



Effect of Meta-Heuristic Strategy on Interest in Settlement Concepts among Secondary School Geography Students in Minna Education Zone, Nigeria

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ABSTRACT

The study determined the Effect of Meta-Heuristic Strategy on Interest in Settlement Concepts among Secondary School Geography Students in Minna Education Zone, Niger State. The study contained three objectives with their corresponding research questions and null hypotheses. The research design employed for the study was Quasi-experimental design, particularly pretest, posttest groups design. The study consists of experimental and control groups. The non-equivalent control groups design involving two groups were used, that is, experimental group and control group. The population of the study comprised of 9000 SSSII students offering Geography as at 2018/2019 academic session in government own senior secondary schools in Minna, Niger State. A sample of two hundred and one (201) students were derived from two co-education and two single schools, that is, one hundred and seven (107) male and ninety-four (94) female students using stratified random sampling procedure. One validated instrument was developed by the researcher named as Settlement Inventory Interest Questionnaire (SIIQ) with reliability coefficient of 0.7 respectively. Research questions raised were answered using descriptive statistics of mean and standard deviation while null hypotheses formulated were tested using inferential statistics of Mann Whitney (U-test) at conventional threshold value of $p \leq 0.05$ level of significance. The finding showed that, there was significant difference between the interest ability of students taught settlement concepts using meta-heuristic strategy and those taught using lecture method only at senior secondary schools of the study area. Similarly, the finding portrayed that, there was no significant difference between the interest of male and female students in two different single schools taught settlement concepts using meta-heuristic strategy only at senior secondary school of the study area. The study recommended the need for State Ministry of Education and Science Teacher's Association of Nigeria (STAN) to encourage teachers on the use of meta-heuristic strategy in teaching Geography at secondary schools level.

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INTRODUCTION

Science is concerned with critical analysis of fundamental issues that relates or affects science knowledge as equality, autonomy, equity, freedom analysis of the kind and nature that influence society. Singh (2014) defined science as the study that involves systematic study of natural phenomena which allows the students to experience the richness and excitement of the natural world, the process of inquiring, critical thinking and demonstration of skills. Science and technology education had to do with the teaching and training individuals to acquire skills, knowledge and attitudes systematically and the application of these values to the society.

Geography was derived from two Greek words "Geo" meaning the Earth, and "Graph" meaning description. Therefore, Geography could be defined simply as the description of the earth. Geography is the study of the earth's surface and its features and the processes that occur. It is also centred with the study of the size, shape and movement of the earth and other heavenly bodies. As defined by Iwena (2018) Geography is the study of people, their activities, places and physical surroundings within the earth. The objective of teaching Geography at Senior Secondary School level as spelt out by National Policy on Education (FRN, 2013) include given students a sound knowledge of the immediate environment and inculcating meaningful knowledge to students so as to contribute positively to their communities and nation at large. This indicates that, knowledge is passed to students as skills and values which can improve the meta-cognitive structures

of the students. Adeyemi (2008) opined that, the learning of Geography should be based on teaching materials, variety of teaching methods and dynamic approach. Students learn through observation and doing, which signifies hands-on and minds-on strategies that could be introduced to the phenomena of nature which surround them through the use of fascinating learning materials that will make them to be exploratory in nature.

Meta-heuristic strategy is also a method of inculcating knowledge to learners. In this method, learners actively involved in meta-heuristic. Cognitive processes of planning, monitoring and reflecting which allows learners to show, tell and create knowledge in process of learning. It helps students to develop effective learning ability on their own (Van Gog, Pass and Kostons, 2010). Veeman (2010) posited that, meta-heuristic strategy specifically addresses four commonly distinguished meta-heuristic skills as; orientating, planning, monitoring and evaluation. While working on the exercises, students are stimulated to ask meta-heuristic questions and reply to the questions latte, which trains them to reflect and organise the process of the solution. Chief Examiner's Report (NECO, 2019) indicated that, students' performances in questions related to settlement concepts are relative poor. This is because majority of candidates could not indicate and interpret a given patterns of settlement on map. The situation was the same in 2018 and 2019 where the majority of students who sat and attempted for June/July, 2018 and 2019 Geography Paper I, and question number one on map reading could not

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properly indicate and name patterns of settlement such as nucleated, ring, linear and dispersed patterns of settlement. Likewise stated that, geography students failed to attempt questions on map reading because of students' inability to locate, indicate and differentiate the types and patterns of settlement as well as direction of flow of river from one settlement to another on map. It was based on this background, the researcher used meta-heuristic strategy and taught students settlement concepts, based on the findings of the study, and the instructional strategy has improved students' interest in settlement concepts among Geography students in Minna education zone, Niger State.

