IMPART OF ZIMMERMAN MODEL OF SELF-REGULATED LEARNING STRATEGY (SRLS) ON THE ACADEMICS PERFORMANCE OF SSII PHYSICS STUDENTS IN DELTA STATE.

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Abstract

Trend analysis studies on students' academic performance have revealed that there is a steady decline in the performance of physics students in external examinations. Also several research efforts has been made to reverse this deteriorating trend in students' academic performance towards the study of physics but the problem still remain unabated. In order to address these issues, three research questions and three hypotheses were raised and tested in the study at 0.05 level of significant. The study adopted quasi-experimental research design. 675 SSII physics students in 12 co-educational senior secondary schools in Sapele Local Government Area in Delta State formed the population of the study. The sample for the study comprised of 108 (63 male and 45 female) students drawn from two (2) co-education public senior secondary schools, these schools were selected using the simple random sampling techniques by balloting. The instrument used for data collection was the Physics Students Achievement Test (PSAT). The instrument was validated by three experts and table of specification covering the 30 items was also used. The reliability coefficient for PSAT was 0.66 using Kuder Richardson 20(K-R20). The data collected were analysed using the t-test and analysis of covariance statistics. Based on the findings of the study, it was recommended among others that physics teachers should adopt Zimmerman Model of self-regulated learning strategy as an effective instructional strategy in enhancing students' academic performance towards the study of physics.

Keywords: Zimmerman Model, Self-Regulated Learning Strategy, Academics Performance & Physics Students

Introduction

One of the primary goals of education is to understand the learning process and provide support for those who struggle with it. In the late 1980s driven by the findings of rigorous educational research, several educational systems around the world participated in a movement to improve students level of higher order thinking skills and encourage learners to become move self–regulated and independent in their learning, so that they are able to take charge of their learning, control their learning processes, take part actively in such processed and have confidence in their capabilities and correctly use these capabilities. This will be a departure from individual raised with traditional method of education which involves mechanical learning and rote memorization.

Trend analysis studies on achievement patterns in physics among Nigerian senior secondary school students clearly shows that from 2001 to 2015 there was a steady average of 1.9% annual decline in students' achievement in physics at the West African Senior School Certificate Examination (WASSCE). Similarly, 2016 Nov/Dec. NECO results show that out of 22,201 number of students who sat for physics, only 818 representing 3.68% of the students pass at credit level. This downward trend in students' performance in external examinations in physics has become a source of worry for all especially physics educators. Could teaching method be responsible for this poor performance?

The essence of teaching is to bring about positive change in attitude and thinking of the students. The teaching method the teachers adopt in order to bring about this positive change is very important. But in Nigeria the predominant method of teaching physics is the traditional method which is mostly talk and chalk method that emphasizes transfer of knowledge, skills and rewards memorization. In this method the teachers talk while

the students listen and jot down notes mainly for the purpose of passing examination(s). According to Piaget and Vygotsky deposited that an important goal of teaching should be to lead the students to achieve participation so that they can actively explore and think and construct their own knowledge (Ihensekhien, & Salami, 2012).

The different ways in which students learn is a reflection of the type of teaching method that they are expose to. Therefore, teaching and learning through rote memorization could lead to poor performance of students towards physics. Studies have suggested that students generally regard the study of physics as difficult, abstract, uninteresting and elite disciples only suitable for exceptionally talented and gifted students. This might not be true as observed by the researchers.

Despites the different instructional methods proposed by different researchers, there is still persistence poor performance toward physics. Could it be that teachers only focus on teaching methods (that is teachers leaving the learning to the faith of the students)? How can we help students to learn and understand physics better and more importantly, encourage their future involvement in the study of physics? In answering these questions raised by the researcher is to look at a teaching and learning strategy proposed by Bandura knows as "Self–regulated learning strategy (SRLS) using the Zimmerma Model Of Self–Regulated Learning Strategy".

