

EFFECT OF COOPERATIVE INSTRUCTIONAL STRATEGY ON INTEREST, AND ACHIEVEMENT IN BIOLOGY AMONG LOW –ACHIEVING SENIOR SECONDARY SCHOOL STUDENTS IN NIGER STATE, NIGERIA

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Abstract

This study employs a quasi-experiment, non equivalent control group, pretest-posttest design in investigating the effect of Cooperative Instructional Strategy on Interest and Achievement in Biology among Low-achieving Senior Secondary School Students. The population of the study was all senior Secondary School Students in Bida Educational Zone, Niger State, Nigeria. Two research questions and two null hypotheses guided this study. The sample was 44 students drawn from four schools purposively sampled, from 40 schools in the Educational Zone. An Instrument Tagged Biology Interest Inventory (BII) and Biology Achievement Test (BAT) were developed and used for the study. Data was analyzed using means and analysis of covariance (ANCOVA). Findings indicate that Cooperative Instructional Strategy (CIS) significantly affects student interest and achievement in Biology. Recommendation among which include, The use of Cooperative Instructional Strategy (CIS) of teaching should be encouraged and practiced among students in senior secondary schools especially those whose performance is below average or those regarded as low-achieving students.

Keywords: Cooperative Instructional Strategy, Interest, Achievement, Biology, Low-Achieving Student

Introduction

To Achieve Learners' Active Participation in Science Education (Rennie, Feher, Dieking & Falk; 2003) and Savery & Duffy; 2003)

maintained that science teacher needs to teach students how to learn and not just to give them what to be learnt. This approach according to the researchers will help students utilize knowledge of science in different situations and provide them opportunities to actively participate in the teaching/learning situation. This is the constructivist view of learning (Brooks & Brooks, 1999; Rochelle, 1992; Glasserfeld, 1987) who views learning as a process in which the learner constructs knowledge from pre-existing ideas. The implication is that when a learner reconciles the new information with his previous ideas and experiences, he can change what he believes, or disregard the new information as irrelevant. In either case, he is an active creator of his own knowledge. Helping students to construct their own knowledge Brooks and Brooks, (1999) urged that it is a great challenge to the Biology teacher owing to the unfavourable classroom environment in our schools.

To address these challenges, the teacher's role needs to shift from that of the 'dispenser' of knowledge to the 'facilitator' of learning. This is evident in the huge amount of funds being invested by both governments, private, and voluntary organizations in the establishment and equipping of science schools in Nigeria for learning (Wasagu, 2006; Okebukola, 2005). Despite efforts being made to improve teaching and learning of Biology, high records of poor achievement of students in Biology is on the increase (Ali, 1998; Adeyegbe, 1998; WAEC, 2010), resulting to low-achievement in school Biology.

The low-achieving Biology students therefore, need special intervention if they must record success in dealing with Biology problems. Low Biology achievers are those students whose achievements are consistently very low and who, in spite of efforts to cope, may be quite slow, confused and lack confidence in themselves (Okebukola, 2005). They are those whose achievements are consistently below average, and who may have numerous aversions associated with solving arithmetic and other related problems, (Montague, 1998). Such problems could be attributed to a number of environmental factors such as peer group influence; weak relationship with teachers, poor mastering skills of the teacher's incompetence, competent on the part of the students themselves, cultural and other school related factors (Umaru, 2010).

Research studies by Eniayeju (1990) and Odoh (2000) have shown that low academic achievement in Biology is due to poor understanding of the basic concept, lack of teaching aids and textbooks that reflect the students' environmental needs, low level and low quality of cognitive interactions with teachers, and language problems. All these compel students to memorize and regurgitate facts and principles (Okebukola, 2005). Several researchers (Woods, 2007; Gou, Abram and U'Appolonia 2003; Nwosu,

2003) have therefore suggested that use of alternative contemporary teaching strategies, which reflect the constructivist approach to learning, may help to facilitate the teaching and learning of the subject, may lead to success, and increase students interest in the subjects.

Elliot, Kratochwill, Littlefield and Travers (2000) defined the term interest, as an enduring characteristic expressed by a relationship between a person and a particular activity or object. Ngwoke (2005) explained interest, as something with which one identifies one's personal well-being. In this sense interest is a source of motivation. Ryan and Deci (2000) argued that since intrinsically motivated behaviour is a behaviour an individual undertakes out of interest, then clarifying the importance of interest would add to educator's understanding of the impact of intrinsic motivation in learning.