Meta-heuristic strategy allows students to develop skills that will enable them to effectively adapt to changes, stay up to develop into self-directed and lifelong learners (Guglinelmino, 2013). Meta-heuristic strategy is an instructional technique that provides students with opportunities to develop and improve their abilities to direct their own learning (Song, and Bank, 2016). According to Kan'an and Osman (2015) it is a teaching and learning activities aimed at developing skills which may contribute to students' success in their current as well as future learning. Saks and Leijen (2014) posited that, it is the ability to accept responsibility for owning learning and to view problems as challenges, not as obstacles but a desire to learn and the ability to manage own learning. Mentz and Van Zyl (2016) lamented that, meta-heuristic strategy provides individual the opportunity to have the innate and universal need for

competency. Also, it affords ones' ability to gain mastery of tasks and learn new skills, to interact with others and feel accepted to experience the feeling of being in control of one's own actions and goal. Gurickis and Markant (2012) explained that, students tend to be more successful learners when they control the learning process themselves, which means that, they have the ability to self-direct their learning, hence, this indicates the significance of meta-heuristic strategy. Havenga (2015) stated that, a meta-heuristic strategy enables students to manage their learning, which leads them to become responsible and independent learners. It seems that, most students are ignorant about meta-heuristic and are not involved in meta-heuristic thinking, unless they are encouraged to do so through appropriate teaching and learning activities (Gezer-Templeton, 2017). Stacy (2010) explained that, the acquisition of meta-heuristic skills can help the learners to understand, learn in a positive and effective manner, ease the acquisition of new habits of thinking, the acquisition of mental skills that enable independent self-learning, control thinking to improve ability to understanding management, planning, problem solving. Due to the importance of developing the skills of meta-heuristic strategy, the researcher examined the Effect of Meta-Heuristic Strategy on Interest in Settlement Concepts among Secondary Geography Students in Minna Education Zone, Niger State. The used of instructional technique (meta-heuristic strategy) has significant effect on interest of Geography students according to the finding of the study.

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Gender is another moderating factor in this study, especially since it involves the use of meta-heuristic strategy. The usual assertion is that since boys are more predisposed to the use of technology, they may benefit more from the integration technology for teaching and learning. Girls on the other hand may be limited in their learning when it involves technology. Gender differences in academic performance have been observed in teacher grades and in standardized tests for many years (Obeka, 2010). Girls generally receive high classroom grades while boys outperform girls on standardized tests. Several reasons have been offered for these differences. In standardized testing situations, individual differences in knowledge or skills are more directly assessed. Perhaps of even greater importance is the transfer of knowledge to different situation. Evaluation of academic performance among male and female over the years has to who performs better in classroom situation and during evaluation process has for long remain a controversial issue (Usman, 2010; Oloyede, 2011; Obeka, 2012; Nuruddeen, 2013).

The effect of gender on learning outcomes in sciences is still an issue of debate among educators as a result of conflicting results from studies that focus on gender and performance. Researchers have come up with different findings on the effect of gender on learning outcomes. Nuruddeen (2013) disclosed that, the influences of students' gender in their academic achievement had been a concern to researchers in education, yet no consisted result had emerged. These

situations therefore sustain the curiosity of researchers, making it necessary for the need to understand how academic achievement was influence by gender on instructional package. Ochu and Atagher (2011) findings which have demonstrated differences due to gender in various academic achievements have become popular and generally accepted by scholars. Females tend to score higher on verbal test and always do better on coding tests, which call for short memory, speed and daftness. The males on the other hand, invariably achieved higher scores on arithmetic, although there was no enough evidence that males and females differ in average intelligence. Oloyede (2011) in his findings showed that there was no significant difference between the academic performance of male and female students taught chemistry with pictorial and written organizers. The non-significant difference in the achievement of male and female chemistry students agreed with the findings of Nsofor (2010) who reported that both male and female could do well in science if exposed to similar learning conditions. So, the researcher had investigated the effect of meta-heuristic strategy on interest in settlement concepts among secondary Geography students in Minna Education Zone, Niger State. Hence, the finding of the study portrayed that, the exposure of students to the instructional approach had positive effect on interest of both male and female students in learning settlement concepts of Geography in Minna Education Zone. As a result of that, the teaching method is gender friendly.