Saks and Leigen (2014) define self-regulated learning strategy as an active process whereby students set goals for learning, monitor and control their cognitive processes, get motivated and get to achieve the targeted goals set by the students. Self–regulated learning strategy is a learning process whereby learners can control their own motivation, cognition and behavior. Students can manage their own learning in a proactive way which includes the process of goal setting, planning, use of strategies, monitoring and evaluating. Therefore, to promote physics learning in Senior Secondary level in Nigeria, there is need for physics teachers to encourage students to develop and employ self–regulated learning strategy that will enable them view scientific knowledge as that which is not separated from their environment and background. Self-regulated learning strategy includes two sub–processes, motivational beliefs and strategy use. It can also be seen as the integration of "will" and "skills". "Will" refers to learners' goals, values and expectation or motivational orientation. "Skills" refers to the learners' use of different strategies of cognition, Meta–cognition and resources management (Garica, 1996).

Self–regulated learning strategy has a reputable history in cognitive psychology with roots in Bandera's Social–cognitive learning theory (SCLT) which suggests that learning occur as a result of a dynamic interaction of three factors constantly influencing each other, Person, Behaviour and Environment (Bandura, 1991; Melellan. & Martin, 2008; McAlister, Perry, & Parcel, 2002). For instance, an individual's belief, goals and self–perception can influence their behavior, in turn influence their thought and emotion. Additionally, an individual's behaviour can determine element of their environment and their behaviour can also change as a result of their environment. Finally physical and social factors of an individual's environment can influence their beliefs and cognitive functioning and vice – versa (Bandura, 2001). Bandura included self–regulation in his social–cognitive learning theory of human behavior as a process through which individuals control their external environment by conducting self–observation and judgments as well as self–reactions (Bandura, 2001; Schunk, 2008). More specifically, self–regulation focuses on the result of behaviour that can be seen as the product of the individual environment interaction.

Therefore, self-regulated learning strategy can be used to described learning that is guided by Meta-Cognition (thinking about one's thinking), Strategic action (planning, monitoring and evaluation, personal progress again a standards), and Motivation to learn (Zimmerman, 2001; Winne & Perry, 2000; Perry, Phillips & Hutchinson, 2006). In particular, self-regulated learners are cognizant of their academic strengths and weakness and they have a repertoire of strategies they appropriately apply to tackle the day–to–day challenges of their academic tasks. These learners hold incremental beliefs about intelligence (as against fixed views of intelligence) and attribute their successes or failure to factors (e.g effort expended on task, effective use of strategies) within their control. They believe that ability is incremental; they also value personal progress and deep understanding

and view errors as opportunity to learn. Understanding the nature of self-regulated learning strategy and how it is been nurtured opens up a world of possible roles and their relationship between teachers and students. That is why the metaphors of teaching as coaching and mentoring are popular today. It emphasizes how teachers deign and scaffold experiences that make students to emulate the wisdom of the teachers.

It is important to outline what does not constitute self-regulated learning strategy as documented in the literature. Researchers in the field have operated with the view that self-regulated learning is not a mental ability or an academic performance skill, but is a self-directed process through which students transform their mental abilities into academic skills (Zimmerman, 2008). Rather viewing themselves as victims of the learning process, with their learning simply being an event in reaction to teaching, self-regulated learners perform learning activities consciously in a proactive way for their own benefit (Zimmerman, 2008). Self-regulated learning strategy is also not a single personality trait that an individual possesses but involves selective use of specific processes/strategies that are personally adapted to each learning task and educational context.

There are different taxonomies of self-regulated learning strategy model available in literature, but his study adopts Zimmerman's cyclical Model of self-regulated learning strategy. McKeachic, Pintrich, Lin, and Smith (1987) deposited that, it is comprehensive and fit for Science (Physics) teaching and learning. However, self-regulated learning (SRL) strategy theories try to model how each of these Cognition, Meta-Cognition, Motivation and Contextual factors influences the learning process. Even though the four assumptions serve as the basis for most SRL strategy theories but reviews of literature indicates that some approaches have shown major dominance when it comes to studies involving students' academic performance and Zimmerman's Cyclical Model is one of them.

