

Effects of Study Skills Training on Achievement in Mathematics of Low Achieving Upper Basic Students in Plateau State, Nigeria

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Abstract. The study investigated the effects of study skills training on achievement in Mathematics of the low achieving Upper Basic Students in Jos East, Nigeria. The purpose of the study was to find out whether study skills training improved the Upper Basic Students study habits and achievement in Mathematics. Two research questions as well as two hypotheses were formulated to guide the study. The study as well, adopted the Stimulus Response (SR) Theory of Edward Thorndike as its theoretical framework. The population of the study comprised of all the Upper Basic Students 2 in Jos East Local Government Area of Plateau State, while the sample were 70 respondents (35 boys and 35 girls), who were assigned to the experimental and control groups. The study adopted the pre-test post-test control group, experimental research design. To further investigate on this, the study used two research instruments namely: the Study Skills Questionnaire (SSQ) and the Mathematics Achievement Test (MAT) to collect data. The data collected were analysed using the mean, standard deviation and analysis of covariance (ANCOVA). Findings from the study revealed that prior to intervention, the Upper Basic Students had low study skills and achievement in Mathematics, but improved in both areas after exposure to study skills training. Based on this therefore, the research recommends among others that in order to enhance students' study skills and achievement in Mathematics, study skills training be introduced early in school years, so as to enable students develop effective study habits, and also, educational administrators of secondary schools should organize seminars and workshops for school teachers on training in study skills for maximum output in the subjects taught in schools.

Keywords: Study skills, study skills training, Mathematics achievement in Mathematics, low achieving students.

1. Introduction

The Universal Basic Education (UBE) system is meant to provide six years of primary education and three years of Upper Basic Education to attain the Universal Basic Education. While the six years of primary education is crucial to the achievements in the Upper Basic Education, the Upper Basic Education achievements are critical to the achievements in the senior secondary and post-secondary school achievements. Hence, academic achievement at the Upper Basic Education are of utmost importance to the learner's future attainment and academic achievement. Academic achievement refers to the outcome of one's learning in a formal school system. It is when one successfully accomplishes the goals set in the curriculum of a particular subject. Academic achievement as defined by Adell (2002) is the extent of demonstrated ability in school subjects as observable in the termly, semester or sessional results of evaluations in continuous assessments, tests or examinations of students. Therefore, the requirements which lead to academic achievement include excelling in one's studies and other school works by obtaining good and high grades in given tasks.

Low achieving students are those who are not able to achieve, attain or successfully accomplish the required objectives at the end of a lesson, term or semester. They are students who have limited ability to different reasons in the education process as pointed out by Issa (2016). To Reid (2020), they are

students who lack basic knowledge/skills thereby, have difficulty in comprehension, lack concentration and are confused easily in the classroom. This implies that students who are not able to perform well, get good grades or score below the baseline of proficiency on any subject (Mathematics) scale because of different limitations and are termed low achievers. Students who achieve low have difficulty identifying or remembering important information during or after lectures, focus on irrelevant information, do not take notes, forget to bring items to class, easily distracted and engage in off-task behaviour, do not have system for organizing information for different subject areas, have trouble estimating how long a task will take and so run out of time when working on a project, lack knowledge of an appropriate strategy to use when studying, thereby using the same ineffective strategy for all academic tasks (Morrison, 2013). This implies that, students with these characteristics may have low achievement especially in the subject of Mathematics.

One subject area which has been identified to be challenging to students in school, is the subject of Mathematics. Mathematics is a science of structure, order and relation that has evolved from counting, measuring and describing the shape of objects (Gouba, 2008). Through the knowledge of Mathematics, students develop knowledge to solve problems in their environments, acquire understanding for numbers and calculating strategies as well as associating them with daily life problems (Obiweluzo, 2014). The importance of Mathematics necessitated its endorsement as a core and compulsory subject in both primary and secondary schools' curricular as enshrined in the National Policy on Education (NPE, 2004). The aim is to help students master the subject in order to apply the knowledge in everyday life activities so as to contribute positively to the growth and development of the nation. Mathematics also gives students the ability to think and reason logically in any field of endeavour. It is therefore an indispensable tool in human development and is essentially needed for sustaining science and technology and as well, key in realizing any national development and aspiration over the years (Ugodulunwa & Okolo, 2015).