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Interest is an attraction or desire which compels a learner to respond to a particular stimulus. Mangal (2010) observed that, interest is the key factor driving force that help us in paying attention as well as remaining engaged in our so attended activities. It is the great motivating force capable of moulding and shaping one's behaviour. Interests are not permanent fixed; they change as a result of maturation and other environmental factors (Mohammed, 2017). Obeka (2010) defined interest as the course of certain actions which acts as motivation that propels to act in certain ways and as the effect of an activity which a child is learnt to pay attention as the lesson goes on, if he or she is interested in the particular lesson and the method of learning. According to Mohammed (2017) paraphrased interest as a feeling that prompts learners on spontaneous activity. It is the motivating force that impels learners to attend to a person, a thing or an activity as well as effective experience that has been stimulated by the activity itself. Interest is also aroused in studies and good conduct. Thus, interest could be the cause of activity and the result of participation in a given task. Therefore the investigator determined the effect of meta-heuristic strategy on interest of students in learning settlement concepts of Geography. As a result of that, the findings of the study indicated that, interest is motivating factor capable of shaping and broadens learners' behaviour in acquiring meaningful knowledge of settlement concepts of Geography in Minna Education Zone.

Settlement can be defined as a group of houses with people living in

them. It is a unit or organised group of men, women and children making out of their surrounding environment. These units vary in size, complexity and stage of development (Areola, Ahmed, and Adeleke, 2016). A settlement is a way of arranging houses into a hierarchy based upon their population or some other criteria. A settlement is also referred to grouping of houses which can result to gregarious nature of human beings. According to social scientists, a settlement comes into existence when the people settle down at a place to collectively utilize the local resources (Singh, 2014). The researcher selected and taught students settlement concepts because of Chief Examiner's Report (NECO, 2019) which indicated that, students' performances in questions related to settlement concepts are relatively poor. This is because majority of candidates could not answer, indicate and interpret a given questions on patterns of settlements on map, the candidates that were examined in Geography failed to make a credit pass in Geography. Hence, the researcher used meta-heuristic strategy and taught students settlement concepts so as to improve the interest of learners. Based on the finding of the study the instructional approach has improved the students' interest in acquisition of meaningful knowledge of settlement concepts among secondary Geography students in Minna Education Zone, Niger State.

Statement of the Problem

Chief Examiner's Report (2019) disclosed the consistent failure in Geography at SSCE level as at 2015-2019 academic sessions. The results calibrated that, about 60 to 70 percent of

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the candidates that were examined in Geography failed to make a credit pass in Geography. The researcher selected and taught students settlement concepts because of Chief Examiner's Report (NECO, 2019) indicated that, students' performances in questions related to settlement concepts are relatively poor and developed less interest. This is because majority of candidates could not indicate and interpret a given patterns of settlement on map. The situation was the same in 2017 and 2018 where the majority of students who sat and attempted for June/July, 2017 and 2018 geography paper I, question member one on map reading could not properly indicate and name patterns of settlement such as nucleated, ring, linear and dispersed patterns of settlement. Likewise stated that, geography students failed to attempt questions on map reading because of inability to locate, indicate and differentiate the types and patterns of settlement as well as direction of flow of river from one settlement to another on map. Abdulkarim (2013) attributed the students' poor academic performances to persistent use of conventional teaching approach such as the didactic method to disseminate knowledge of Geography to students. Therefore, there is need for Geography teachers to shift from persistent use of conventional teaching method to experimental method, students-centred, active learning, hands-on and minds-on techniques, process-based instruction as well as metal-heuristic strategy that would enhance academic performance and retention ability of the geography students.

Limited use of instructional methods and materials by staff and students for teaching Geography, like using computers, globes, meteorological stations, water reservoirs, forest reserved were reported by Aderogba (2010) and Abdulkarim (2013) as the major challenges of teaching Geography at Nigeria's senior secondary schools level. In the study conducted by Abdulkarim (2011) observed that 85% of senior secondary schools in Kaduna State operates the teaching of Geography with obsolete and inadequacy of equipment/media for teaching the subject. Existing realities at senior secondary schools in Nigeria showed a dismal utilization of Geography equipment by the teachers and students.