According to Ngwoke as cited in Umaru (2010), interest drives people to do what they are free to choose. When people see that something will benefit them, they become interested in it. Every interest satisfies a need. In activities like identification, Drawing, Labeling, Syntheses, understanding and learning concept in Biology, interest leads one to know and learn more from the task. Interest adds enjoyment and makes the performance of activity or task more economical in terms of demand on limited cognitive resources. The interest students show in an activity or in an area of knowledge predicts how much they will attend to it (Papalia, Old and Feldman, 2002). To the researchers, Interest, therefore means an enduring trait expressed by a relationship between a person and a given task. Interest is the factor that makes a students' to pay attention to attributes and paying attention makes learning faster and better.

The researchers' experiences with adolescents in secondary schools indicate that most of them adopt role memorization and repetition strategies. These strategies have been observed not to be effective in learning, especially, when complex tasks are involved (Wood, Willoughby and Motz, 1998). This weakness of stated strategies creates the need to expose students to a more effective strategy such as cooperative instructional strategy the low-achieving Biology students therefore, need special intervention if they must record success in dealing with Biology problems.

Cooperative Instructional Strategy has been found, though not in Nigeria, to be effective tools for learning a variety of learning tasks, and if effectively used, can enhance achievement in such a tasks (Baron, 2004). Effective in increasing academic achievement in all ability levels, gender and ethnic groups (O'Donnell, 2002) and Barron, 2004), Cooperative learning is also said to be effective in promoting higher thinking skills, problem solving abilities and greater meta-cognitive awareness and Interest in an academic endeavour (Woolfolk, 2004). Cooperative instructional

strategy (CIS) is a strategy in which students are involved throughout the class time in activities that help them construct the understanding of the materials in a variety presented to them. According to Timberlake (2002), cooperative instructional strategy provides students the opportunity to engage in active interaction such as cognitive conflict, social construction and meta-cognitive in the learning process. In this learning situation, the teacher no longer delivers a vast amount of information but uses a variety of hands-on activities to promote learning with students working in groups.

The benefits of cooperative learning are not restricted to increases in academic achievement; increases in self efficacy, intrinsic motivation, decision making skills, empathy, tolerance for differences, feelings of acceptance, and even school attendance have also been reported (Odoh, 2013). Hence this strategy of instruction has been suggested as an important means of enhancing learners' interest and self-efficacy (Schunk, 1985). This is because when learning skills have been acquired through instructions, learners become more focused and approachable, and learn in a systematic manner. The acquisition of skills necessary for tackling learning problems is also believed to raise learners' interest self-efficacy and belief for task accomplishment (Umaru, 2010).

Interest and Academic achievement which are psychological constructs would be influence if learners are exposed to instructions with cooperative learning strategies.

Empirical Review

Peklaf (2003) investigated the effect of Cooperative learning on achievement in Mathematics and Native Language and related students' achievement in cooperative learning to the gender, abilities and cognitive styles. 370 (170 in experimental and 200 in the control group) 5th grades students from 9 different primary schools participated and were introduced into one quarter of the hour dedicated to Mathematics and Sloveno Language during the school year. Control group were exposed to the traditional way of teaching in both courses. From the results derived analyzed with ANOVA, positive effects of cooperative learning were found in both courses. The results in cooperative learning group were further analyzed according to students' gender abilities and cognitive styles. No significant interactions between students' achievement and their gender or abilities were found, but statistically significant interactions between students' cognitive styles and achievement were found in both courses, field dependent students benefited most from cooperative learning.

Garduno (2001) investigated gender differences in cooperative problem solving Mathematics; she found no statistically significant differences in achievement or self-efficacy in 7th and 8th grade students in

Mathematics in single or mixed-gender group. However, females from mixed-gender groups reported better attitudes towards Mathematics than females from single-gender group at the end of the study. Also females from mixed-gender groups also reported better attitudes towards Mathematics than males from mixed-gender groups.

Simsek, Yilar and Kucuk (2013) investigated the effect of cooperative learning methods on student academic achievement in social psychology lessons. Their research included 107 first grade students from two classes. Each class was selected to test one teaching method. The first class was selected as the non-group investigation group (n=52), the second was selected as the reading writing and presenting group (n=55). Results from data collected through the academic achievement test. Show that the reading writing presenting method (cooperative method) has a more positive effect on increasing students' academic knowledge and achievement in social psychology lesson than the non-group investigation method.