Zimmerman's Cyclical Model takes into consideration how an individual's perceptions; environment and behaviour interact to influence the learning process. He believed that self-regulated learning is distinct from other theoretical model of learning because it describes learning activities form the students' perspectives, also draws heavily from an individuals' self–image as a learner. Hence, his cyclical model of SRL strategy provides a useful way of exploring issues such as how self–efficacy shapes learning strategy used and how learners' self–evaluations influence their sub–sequent motivation and goal–setting. Zimmerman's cyclical model involves three sequential phases namely the fore thought (Pre–action) phase, the performance (actions) phase, and the self–reflection (Post–action) phase.

Forethought phase is seen as stage setting for learning – students engage in task analysis and assess their motivational beliefs. Students who self-regulate set achievable goals and are specific with the outcomes they are expecting (Moos & Ringdal, 2012; Zimmerman, 2008; Pintrich, 2004). The students strategically plan and select strategies that would optimise their success on a particular learning activity, (Duckworth et al, 2009; Stoeger and Ziegler, 2007; Boekaerts, Pintrich and Zeidner, 2000). Under this phase as well, students tend to ask themselves series of questions such as "where is the suitable place to complete this task?" "How can I complete this assignment on schedule?"

The second phase of the model is the *performance volitional (action) phase*. The phase entails the approach (i.e. self-control and self-observation) students' use in achieving their goals during task performance or learning. In this phase also, self-regulated students' can catechize themselves like "Am I following my plan correctly?" "Am I being distracted?", "What strategies can I use to help me keep working?" (Moos, & Ringdal, 2012 p.13).

Finally, the third phase is the *self-reflection phase (post-action)*. Self-regulated learners ponder on their actions and learning and evaluate them to see if they have been able to achieve the stated goals and the expected outcomes (Moos & Ringal, 2012; Zimmerman, 2000, 2008, 2009; Pintrich, 2004). Students who practice self-reflection do ask questions like "Have I been able to achieve all of my goals?" "Which strategies worked in view of the strategies worked in view of the activity and the situation (environmental context)?" "What conditions help me to be successful and what conditions distracted me?" Those questions are asked by the students to guide them to maintain and improve on strategies and to be intrinsically motivated as well. In a nutshell,

Zimmerman cyclical model of SRL strategy emphasis the inter-connectedness of personal (learners/students), social (teachers/more knowledgeable person), and environmental (school environment/outside school environment) factors as potential resource for learning and lack of it is likely to weaken students' performance and attitude.

The fact still remains' that beyond the various ways of how learners generate their thoughts and approaches to learning, self-regulated learners are generally characterized as active, efficiently managing their own learning through *setting of goals*, *monitoring and strategy use*. Taking into account the variations in the conceptualizations and re-conceptualizations of SRL strategy by major groups at the various model and theories appear to agree that it involves the use of **cognition,** *meta-cognition*, **motivational** and *behavioural strategies*. SRL theorists believe that the teachers can only understand students' learning and motivation fully when they study together since the two concepts are inter-reliant processes. On the whole, self-regulated learners are perceived to be able to plan and control the nature of instruction and the amount of instruction; select, create and organise advantageous situations and environments for themselves at any given time. But teachers should be able to model classrooms that encourage self-reflection, self-observation, and self-reaction in order to nurture students' self-regulatory skills and capacities

To promote or integrate SRL strategy in science classroom, teachers must teach students' the self-regulated learning processes that facilitate learning. These processes often include: *goal setting planning, attention control, flexible use of learning strategies, self-monitoring, appropriate help–seeking and self–evaluation.*