Despite the relevance and usefulness of the subject, students' achievement in this particular subject has been challenging. This is because to many students, the subject is difficult, boring, demands plenty of efforts and involves the use of many difficult concepts and abstract principles which may not be easily learnt like many other subjects. Other identified reasons by some researchers such as Tella

(2007), Nizoloman (2013), Obiweluzo (2014), Ebele and Olufu (2017) and Gouindhara (2019) are: nature of the subject, the learner, teacher, textbooks, school environment factors, lack of interest, supervision by government authorities, and poor study skills.

Study skills are learning strategies that help students organize process and use information effectively (Kerka, 2007). Crede and Kuncel (2008) see study skills as the students' knowledge of appropriate study strategies and methods and the ability to manage time and other resources in order to meet the demands of the academic tasks. In other words, study skills are the different approaches and techniques students employ to enable them study effectively and achieve academically. Study skills help students to learn to be organized and as well take full responsibility for the learning process (Simon, 2015). Therefore, achievement in school subjects depends on study skills acquired as stressed by Ghulam (2013) and Harackrewe, Baron, Taver, Carter, and Elliot (2000). The study skills focused on this work includes homework and assignment, time management, concentration and test and examination (adapted from Bakare, 1977).

Homeworks and assignments are learning tasks given to students by school teachers which is meant to be carried out during non-school hours (Cooper, 1989). Homeworks and assignments are given to help students recognize that learning can occur both at school and home, foster independent learning as they also explore topics of their interest, give parents opportunity to see what is going on at school, elaborate on information that has been addressed in class, give students better retention of factual knowledge, encourage critical thinking, help in information processing, better study habits, give greater self-direction and instil self-discipline (Eqstein, 1988; Cooper, 1989; Warton, 2001; Hayward, 2010 and Quade, 2013).

Time management has been described as the process of planning, organizing and exercising conscious control over the amount of time spent in particular activity in order to increase effectiveness, efficiency or productivity (Management Study Guide, 2013). Time management helps students learn to plan, be focused and disciplined in all areas, assign specific activities per their importance which enables them realize goals and objectives planned within a short time.

Concentration is the ability to pay attention whereby an individual develops interest and attitude towards a

stimulus from the multiplicity of stimuli available in an environment (Sharma, 1987). Kathleen (2008) also pointed out that concentration involves two major skills or abilities which are exclusion (which is doing away with all distractions) and focusing (paying attention to what one is doing). Concentration therefore emphasizes patience, persistence and avoidance of distraction while studying as observed by Bakare (1997). Concentration is therefore very useful in the teaching and learning process because it increases students' learning ability (Harboe and Mullen, 2009). It also helps students learn how to deal with distractions that come from within and outside the environment. When low achieving students are able to handle all kinds of distraction and focuses on a target, an inner strength is gained to continue on that task until success is attained.

Test and examination are skills employed by teachers to assess the extent to which learning has taken place. Test and examination can be carried out at the end of a lesson, term or a session. They can be oral or written in the teaching-learning process. Test and examination serve as a necessary incentive to study, a means of getting feedback and a yardstick for evaluating the effectiveness of instructional delivery selection, placement and for employment, a way of assessing how much has been grasped from a course that might have been a whole term or semester and a way through which qualifications are acquired (Iliya, 2010; Upepe and Ndifin, 2012). For low achieving students to adopt these skills of studying for better achievement especially in Mathematics, training in study skills becomes necessary.