Ajaja & Eravwoke (2010) investigated the Effects of Cooperative Learning Strategy on Junior Secondary School Students Achievement in Integrated Science. Five research questions and hypotheses were formulated to guide their study. The design of their study was a 2*2 factorial, pretest – posttest control group design. Variables investigated included the two instructional groups (cooperative and traditional classroom groups), sex (male and female), ability (high and low), and repeated testing (pretest and posttest). The population of the study was made up of 120 JSIII students. The instruments used for the collection of data included a Scholastic Ability Test in Integrated Science (SATIS), Students Aptitude Scale (SAS) and Integrated Science Achievement Test (ISAT). Their major finding from the use analysis of Covariance (ANCOVA) revealed a significant higher achievement test scores of students in cooperative learning group than those in traditional classroom; a significant higher attitude scores of student in cooperative learning group than those in traditional classroom; significant higher achievement test scores of all students of varying abilities in cooperative learning group than those in traditional classroom, a non-significant differences in achievement test scores between male and female students in the cooperative learning groups, and non-significant interaction effect between sex, ability , sex and method, between ability and method, and among method, sex and ability on achievement.

Objectives of the Study

The following objectives were formulated to guide this study;

1. To determine the difference in the mean scores on interest in Biology of those exposed to cooperative instructional strategy and those in the control group

2. To determine the difference in the mean scores on achievement in Biology of those exposed to cooperative instructional strategy and those in the control groups

Research questions

- 1 What is the difference in the mean scores on interest in Biology of those exposed to cooperative instructional strategy and those in the control group?
- 2 What is the difference in the mean scores on achievement in Biology of those exposed to cooperative instructional strategy and those in the control groups?

Hypotheses

Ho1: Cooperative Instructional Strategy has no significant effect on student interest in Biology as measured by their mean score on BII.

Ho2: Cooperative Instructional Strategy has no significant effect on students Achievement in Biology as measured by their mean score on (BAT)

Methodology

This study employs a quasi-experimental, non equivalent control group, pretest – posttest design. The population of the study was all Secondary School Students in Bida Educational Zone, Niger State, Nigeria. The sample was 44 students drawn from four schools purposively sampled from 40 schools in the Educational Zone. Each of the two schools was randomly assigned to experimental and control group. In each of the two schools, one intact stream of SSII and SSIII classes were randomly selected for the study.

The instrument used for the study was 15 essay questions tagged Biology Achievement Test (BAT) and Biology Interest Inventory (BII) with 10 items developed by the researchers, after extensive Literature review. The internal consistency estimate obtained for BAT and BII using Cronbach alpha was 0.85 and 0.78 respectively. The coefficient of stability obtained using Pearson Product Moment Correlation was 0.78 and 0.79 respectively.

Treatment Procedure

Before the commencement of the training, the researchers familiarize themselves with the subjects (respondents) to ascertain whether respondents experience low achievement in Biology in school. Those whose record of achievement ranges between 30-49% in first term examination were picked and tagged the low-achievement. This was believed to have helped the researcher in determining how best to motivate the subject to acquire the new techniques.

Immediately after assigning the subject to treatment and control groups, the pretest was administered to them. Instructions on Cooperative Instructional Strategies (CIS) were taught to those in treatment groups. All these were done through the following processes: positive inter-dependence, individual accountability, interpersonal skills, face to face interaction and processing out (that is, feedback mechanisms and conclusions also were used through out the session (adapted from Johnson & Johnson 1994).

The trained research assistants who are Biology teachers were used. Each one handled the treatment and the control group. This help to minimize the teacher effect. The study lasted for eight weeks through which scores were gathered for pretest and post-test, the experimental groups were expose to cooperative instructional strategy while the control groups, were only been exposed to conventional teaching method.

The data collated, were organized, and analyzed using mean and standard deviation and analysis of covariance(ANCOVA) was used to test the hypothesis at 0.05 level of significant.

Result

Table 1: Pre – Test and Post Test Mean Score and Standard Deviation of interest in Biology (BII).