Self-regulated learning strategy as apply to performance is not necessarily universal in its application; rather, it can be situation or contextual. The skills and approaches needed for one subject do not necessarily apply to all subjects. As applied to the study of science (although it has been argued by researchers that SRL strategy can be applied to all subjects), Winne and Perry (2001) view SRLS which is similar to that of Zimmerman, has three components: Cognition, Meta–Cognition and Motivation. The Cognitive aspects comprises of the knowledge and skills a students' needs to engage in the processes of science; problem–solving, inquiring and critical thinking. The Meta–Cognitive aspect comprised of the knowledge and skills the students need to understand and exert control over there cognitions. While the motivational aspect comprised the attitudes and belief the students have in relation to the use and development of one's cognition and meta – cognition". (Sinatra & Taasobshirazi, 2011). Over the past decades, educational research has emerged on the use of SRL strategy as a dominant paradigm. This new paradigm emphasis learning as an active process best facilitated by the learner himself and the interaction with peers, teachers, and other learning resources.

Chika, Abigial and Okafor (2015) carried out a study of the effect of SRL approach on junior Secondary School students' academic achievement in basic science. The study attempted to provide education with various strategies to increase basic science students' learning. The purpose of the study according to them is to explore the effect of SRL approach on students' achievement also on male and female students' achievement as well. However, the findings of the study reveal that SRL approach enhance students' academic achievement in basic science than the conventional method. Anane (2014) perform a study investigating pre-service teachers' motivation and self–regulated learning and its impact on their academic achievement. The multi–stage sampling technique was used in selecting 500 teachers' trainers from residential colleges of education in Ghana. The findings from the study indicate that SRLS intervened significantly in the influence of performance. Baris (2015) investigated whether academic motivation and academic self–regulated learning predicted students' academic achievement. The results of the study showed that there was no correlation between grade point average of students and academic motivation and academic self–regulated learning. Kim and Seo (2013) in their study showed that self–regulated learning explained academic achievement. Komacraju, Karau and Schmeck (2009) determined that self–regulated learning best predictors of academic achievement and intrinsic motivation to accomplish task. Kosin (2007) study showed that self–regulated learning strategy is the best predictor of academic achievement in college students. Self-regulated learning strategy and achievement is one of the most studied topics of self–regulation, but findings are not entirely consistent. Some researchers like Miechenbaum &

Beimiler (19992) Puklek–Leupuseek (2001) have found positive connection between using Cognition, Meta–cognitive strategy and achievement, but others like Peejala & Kosir (2003), and Peklaj and Vodopive (1998) found no or negative connection.

However, the choice of heat and temperature for this study was born out of the fact that studies have shown that students have difficulty about the concepts of heat and temperature which may hinder their adequate understanding of the concepts and also heat and temperature are important topics as they are applicable to many fields of science and technology. Researchers have also observed that students frequently confused the concepts of heat and temperature. Therefore, this study will make an attempt to investigate the effects of self–regulated learning strategy (SRLS) on academic performance of Nigeria Senior Secondary school physics students applying SRLS model in the concepts of heat and temperature.

Statement of the Problem

Over the year's students' performance in the study of physics have considerably deteriorated in external examinations. Trend analysis studies on performance patterns in physics among Nigeria Senior Secondary School students clearly shows that between 2004 to 2006, in the West African School Certificate Examination (WAEC) results showed that the percentage of students with credit pass and above in physics for May/June Senior School Certificate Examination (SSCE) was 45,40%, 41.05 and 48.66% respectively (WAEC, 2006). Omoifo (2012) showed that NECO results released for 2011 examination show that the total numbers of students who sat for physics is 43, 504, but 90.05% of the total number of students failed, only twenty-four (24) candidates' or 0.5% passed at credit level and above. However, several teaching and learning methods have been proposed to address this ugly trend but still there is no improvement. Thus, the question arises as "is self–regulated learning strategy (SRLS) using the Zimmerman Model an appropriate learning strategy that can address this ugly situation?

Purpose of the Study

The main purpose of this study is to determine if self-regulated learning strategy using the Zimmerman Model can be inculcated in Senior Secondary School Physics learning and its effects on their academic performance in physics. Specifically, the study explored the impact of self-regulated learning strategy on students' academic achievement.