Study skills training are teachings or tutorials given to students in different areas of learning in order to help them adopt appropriate ways of studying for academic excellence. Kerka (2007) sees study skills training as teachings given to students in order to help them utilize a process of thinking which includes the steps of recognizing, recalling, and executing particular steps in acquiring study skills. The essence of training students in study skills is to help them identify appropriate skills to use in every learning. Scholars such as Graham (2007) and Gettinger and Seibert (2013), asserts that study skills training helps students prepare, plan, select, comprehend points when reading, ask and answer questions, review, recite, and recall what has been learned, acquire greater confidence to prepare for tests and examinations. Therefore, when low achieving students are trained in study skills, they become exposed to different learning materials which will in turn help them adopt appropriate studying, become competent and confident learners, thereby

making learning interesting and as well attaining academic excellence.

2. Statement of the Problem

The increasing rate of low achievement in Mathematics among students due to lack of training in study skills has been of immense concern to the teachers, parents, psychologists and educationists. This has led to truancy, examination malpractice and dropouts. Several efforts have been made by the government in order to enhance achievement in Mathematics among students. These efforts include: Mathematical curriculum reforms, addition of different mathematical textbooks to existing ones and organization of workshops and seminars for Mathematics teachers, which all aims at helping students excel in Mathematics. Despite the effort made by the government, students' achievement in Mathematics has been low. School records such as class exercises, tests, promotional examination results have been low. An investigation into these low achievements in Mathematics reveals that students lack good and proper study skills as well as training in study skills. Students who lack proper study skills lack the competencies of doing their homework and assignments, organization and effective time management, concentration in academic works, preparation and effective ways of writing test and examinations which consequently has led to low achievement in Mathematics. Training in study skills can help students prepare, process, retain, demonstrate and apply what has been learned all through Basic Education as they continue in their Senior Secondary Education. Therefore, training the Upper Basic students 2 in study skills and ascertaining the effects on achievement in Mathematics is the problem this study intends to focus on.

3. Purpose of the Study

The purpose of this study is to find out the effects of study skills training on achievement in Mathematics of the low achieving Upper Basic students 2 in Plateau State.

4. Research Question

- What are the types of study skills found among the Upper Basic Students 2 before and after treatment?
- What is the level of achievement in Mathematics of the Upper Basic students 2 before and after treatment?

5. Hypotheses

- There is no significance difference between the experimental and control groups study skills mean scores of the Upper Basic students 2 after treatment.
- There is no significant difference between the experimental and control groups achievement in Mathematics mean scores of Upper Basic students 2 after exposure to treatment.

6. Methodology

The present study adopted the pre-test – post-test randomized control group experimental research design. The design consists of two groups, the experimental and control group, where only the experimental group was exposed to treatment (study skills training) while the control group was not exposed to such treatment, for the purpose of finding out the effects of such treatment on the dependent variables (achievement in Mathematics). The choice of the design is anchored on the fact that all threats to internal validity such as pre-test is controlled.

The Upper Basic Students 2 (UBS2) in Jos East Local Government Area of Plateau State identified with low achievement in Mathematics constituted the target population for the study. The participants for this study consisted seventy (70) Upper Basic Students 2 (UBS2) identified with low achievement in Mathematics and the simple random techniques was employed to select these students. Two research instruments were used to collect data for the study. The Study Skills Questionnaire (SSQ) and the Mathematics Achievement Test (MAT). The SSQ was adapted from the Study Habit Inventory (SHI) by Bakare (1977). The SSQ is a self-reporting inventory designed to measure the effective and defective study skills used by secondary school students. The 20-item instrument consists of four sub-sales, homework and assignments, time management, concentration, test and examination. The questionnaire comprises of two sections. Section A contains information on

participants’ personal data such as name of school and gender, while Section B contains information on the four study skills. Homework and assignments measured students’ commitment in carrying out given tasks in Mathematics. It had five questions. An example of such item is, I do the Mathematics homework and assignments I am given as soon as it is given. Time management measured students’ ability to manage, allocate and budget time. It contains five (5) questions. An example includes, I make a daily plan for the time I use each day for my Mathematics studies. Concentration study skills measured students’ ability to pay attention and not be distracted by any external activity. It also contains five (5) questions. Example of such item is, I study Mathematics when I can be most alert and attentive eliminating noise and all distractions. Test and Examination measured students’ preparedness before and while taking test and examination. It had 5 questions. An example is, I go in for my test and examination fully prepared and certain of what I have studied. Participants responded on a 4-point scale that ranges from Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). The Cronbach Alpha reliability coefficient of the instrument is 0.83.