Biology Interest Inventory (BII)	Pre-Test	Post- Test	Mean gain score
Treatment Mean	6.33	18.83	11.8
N	24	24	
Std. Deviation	2.22	1.34	
Control Mean	6.20	8.50	2.3
N	24	24	
Std. Deviation	2.20	1.08	

Data presented in table (1) above indicate the pretest and posttest mean Interest score of the students in the treatment and control groups. The Low-Achieving Biology student taught using instruction in cooperative strategy had a pre-test score of 6.33 with a standard deviation of 2.2 and a post-test score of 18.83 with a standard deviation of 1.34, the pre-test – post-test mean score gain was 11.8. The control group had a pre-test score of 6.20 with a standard deviation of 2.20 and a post-test mean score of 8.50 with a standard deviation of 1.08, the pre-test – post-test control group gain score is 2.3. Result showed that those exposed to instructions in cooperative strategy out weight those in control group and developed more interest in Biology due to the use of cooperative strategy.

Table 2: Pre – Test and Post Test Mean Score and Standard Deviation of Biology Achievement (BAT).

Achievement in Biology (BAT)	Pre-Test	Post- Test	Mean gain score
Treatment Mean	6.50	18.83	12.33
N	12	12	
Std. Deviation	2.21	1.47	
Control Mean	6.20	8.50	2.4
N	12	10	
Std. Deviation	2.20	1.14	

Data presented in table (2) above reveal the pretest and posttest mean achievement score of the students in the treatment and control groups and pre-test – post-test mean gain score of the group. The Low-Achieving Biology student taught using instructions in cooperative strategy had a pre-test score of 6.50 with a standard deviation of 2.21 and a post-test mean Biology Achievement score is 18.83 with a standard deviation of 1.47, the pre-test – post-test mean Achievement in Biology gain is 12.33. The student in control group had a pre-test score of 6.20 with a standard deviation of 2.20 with a posttest of 8.50 with a standard deviation of 1.14, the pre-test – post-test mean gain score is 2.4. The differences in mean gain scores for the two groups, which favoured the treatment groups, indicated that the Low-Achieving Biology Students benefited from the use of instructions in cooperative strategy.

Hypothesis 1:

Table 3: Summary of 2 ways Analysis of Covariance (ANCOVA) on Interest in Biology as measured in BII.

Source	Type Sum of Square	df	Mean Square	F	Sig.
Corrected Model	583.759 ^a	4			
Intercept	37.888	1	145.940	86.051	.000
Interest in biology	1.235	1	37.888	22.340	.000
Sex	.068	1	1.235	.728	.405
Group	289.918	1	.068	.040	.844
Sex* group	.028	1	289.918	170.945	.000
Error	28.831	17	1.696	.017	.889
Total	5009.000	22			
Corrected Total	612.591	21			

a. R Squared = .953 (Adjusted R Squared = .942)

Data presented in Table 3 shows that treatment as main factor had a significant effect on interest in Biology. This was because the F-value of 170.945 in respect of the treatment group as main effect was shown to be significant at 0.005 levels. This therefore, implied that training in cooperative instructional strategy improved student interest in Biology

significantly. The adjusted R squared of 94 further suggested that 94% of the total variance on the dependent measure was contributed by treatment using instructions in cooperative strategy. These evidences showed that instruction in cooperative strategy was effective in enhancing student's interest in Biology

Table 4: Summary of 2 ways Analysis of Covariance (ANCOVA) on Achievement in Biology as measured by BAT

Source	TypeSumofSquare	df	Mean Square	F	Sig
Corrected Model	583.524 ^a	3			
Intercept	4075.152	1	194.175	116.247	.000
Sex	.055	1	4075.152	2439.669	.000
Group	582.424	1	.055	.033	.459
Sex* group	.055	1	582.424	348.680	.000
Error	30.067	18	.055	.033	.859
Total	5009.000	22	1.670		
Corrected Total	612.591	21			

a. R Squared = .951 (Adjusted R Squared = .943)

Data presented in Table 2 shows that treatment as main factor had a significant effect on Achievement in Biology. This was because the F-value of 348.680 in respect of the treatment group as main effect was shown to be significant at 0.005 levels. The result implied that training in co-operative instructional strategy improved student Achievement in Biology significantly. The adjusted R squared of 94 further suggested that 94% of the total variance on the dependent measure was contributed by treatment using instruction in cooperative strategy. These evidences showed that instruction in cooperative strategy was effective in enhancing student Achievement in Biology.