The National Geography Curriculum is designed to cover the three domains of education; cognitive, affective and psychomotor skills of the learner (NERDC, 2013; Obeka, 2010; Haliru, 2015). However, the report indicated that teachers dispensed and imparted only the cognitive skills to the detriment of other two skills. In essence, the attitudinal interest (affective) and psychomotor aspect of the course are neglected. This situation has resulted to the low rate of interest and inadequate academic values of geography studies by students (Mohammed, 2017).

Learners acquire and retain the knowledge imparted in school for future situations, use in school, life and in meeting out-off school life problems of the present and future. However, despite some of the findings and recommendations from other studies the low interest confronting Geography students in the study area. Based on

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these issues, challenges and problems identified, so, the researcher used meta-heuristic strategy and taught students settlement concepts in order to enhance the interest of students, hence, the findings of the study showed that, the teaching method has improved students' interest in learning settlement concepts among Geography students as regard to poor academic performance as well as low cognitive abilities observed.

Objectives of the Study

The study determined the following objectives:

1. Determine the Effect of Meta-Heuristic Strategy on interest of co-education students in learning of settlement concepts.
2. Find out the Effect of Meta-Heuristic Strategy on interest of male and female co-education students in learning of settlement concepts.
3. Find out the Effect of Meta-Heuristic Strategy on interest in two different single schools of male and female students in learning of settlement concepts.

Research Questions

The following research questions were raised to guide the study.

1. What is the difference between the mean interest scores of co-education students taught settlement concepts using Meta-Heuristic Strategy and those taught using Lecture Method?
2. What is the difference between the mean interest scores of male and female co-education students taught settlement concepts using Meta-Heuristic Strategy?
3. What is the difference between the mean interest scores in two different

single schools of male and female students taught settlement concepts using Meta-Heuristic Strategy?

Null Hypotheses

The following null hypotheses were formulated and tested at $p \leq 0.05$ level of significance.

- HO1:** There is no significant difference between the mean interest scores of co-education students taught settlement concepts using Meta-Heuristic Strategy and those taught using Lecture Method.
- HO2:** There is no significant difference between the mean interest scores of male and female co-education students taught settlement concepts using Meta-Heuristic Strategy.
- HO3:** There is no significant difference between the mean interest scores in two different single schools of male and female students taught settlement concepts using Meta-Heuristic Strategy.

METHODOLOGY

The research design employed for the study was Quasi-experimental design, particularly the post-posttest control groups design. The non-equivalent control group design involving two groups were used, that is, experimental group and control group. The experimental group was taught using model of meta-heuristic strategy as treatment while the control group was assigned to conventional method that is, without treatment. An intact class was used for both experimental and control groups.

The population of the study comprised of 9000 SSSII students

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offering Geography as at 2018/2019 academic session in government own senior secondary schools in Minna, Niger State. A sample of two hundred and one (201) students were derived from two co-education and two single schools, that is, one hundred and seven (107) male and ninety-four (94) female students using stratified random sampling procedure which is in line with Sambo's (2008); Musa (2012); Thomas and Israel's (2014) recommendation that, a sample size of minimum number of 30 is viable for a study.

One instrument was developed by the researcher to generate data for the study, which was Settlement Inventory Interest Questionnaire (SIIQ). The SIIQ comprised of twenty (20) items on interest inventory questionnaire that were adapted from Mohammed (2017) on Geography Interest Questionnaire (GIQ) which contained twenty (20) items interest inventory questionnaire on landform processes of Geography and Asogwa (2018) to assess the interest of the students. The items were developed using the Likert's (1973) 5-point rating scale which are Strongly Agreed (S.A=5), Agreed (A=4), Undecided (U=3), Disagreed (D=2) and Strongly Disagreed (S.D=1) respectively.

The SIIQ draft were scrutinized by panel of experts that is, two with qualification of PhD and three with rank of Professor in the field of Geography at Department of Science Education, Institute of Education and two PhD qualification holders in Department of Geography in Ahmadu Bello University, Zaria. Pilot testing for reliability of the research instrument was conducted using Settlement Inventory Interest

Questionnaire (SIIQ) on thirty (30) SSS II Geography students of Government Day Secondary School Minna whom are not part of the sample for the study but part of the population of the study. The researcher with the help of Geography teachers in the school administered the instruments which lasted for one hour. A test-retest method of pilot testing was employed which was conducted at the first week of pilot testing of instrument and collected back for scoring. Cronbach's Coefficient Alpha Statistic was used to ascertain the internal consistency of SIIQ with the aid of excel and SPSS package. The result obtained for the reliability coefficient of SIIQ was $r = 0.70$.