The Mathematics Achievement Test (MAT) is a 30 item multiple choice and four essay questions in Mathematics adapted from past Junior National Examination Council (NECO) questions covering only UBS2 syllabus. MAT was used to measure the achievement level of UBS2. MAT had four answer options under each item ranging from a-d in which participants were expected to select and circle the correct answers. Each of the correct answers carried 2 marks, making a total of 60 marks. The easy part had four questions of “a” and “b” and participants were asked to answer any 2. Each correct answer carried 20 marks (a and b), making a total of 40 marks. The total mark of MAT is summed to 100. Data collected was analysed using the mean and standard deviation to answer the research questions raised while Analysis of Covariance (ANCOVA) was used for the hypotheses.

7. Results

Research Question One: What is the type of study skills found among Upper Basic Students 2 before treatment?

Table 1: Mean Scores on Level of Study Skills Among UBS 2 Before Exposure to Treatment

Study skills	Experimental			Control		
	\bar{x}	SD	Remark	\bar{x}	SD	Remark
Time Management	2.02	0.28	Low	2.00	0.30	Low
Concentration	2.03	0.21	Low	2.24	0.29	Low
Homework on assignment	1.97	0.10	Low	1.88	0.20	Low
Test and examination	2.22	0.25	Low	2.01	0.14	Low
Overall	2.06	0.21	Low	2.03	0.23	Low

Table one shows that students in both experimental and control groups had means scores on all the study skills less than the bench mark of 2.50 ($\bar{x} < 2.50$). This implies that UBS 2 had low study skills before the study skills intervention.

Research Question 2: What is the level of achievement in mathematics of the Upper Basic Students 2 before and after treatment?

Table 2: Mean Scores On Level of Achievement in Mathematics of UBS 2 Before and After Treatment

Groups	N	Pre-test			Post-test		
		\bar{x}	SD	Remark	\bar{x}	SD	Remark
Experiment	35	33.06	20.84	Low	71.57	12.30	High
Control	35	32.74	19.46	Low	35.97	18.22	Low

Table 2 results shows that students: pre-test achievement in mathematics mean scores of the experimental and control groups are very low ($M = 33.06$, $SD = 20.84$ and 32.74 , $SD = 19.46$ respectively) on the mathematics achievement test. Interestingly, the post-test mean scores of the experimental group ($M = 71.57$, $SD = 12.30$) is high, whereas that of the control group ($M = 35.97$, $SD = 18.22$) is still low. This suggests that UBS 2 had very low achievement score in Mathematics before exposure to study skills training and had high achievement in Mathematics after the study skills training.

Hypothesis One: There is no significant difference between the experimental and control groups study skills mean scores of the Upper Basic Students 2 after treatment.

Table 3: Summary Table showing ANCOVA on Post-test Study Skills Scores Between the Experimental and Control Groups

Source	Type III Sum of Squares	DF	Mean Square	F	P
Corrected model	13756.35 ^a	2	6878.17	301.93	0.000
Intercept	2478.63	1	2478.63	109.20	0.000
Pre-test	8.33	1	8.33	0.37	0.547
Group post test	13748.01	1	13748.01	603.50	0.000
Error	1526.30	67	22.78		
Total	218863.00	70			
Corrected total	15282.64	69			

Descriptive Statistics		
Group	\bar{x}	SD
Experimental group	67.94	4.69
Control group	39.91	4.81

NB: R squared = 0.900 (Adjusted R squared = 0.897)

Table 3 analysis indicates that the post-test comparison between the experimental and control group had P value = 0.00 less than the significance level ($P < 0.05$). Thus, the null hypothesis is rejected and concludes that there is a significant difference between the experimental and control groups on study skills after controlling the effects of pre-test, $F(1,69) = 603.50$, $P < .05$. The experimental group is higher in mean score ($M = 67.94$, $SD = 4.69$) as compared to the control group ($M = 39.91$, $SD = 4.81$) with mean difference of 28.3. This suggests that study skills training improve the study habits of secondary school students.