Discussion

The finding of this study indicated that those exposed to instructions in cooperative strategy had more interest in Biology and performed better than those not exposed to instruction in cooperative strategy. Thus, the interest students showed in an activity or area of knowledge predicts how much they would attend to it, and how well they process, comprehend and remembers it. Instruction in cooperative strategy could have been the reason for the higher interest in Biology as demonstrated by those in treatment condition. This finding agree with the finding of Odoh (2013) and Okebukola (2005) who maintained that Cooperative Instructional Strategies is an essential tools that boost students achievement in Chemistry. Similarly, the finding showed that instruction in cooperative strategy was effective in enhancing student interest in Biology. The finding is in line with the finding of Simsek, Yilar and Kucuk (2013) who investigated the effect of cooperative learning methods on student academic achievement in social psychology

lessons. The results obtained from the data show that the reading writing presenting method (cooperative method) has a more positive effect on increasing students' academic knowledge and achievement in social psychology lesson than the group investigation method (control group).

The differences in the meanscores gain for the two groups which favoured the treatment groups indicated that the Low-Achieving Biology Students benefited from the use of instructions using cooperative strategy. The finding is in line with the finding of Timberlake (2002), who maintained that cooperative instructional strategy provides students the opportunity to engage in active interaction such as cognitive conflict, social construction and meta-cognitive in the learning process.

The finding of this study showed that instruction in cooperative strategy was effective in enhancing student Achievement in Biology. This suggests that good learners engage in the process of assessing the quality of their work based on evidence and set criteria. They get involved in active self-appraisal and management of the thought. These are attributes of cooperative strategy. Also as students monitor their own learning they learn to check their own responses and become aware of errors or answers that do not fit. Instruction in co-operative strategy of positive inter-dependences, individual accountability, inter-personal skills, face to face interaction and feedback mechanism had helps the respondent's achievement in Biology. This finding is similar to the findings of Ajaja & Eravwoke (2010) who investigated the Effects of Cooperative Learning Strategy on Junior Secondary School Students Achievement in Integrated Science. Their major finding revealed a significant higher achievement test scores of students in cooperative learning group then those in traditional classroom. Thus, instruction in cooperative strategy could have permitted the low-achieving students to gain control of their learning activities and were therefore, able to learn, the processes in Biology achievement such as, labeling, drawing, identifying and so on were enhanced due to instructions in cooperative methods.

Recommendations

1. The Cooperative Instructional Strategy (CIS) of teaching should be encouraged and practiced among students in senior secondary schools especially those whose performance is below average or those regarded as low-achieving students.
2. The pre-service teachers should be exposed to the new strategies so as to enhance effective teaching and learning in schools
3. Ministry of Education (Federal, State and Local Government areas) should as a matter of urgency, add to their curricular the use of CIS in

addressing the problems of low-achieving Biology students in senior secondary school in Nigeria and

4. They should frequently organize lectures, seminars for Biology and other science teachers in Nigeria on the need to use the new CIS.

References:

Ajaja O. P. & Eravwoke O. U. (2010) Effects of Cooperative Learning Strategy on Junior Secondary School Students on Achievement in Integrated Science. *Electronic Journal of Science Education* vol 14 No. 1-18 retrieved on 18/8/13 from ejse.southwestern.edu.

Ali. A. (1998) *Language problem in studying and understanding science concept among Nigerian secondary school students*. Nigerian Educational forum 6(2) 129-133

Baron, A. R. (2004) *Social Psychology* (10th ed). Hodder & Stoughton. Retrieved on 10/10/13 at <http://www.ISAN10-340-844965.htm>

Brooks, M. G. & Brooks, J. G. (1999) The Constructivist Classrooms: The Courage to be a Constructivist. *Educational Leadership*, 57 (3), 82-85.

Eniayeju, P. A. (1990) Seeking meaning in mole ratio instruction, *Journal of Science teachers' Association of Nigeria*, 26 (2), 93-95.

Elliot, S. N. Kratochwill T. R. Littledfeid C. J. & Trawers J. F. (2000) *Educational Psychology*. Boston McGrawHill.

Garduno F. L. H. (2001) The influence of cooperative problem solving on gender difference in achievement self-efficacy, and attitudes towards Mathematics in gifted students. *Gifted child quarterly*, 45(4), 268-282.

Glassersfeld, V. E. (1987) Learning as a constructions activity in C. Janvier & B. Gou (2003) *Contemporary Teaching Strategies in general Chemistry*. The clina papers 10(2) 39-41

Gou, Y., Abrami, P. C., & D'Appolonia, S. (2003) Small group and individual learning with technology: A meta-analysis. *Review of Educational Research*, 71, 449-521.