Research Questions

The following research questions were raised to guide this study.

i. Is there any difference in performance of SSII physics students exposed to self-regulated learning strategy and those exposed to the traditional (lecture) method of physics instruction?

ii. Is there any difference in performance between pre-test and post–test of SSII physics students in the experimental group?

iii. Is there any difference between the performance of male and female students after being taught using self-regulated learning strategy?

Hypotheses

The following hypotheses were formulated:

Ho_1: There is no significant difference between students' academic performance of those exposed to self-regulated learning strategy and those exposed to the traditional (lecture) method of instruction.

Ho_2: There is no significant different in performance between pre-test and post-test of SS11 Physics students in the experimental group

Ho_3: There is no significant difference in performance of male and female SS11 students' after being taught using self-regulated learning strategy.

Significance of the Study

The findings of the study will enable researchers, science educators, curriculum planners, ministries of education, education research institutions and organizations of interest to have empirical evidence on self-regulated learning strategy model on academic achievement among physics students. The findings will also be beneficial to physics teachers as it would enable them to be knowledgeable on the appropriate learning strategy that will equip students to be independent (taking responsibility of their own learning) and becoming life–long learners.

Method

The research design that was adopted in this study is the quasi–experimental design. It is a quasi–experimental study because it can be used to establish a causal effect connection between the dependent and independent variables. The design is represented and illustrated in

Tables1: Pre–Test/Post–Test Non–Equivalent Control Group Design.

Group	Pre-test	Treatment	Post-test
Experimental group	O_1	X_1	O_2
Control group	O_1	_	O_2

Where 0_1 and 0_2 represent the pre–test and Post–test respectively. X is the treatment (self–regulated learning strategy and - is the traditional method of instruction.

The populations for this study consist of all senior secondary school two (SSII) students that offer physics as a subject in all Co–educational public senior secondary schools in Sapele Local Government Area of Delta State. A total of 13 Government secondary schools offer Physics in Sapele L.G.A. with students' population of 675. The sample size for this study was 108 SSII physics students which comprises of 63 male and 45 female. The experimental group consists of 53 students (30 male and 23 female) while the control group consists of 55 students (33 male and 22 female); out of the 13 Co–educational public Senior Secondary Schools in Sapele L.G.A. only two schools was randomly selected through purposive sampling technique for the study based on the criteria set by the researcher. One intact class was selected randomly through balloting to determine which school served as the experimental and control group respectively.

The instrument used for this study was the pre–test/post–test achievement test, to measure students' acquired knowledge that enhanced their performance. A total of 30 multiple choice questions developed by the researcher were used for both the pre–test/post–test performance test. The instrument was given to three experts for face and content validity. The experts were required to scrutinize the items of the instrument in terms of their appropriateness to achieve the purpose of the study. They were also required to ensure the relevance of the content validity of the pre–test/post–test performance test was done using table of specification covering the 30 items. The 30 items covered the topic taught to the students in the experimental and control class. To determine the internal consistency of the instrument a pilot testing was carried out by the researcher. Twenty (20) copies of the instrument were trial tested on a sample of 20 senior Secondary School two (SSII) physics students in one of the schools in Sapele L.G.A. The school is part of the population but is not part of the study. Using Kudder Richardson 20 (K–R20), the reliability coefficient was found to be 0.66 since the achievement test was dichotomously scored.

Method of Data Analysis

The data obtained from the pre–test/post–test achievement test was analyzed using mean and standard deviation. The null hypotheses formulated were analyzed using t-test and Analysis of covariance (ANCOVA). All statistical analysis was tested at 0.05 level of significance.

Results and Discussion

Hypothesis 1: There is no significant difference between students' academic achievement of those exposed to self–regulated learning strategy and those exposed to the traditional method of instruction.

Table 2: Independent Sample t–test of achievement of SSII students exposed to self–regulated learning strategy and those exposed to the traditional method of instruction at pre-test.