Hypothesis Two: There is no significant difference between the experimental and control groups achievement in Mathematics mean scores of the UBS2 after exposure to treatment. ANCOVA was used to test this HO.

Table 4: Summary Table Showing ANCOVA Test on Achievement in Mathematics Mean Scores Between the Experimental and Control Groups after Treatment

Source	Type III Sum of squares	Df	Mean square	F	P
Corrected model	24470.41	2	12235.20	57.99	0.000
Intercept	36723.93	1	36723.93	174.06	0.000
Pretest	2291.61	1	2291.61	1.86	0.091
Group post test	22064.84	1	22064.82	104.58	0.000
Error	14135.93	67	210.98		
Total	241002.00	70			
Corrected total	38606.34	69			

Descriptive statistics		
Groups	\bar{x}	SD
Experimental group	71.57	12.30
Control group	35.97	18.22

Table 4 computation showed that, due to $P < 0.05$, the null hypothesis is rejected and concludes that there is significant difference between experimental and control groups on achievement in Mathematics, $F(1, 67) = 104.58$. Also, experimental group is higher in mean than the control group ($M = 71.57, SD = 12.30$ and $M = 35.97, SD = 18.22$ respectively) with mean difference of 35.6. This implies that study skills training has effects on UBS 2 achievement in Mathematics.

8. Discussion of Findings

The present study investigated the effects of study skills training on achievement in Mathematics of the low achieving upper basic students in Jos East Local Government, Nigeria. The first hypothesis sought to find out if there is no significant difference between the experimental and control groups study skills mean scores of the Upper Basic Students 2, after treatment. The findings of the study showed that there was a significant difference between the experimental and control groups on study skills of the Upper Basic Students 2. These findings corroborate the findings of Graham (2007) who found that, for students to prepare and plan for learning, select, use, monitor, orchestrate and evaluate various other strategies used in learning, special training is required on the part of the student. The findings are also consistent with Crede and Kuncel (2008), who found that the student's knowledge of appropriate study strategies, methods and ability to manage time and other resources in order to meet the demand of the academic tasks is not in built in students but require drilling process.

The second hypothesis sought to find out if there is no significant difference between the experimental and control groups achievement in Mathematics mean scores of the Upper Basic Students 2 after exposure to treatment. The result showed that the null hypothesis is rejected and concludes that there is a significant difference between the experimental and control groups on achievement in Mathematics. This confirms Gbulam's (2013) observation that students' achievement in the subjects offered at school depends also on the study skills of those students and that the quality of school achievement is directly proportional to the quality of study skills in the students. This finding is also in line with that of Harackrewer, Barron, Taver, Carter and Elliot (2000) who concurred that ignorance of study skills is a dreaded factor of low academic achievement.

9. Conclusion

The finding of the study showed that study skills training helped improve the study skills of the upper basic students 2. Therefore, school administrators should ensure that appropriate study skills training programmes are designed to help students adopt effective study skills for academic excellence. Study skills training from findings of the study, also improve achievement in Mathematics of the Upper Basic Students 2. This suggests that study skills training/intervention programmes need to be in place in schools to improve students' achievement especially in the subject of Mathematics.

10. Recommendations

Based on the findings of this study, the following recommendations are made:

- Study skills training should be introduced in early school years so as to enable students develop effective habits.
- Educational Administrators of secondary schools should organize seminars and workshops for school teachers on training in study skills for maximum output in the subjects taught in secondary schools. This could be carried out termly in consideration of the Nigerian secondary school calendar.
- To develop effective study skills, the Federal Ministry of Education should formulate a policy mandating secondary schools in Nigeria to integrate study skills as a course in the curricular. This will motivate students to develop effective study skills for excellent achievement in school subjects like Mathematics.

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