Johnson, D. W. & Johnson, R. T. (1994) An overview of cooperative learning. In Jones, K. A. & Jones, J. L. (2008) Making Cooperative learning work in the college classroom. An application of the five pillars of cooperative learning to post secondary instruction. *The Journal of Effective Teaching (JET)*. Vol 8 No. 2. Pg 61-76 Retrieved on 18/8/13 from <http://www.csenel-.org>.

Nwosu, A. A. (2003) Construction as an innovative model for science teaching: Importance and extent of use in secondary schools. *Journal of Science Teachers Association of Nigeria*, 38(1 & 2), 78-87.

Ngwoke (2005) Effect of two forms of Interest Adjust on students comprehension of a instrumental Teset. *A Journal of the Nigeria council of Education Psychology vol. 1(2) 54-61*.

- Odoh, C.O. (2000) *The relationship between students' achievement in identified chemical concepts and the balancing of chemical equations*. Unpublished M. Ed. Thesis, A.B.U. Zaria.
- Odoh, C.O. (2013) Effect of Cooperative Instructional Strategy on Student's Achievement in Senior Secondary School Chemistry. *Journal of Research in Curriculum and Teaching* Vol. 7 no 1 pp 583-589.
- Okebukola, P. O. (2005) *The race against obsolesce: Enhancing the relevance of STAN to National Development Memorial lecture of 2005 Annual Conference of the Science Teachers Association of Nigeria*. Jos, Nigeria.
- O'Donnell, A. (2002) Promoting thinking through peer learning. *Special issue of Theory into Practice*, 61(1)
- Ormrod, J. E. (2004) *Human Learning* (4th ed). Upper Saddle River/Merrill/Prentice-Hall
- Peklaf C. (2003) *Gender, Abilities, Cognitive Styles and Students' Achievement in Cooperative learning*. Retrieved On 13/8/13 from <http://www.znanstveni.cmpiricinc.raziskoralni>.
- Papalia, D. G., Old W. W. & Feldman R. D. (2002) *A Child World. Infancy through Adolescence* (9th edition) Boston McGraw Hill
- Ryan R. M. & Deci, E. L. (2000) Intrinsic and extrinsic motivation: Classic definition and new directions. *Contemporary Educational Psychology* 25 (1), 56-67.
- Rennie, J. Feher, K. Dieking, L. & Falk, B. (2003) *Toward an agenda for advancing research on Science Learning in out-school settings*. Retrieved On 13/8/13 from <http://www.znanstveni.cmpiricinc.raziskoralni>.
- Rochelle, J. (1992) *Reflections on Dewey's & Technology for situated learning*. Paper presented at annual meeting of American Educational Research Association San Francisco, C. A.
- Schunk, D. H. (1986) *Verbalization and Children's Self-regulated learning*. *Educational Psychology* (1) 347-369
- Slavin, R. E. (1995) *Cooperative Learning* (2th ed). Boston, Allyn & Bacon
- Summers, Woodruff, Tomberlin, Williams & Svinicki, (2001) *Cognitive processes of cooperative learning: A qualitative analysis*. A paper presented at the annual meeting of the American Research Association, Seattle.
- Savery, J. R. & Duffy, T. M. (2003) *Problem-based learning: An instructional and its constructivist framework*. In B. E. Wilson (Ed). *Constructional design pages*. Educational Technology Publications. Eablewood Cliffs N. J.
- Simsek, U., Yilar, B. & Kucuk B. (2013) The effects cooperative learning methods on students' academic achievements in social psychology lesson. *International Journal on New Trends in Education and their Implications*. Vol. 4 Issue 3. Pg 1-9 retrieved on 13/8/13 at www.ijnie.org.

Timberlake, K. (2002) *Using student-centered learning strategies in the Biology Classroom*. retrieved on April 24 from <http://www.karentimberlake.com/studentcenterdclassroom.htm>

Umaru, Y. (2010) *Effect of Instructions in Metacognitive skills on Self-Efficacy belief, interest and achievement of Low-achieving Mathematics Students in Senior Secondary School*. Unpublished Ph.D thesis. University of Nigeria (UNN):

Wookfolk, H. A. (2004) *Educational Psychology* (9th ed) Boston: Allyn & Bacon.

Wood, E. Willoughby, T. & Motz, M. (1998) Examining Students Retrospective

Memories of Strategy Development. *Journal of Educational Psychology*, 90(4), 689-704

WAEC (2010) *Chief examiners' report*, Lagos: WAEC