Group	*N*	*Mean*	*Std*	*t*	*Sig(2-tailed) (p)*
Control	55	8.436	2.440		
				2.101	038
Experiment	53	7.509	2.127		

α =0.05

Table 2 shows a calculated t – value of 2.101 and a P – value of 038, testing at an alpha level of 0.05. Since the P value is less than the alpha level, there is a significant difference between achievement of students exposed to self–regulated learning and those exposed to the traditional method of instruction at pre–test hence the need for ANCOVA at post–test.

Table 3: Descriptive Statistics of achievement of physics students exposed to self–regulated learning strategy and those exposed to the traditional method of instruction at post–test.

Group	*N*	*Mean*	*Std*
Control	55	13.364	4.660
Experiment	53	26.283	1.574

α =0.05

Table 3 shows that the mean and standard deviation for the control group are 13. 364 and 4.660 respectively and for the experimental group are 26.283 and 1.574 respectively. When compare Table 2 and 3, it shows that after treatment (table3), there is improvement in students' academic performance. Hence, the used of ANCOVA.

Table 4: ANCOVA of achievement of physics students exposed to self –regulated learning strategy and those exposed to the traditional method of instruction at post–test.

Source	*Type III sum of square*	*Df*	*mean square*	*F*	*Sig (p)*
Corrected Method	4506.772	2	2253.361	182.031	.00
Intercept	3044.29	1	3044.290	245.923	.00
Pre- achievement	1.683	1	1.685	.136	.713
Group	4359.108	1	4359.108	352.137	.00
Error	1299.797	105	12.379		
Total	47736.00	108			
Corrected Total	5866.519	107			

α = 0.05

Table 4 shows an F value of 352. 137 and a P value of .000. Tasting at an alpha level of 05, the P value is less than the alpha level. So, the null hypothesis which stated that there is no significant difference between SSII physics students' achievement of those exposed to self–regulated learning strategy and those exposed to the traditional method of instruction is rejected. Consequently, there is significant difference between achievement of SSII students exposed to self–regulated learning strategy and those exposed to the traditional method of instruction.

Table 5: Least significance difference multiple comparison of achievement of SSII physics students expose to the experimental group and those exposed to the control group at post – test at post – test.

Group (i)	*Group (j)*	*Mean difference (i – j)*	*Sign (p)*
Experimental	Control	12.970	.000

α = 0.05

Table 5 shows a mean difference of 12.970 and P value of .000 showing therefore that self–regulated learning strategy is more superior to the traditional method of instruction in enhancing students' academic achievement.

Hypothesis 2: There is no significant difference in achievement between pre–test and post–test of SSII physics students in the experiment group.

Table 6: Paired sample t-test of achievement between pre–test and post –test in the experimental group.

Test	*N*	*Mean*	*Std*	*t*	*Sig (2-tailed)(p)*
Pre–test	53	7.509	2.127		
				-55.157	.000
Post–test	53	26.282	1.574		

$\alpha = 0.05$

Table 6 shows a calculated t value of – 55.157 and P value of .000 testing at an alpha level of 0.05. The P value is less than the alpha level. The null hypothesis is therefore rejected. Consequently, there is a significant difference in achievement between pre–test and post–test of SSII physics students in the experimental group.

Since the mean of the post–test (26.283) is greater than the mean of the pre–test (7.509), it shows that the students' academic performance was significantly higher at post–test than the pre–test. Meaning that, the treatment is effective.

Hypothesis 3: There is no significant difference in achievement of male and female SII physics students after being taught using self–regulated learning strategy.

Table7: Independent sample t–test of achievement of SSII physics students' using self–regulated learning strategy by male and female at pre–test.

Sex	*N*	*Mean*	*Std*	*t*	*Sig (2-tailed)(p)*
Male	30	8.33	1.729		
				3.565	.001
Female	23	6.43	2.150		

$\alpha = 0.05$

Table 7 shows an independent sample t–test value of 3.565 and p value of 0.001 at pre–test, testing at an alpha level of 0.05. Since the P value is less than the alpha level, there is a significant difference in achievement of male and female physics students after being taught using SRL strategy at pre–test. Hence there is need for ANCOVA at post–test.

