.

To ascertain the validity of the instrument, professionals in the field of Educational Psychology in Ahmadu Bello University, Zaria validated the instrument and found it appropriate for use in this type of study.

The instrument was pilot tested at Government Secondary School Dutse. The internal consistency estimate obtained WTAS using Cronbach's alpha was 0.76 while the coefficient of stability obtained using Pearson's moment correlation was 0.75. Data were analysed using test statistics.

Treatment

The six weeks training sessions that was given to the treatment group is as follows

Session 1: The researchers explain the importance of this study and its efficiency, as well as the application of various metacognitive strategies, and then a general discussion about the metacognition was conducted. As general discussions were

going on, training sessions began, in which the researcher discusses about cognition and metacognition, their strategies and also some strategies about studying. This session serves as an introduction.

Session 2: During this session the samples in the group receives explanations about the importance and definition of metacognitive planning strategy.

Session 3: During this session, the researchers discussed the features of planning strategy to the group, thereby explaining in details the way of implementation of the strategy.

Session 4: During this session, the researchers presented adopted standardized model for planning strategy. This has helped the samples in having a guide towards designing their own models. Thereafter, the researchers gave an assignment to the groups to design a model and bring back next session.

Session 5: During this session, the researchers fixed a test and then ask the group members to design a model base on their experience of the strategy training they received in order to prepare for the test that is scheduled to hold next session.

Session 6: During this session, mathematics teacher from the school assist in given a test question based on what the students were taught during the term, the test was conducted to the group. Thereafter, the session ends.

Result

Table 1: Independent t-test statistics difference in the mean post-test of test anxiety between students exposed to planning strategy and those in control group

Variable	Group	N	Mean	std.dev	std.err	df	t-cal	P Sign
Test Anxiety	Treatment	10	28.0000	1.88562	.59628	18	3.374	0.003
	Control	10	31.3000	2.45176	.77531			

$P \leq 0.05$

The analysis on table 1 shows that the p-value of 0.003 is less than the alpha value of 0.05, while calculated t-value is 3.374 at df=18. This means that there is a significant difference between the low achieving secondary school students in mathematics in the treatment group and that of the control group. It also implies that the metacognitive planning strategy is effective in reducing test anxiety among low achieving secondary school students in mathematics. Therefore the null hypothesis which states that there is no significant difference in the mean Test Anxiety between students exposed to metacognitive planning strategy and those in control group is hereby rejected.

Table 2: Independent t-test statistics difference in the level of test anxiety between male and female low achieving secondary school students in mathematics

Variable	Gender	N	Mean	std.dev	std.err	df	t-cal	P Sign
Test Anxiety	Male	10	28.6000	2.22111	.70238	18	2.885	0.010
	Female	10	31.4000	2.11870	.66999			

P ≤ 0.05

The analysis on table 2 shows that the p-value of 0.010 is less than the alpha value of 0.05, while calculated t-value is 2.885 at df=18. This means that there is a significant difference in the level of test anxiety between male and female low achieving secondary school students in mathematics. It also implies that female students have more test anxiety than male students. Therefore the null hypothesis which states that there is no significant difference in the effect of metacognitive planning strategy in reducing test anxiety among male and female secondary school students in mathematics hereby rejected.

Discussion

The finding of hypothesis one of this study showed that there is a significant difference between the levels of test anxiety of students in the treatment group of planning strategy and that of the control group. The finding revealed that their calculated p-value (0.003) is lower than 0.05 level of significance and their calculated t-values (3.374) is also higher than the critical t (1.96). Hence, the result made us to reject the null hypothesis. This means that there is significant difference between the experimental group of planning and that of the control group in their levels of test anxiety, after the treatment of metacognitive strategies to the group of planning strategy. Therefore, metacognitive planning strategy have effect on test anxiety among low achieving secondary school students in mathematics in the sense that it has reduced the levels of test anxiety of the students that were in the treatment group, thereby leaving the control group with high level of test anxiety.

The above finding is in line with that of Parastoo, Mozhdeh, and Naeimeh (2015). In their study, they compared the effectiveness of metacognitive and cognitive strategies in alleviating exam anxiety and meta-anxiety among university students. They found that metacognitive and cognitive strategies had similar effects in reducing exam anxiety, and that the effect of metacognitive strategies was mostly in reducing meta-anxiety among students.

The finding on the test of hypothesis two showed that there is a significant difference in the level of test anxiety among male and female low achieving secondary school students in mathematics. The finding revealed that the calculated p-value (0.010) is lower than 0.05 level of significance and their calculated t-value (2.885) is also higher than critical t (1.96). Hence, the result made us to reject the null hypothesis. This means that metacognitive planning strategy is more effective in reducing male students' level of test anxiety than that of the female student thereby leaving the female students with high level of test anxiety.

The finding that female students have a higher level of test anxiety than male students also conforms to the findings of Mohsen & Mansoor (2009). They investigated the relationship among test anxiety, gender, academic achievement and years of study among undergraduate students at the University of Isfahan. Their findings revealed that female students have a higher level of test anxiety in contrast to male students. The average of test anxiety score among female students was higher.

Conclusion

The study therefore concludes that metacognitive planning strategy training is effective in reducing the level of test anxiety among secondary school students in Jigawa State. The study also concludes that female students have more test anxiety than male students.

Recommendation

In view of the above discovery, this paper recommends that school counsellors and teacher should be exposed to metacognitive planning strategy training in order to reduce the level of test anxiety of low achieving secondary school students in mathematics and other subjects. Male and female students should be given equal opportunity to participate in the training of metacognitive planning strategy so as to reduce their level of test anxiety in mathematics.

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