The items of SIIQ were administered by the researcher through the use of marking scheme so as to obtain information from the students. The data collected after marking the students' answer scripts were computed into experimental and control groups. So, the scores collected from test was recorded, calculated, and subjected to data analyses respectively. The data collected were analysed at two different levels, via descriptive and inferential levels. At the descriptive level, the descriptive statistics of mean and standard deviation were used to respond to research questions. While at the inferential level, Mann Whitney (U-test) was used to test the null hypotheses at the significance level of $p \leq 0.05$.

Research Question One: What is the difference between the interest scores of co-education students taught settlement concepts using Meta-Heuristic Strategy and those taught using Lecture Method?



Table 1: Summary of Mean Rank and Sum of Ranks of Settlement Concepts on Interest on Co-education Students for Experimental and Control Groups

Groups	N	Mean Rank	Sum of Rank	Mean Rank Diff.
Experimental	77	100.39	7730.00	66.42
Control	63	33.97	2140.00	

Table 1 showed that the mean rank and sum of rank of interest of co-education students in experimental and control groups were found to be 100.39 and 33.97 and also 7730.00 and 2140.00 as the sum of rank. The mean rank difference was found to be 66.42 indicating difference in the interest in learning settlement concepts by Secondary School Students using Meta-

Heuristic Strategy and lecture method. The students taught settlement concepts using Meta-Heuristic Strategy have the greater sum of rank than control group

Research Question Two: What is the difference between the mean interest scores of male and female co-education students taught settlement concepts using Meta-Heuristic Strategy?

Table 2: Comparison of Mean Rank and Sum of Ranks of Male and Female Students on Interest for Co-education Students in Experimental Group

Variable/Group	N	Mean Rank	Sum of Ranks	Mean Rank Difference
Experimental Group	Male	40	37.71	2.680
	Female	37	40.39	

Table 2 indicated that, the mean rank of male and female co-education students in experimental group were found to be 37.71 and 40.39 while the sum of ranks were found to be 1508.50 and 1494.50. The mean rank difference was found to be 2.680. From their sum of ranks, both male and female students have almost equal ranks. The

established the signed that the treatment had promoted the interest of both male and female students in learning settlement concepts significantly.

Research Question Three: What is the difference between the mean interest scores of male and female co-education students taught settlement concepts using Meta-Heuristic Strategy?

Table 3: Comparison of Mean Rank and Sum of Ranks of Male and Female Students on Interest in Experimental Group

Variable/Group	N	Mean Rank	Sum of Ranks	Mean Rank Difference
Experimental Group	Male	31	28.55	0.07
	Female	30	28.48	

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Table 3 indicated that, the mean rank of male and female co-education students for experimental group were found to be 28.55 and 28.48 while the sum of ranks was found to be 799.50 and 796.50. The mean rank difference was found to be 0.07. From their sum of ranks, both male and female students have almost equal ranks. The established the signed that the treatment

had promoted the interest of both male and female students in learning settlement concepts significantly

Null Hypothesis One (HO1): There is no significant difference between the mean interest scores of co-education students taught settlement concepts using Meta-Heuristic Strategy and those taught using Lecture Method.

Table 4: Mann Whitney (U-test) Analysis among the Interest of Co-education Students for Experimental and Control Groups

Group	N	Mean Rank	Sum of Ranks	Df	χ^2	P	Remark
Experimental Group	77	100.39	7730.00				
Control Group	63	33.97	2140.00	139	9.65	0.001	Significant

Significant at $p < 0.05$

The result in Table 4 compares the change in interest of co-education students in experimental and control groups. The result portrayed that, the experimental group and control group have sum of ranks values of 7730.00 and 2140.00 respectively. The Mann Whitney (U-test), $\chi^2(140) = 9.65$, $P = 0.001$ at df of 139. Since, the p-value of 0.001 is less than $p < 0.05$ level. This indicates that, there was a significant difference in the

interest of students taught settlement concepts due to exposure to treatment against those taught without exposure to treatment. Thus, (HO1) was rejected.

Null Hypothesis Two (HO2): There is no significant difference between the mean interest scores of male and female co-education students taught settlement concepts using Meta-Heuristic Strategy.