Table 8: Description statistics of male and female SSII physics students' academic achievement taught using self–regulated learning strategy at post–test.

Sex	*N*	*Mean*	*Std*
Male	33	13.455	4.714
Female	22	13.303	4.688

$\alpha = 0.05$

Table 8 shows that the mean and standard deviation for the 33 male students who was taught suing self–regulated learning strategy at post–test are 13.455 and 4.714 and for the 22 female students are 13.303 and 4.688 respectively.

Table 9: ANCOVA of male and female physics students' achievement taught using self–regulated learning strategy at post–test.

Source	Type III sum of square	Df	mean square	F	Sig (p)

Corrected Method	.484	2	.242	.011	.985
Intercept	7714.386	1	714386	31.690	.000
Pre- achievement	.181	1	.181	.008	.929
Sex	.271	1	.271	.012	.913
Error	1172.243	52	22.543		
Total	10995.000	55			
Corrected Total	1172.727	54			

$\alpha = 0.05$

Table 9 shows an f value of .12and a P value of .913 tasting at an alpha level of .05. The p value is greater than the alpha level, so the null hypothesis that stated "there is no significant difference in achievement of male and female physics students being taught using self–regulated learning strategy" is retained.

Discussion

This finding of this study revealed that there was significant different between the performance of physics students' who are exposed to self–regulated learning strategy of instruction and those who are expose to the traditional method of teaching physics. Meaning that, self–regulated learning strategy is more effective in improving students' academic performance than the traditional method of physics instruction. The finding is in agreement with the studies of Enyeneokpon (2012), and Kitsantas and Zimmerman (2006), those students who are exposed to self–regulated learning strategy performed academically better than those students' who are exposed to traditional method of teaching physics.

The null hypothesis two (Ho_2) was rejected based on the fact that there is positive connection between self–regulated learning strategy and achievement as shown in **table 6.** Apart from improving students' academic achievement, it also showed that self–regulated learning strategy is an effective instructional method teaching physics which is in agreement with the study of Zimmerman's theory that says when students are given the opportunities to self–regulate and explicitly taught of self–regulated learning strategy, academic performance is more likely to be positively affected. Similarly, the findings also confirm the result of the studies of Chika, Abigail and Okafor (2015); Adodo (2013); and Anane (2014), that the use of the theory of self–regulated learning strategy improve students' academic performance in science subjects.

The null hypothesis three ($Ho_{3)}$ of this study was retained that there is no significant difference in achievement between male and female student that were taught using self–regulated learning strategy as instruction. This implies that there is no disparity in the performance of male and female students' after receiving self–regulated learning strategy instruction. However, the findings is in agreement with the studies done by Peklaj and Peejak (2002) and Metallidon and Vlachon (2007) who did not find any significant differences between boys and girls who used self–regulated learning strategy of instruction.

Conclusion

From the results obtain in the study; the researcher concluded that self–regulated learning strategy of instruction is superior to the traditional method that most physics teachers used in teaching physics. In fostering and mastering of physics concepts among senior secondary school students,' when students are exposed to learning through exploration, asking questions, writing, answering questions, setting of goals and writing down questions and answers on what they have explored. Concepts are more appropriately internalized with the learner taking responsibility of their own learning.

Recommendations

Based on the findings of the study, if science students are to learn what science teachers cannot do for them in the classroom, then it could be recommended that:

i. Physics students should be given opportunities to develop more independence through the provision of consistence use of self-regulated learning strategy in science class.

ii. Physics teacher should adopt self-regulated learning strategy as an effective teaching/learning strategy in enhancing student' academic achievement in their science teaching.

iii. Seminar, workshops, conferences and any other form of i-service training should be organized for physics teachers on when and how to use self-regulated learning strategy in physics classroom.

iv. Science teachers(s) should be discouraged from using teacher centered instructional method in teaching their students, but they should be encouraged in using students centered instructional method such as self-regulated learning strategy in teaching students (irrespective of their sex or ability) to gain from the teaching and learning process in physics.

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