Table 5: Mann Whitney (U-test) Comparison on Male and Female Co-education Students on Interest in Experimental Group

Variable/Group	N	Mean Rank	Sum of Ranks	Df	χ^2	P	Remark
Male	40	37.71	1508.50				
Female	37	40.39	1494.50				
Experimental Group				76	0.53	0.59	Not Significant

Not Significant at $p > 0.05$

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The results in Table 13 compared the change of interest of male and female co-education students. The results showed that, the male and female students have sum of ranks of 100.26 and 40.76 respectively. The Mann Whitney (U-test), $\chi^2(77) = 0.53$, $p = 0.59$ at df of 76. With $P < 0.05$. The results indicated that, there was no significant difference between the mean interest scores of male and female students

taught settlement concepts using Meta-Heuristic Strategy. Hence, HO2 was retained.

Null Hypothesis Three (HO3): There is no significant difference between the mean interest scores in two different single schools of male and female students taught settlement concepts using Meta-Heuristic Strategy.

Table 6: Mann Whitney (U-test) Comparison of Male and Female co-education students on Interest for Experimental Group

Variable/Group	N	Mean Rank	Sum of Ranks	Df	χ^2	P	Remark
Male	31	28.55	799.50				
Female	30	28.48	796.50				
Experimental Group				60	0.54	0.98	Not Significant

Not Significant at $p > 0.05$

The results in Table 6 showed the change of male and female co-education students. The results portrayed that, the male and female students have sum of ranks of 799.50 and 796.50 respectively. The Mann Whitney (U-test), $\chi^2(61) = 0.54$, $p = 0.98$ at df. of 60. With $P < 0.05$. The results indicated that, there was no significant difference between the interest of male and female students in two different single schools taught settlement concepts using Meta-Heuristic Strategy. Hence, HO3 was retained.

Heuristic Strategy (Experimental Group) and those taught using Lecture Method (Control Group). The experimental group therefore, achieved significantly greater than the control group. Therefore, the null hypothesis was rejected based on the finding.

The analysis of the results in Table 5 and 6 indicated that there was no significant difference between the interest in two different single schools of male and female students and co-education students taught settlement concepts using Meta-Heuristic Strategy in the study area. In addition, male and female students exposed to Metal-Heuristic Strategy did not differ significantly. The researcher discovered that, use of Metal-Heuristic Strategy was found to be gender friendly based

DISCUSSION OF RESULTS

The analysis of the results presented in Table 4 indicated that there was significant difference between the mean interest of co-education students taught settlement concepts using Meta-

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on the finding which is in accordance with finding of Obeka, (2012) showed that, the use of innovative strategies in environmental education concepts of Geography proved to be effective in enhancing the performance of male and female students likewise gender friendly.

SUMMARY OF FINDINGS

The following comprised the findings from the study.

1. There was significant difference between the interest scores of students taught settlement concepts using Meta-Heuristic Strategy and those taught using Lecture Method.
2. There was no significant difference between the interest scores co-education students of male and female students and co-education students taught settlement concepts using Meta-Heuristic Strategy.

CONCLUSION

Based on the findings obtained from this study, the researcher made the following conclusions.

1. The use of meta-heuristic strategy is effective in arousing stimulus on interest of students in learning settlement concepts of Geography
2. The treatment is suitable for both co-education male and female students meaning that, is gender friendly and not bias. Hence, meta-heuristic strategy has the capacity for improving the learners' interest in learning settlement concepts of Geography.

RECOMMENDATIONS

Based on the findings of the study, the researcher recommended that:

1. Professional association like Science Teachers' Association of Nigeria (STAN), Comparative Educations and Adaptation Centre (CESAC), Mathematics Association of Nigeria (MAN) and research centres like Nigerian Educational and Research Development Council (NERDC) and National Teachers' Institute (NTI) should incorporate the use of meta-heuristic strategy in science curricula as well as delivery instructions at senior secondary schools.
2. Seminars, workshops and conferences should be organized by secondary education board, STAN, ICASE, NTI, ETF, CESAC, CON, TRCN and NERDC in order to train science teachers on effective implementation for the use of meta-heuristic strategy in teaching science subjects such as Geography.
3. Stakeholders in education, Non-governmental Organizations (NGOs), Parent Teachers' Association (PTA) and State Universal Basic Education Commission (SUBEC) should be encouraged and fascinated to provide sufficient funds so as to facilitate teachers on the use of meta-heuristic strategy for delivery instructions in science subjects at senior secondary schools.

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