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Learning Strategies, Location and Students' Achievement in Physics among Senior Secondary one students in Mkpat Enin local government area of Akwa Ibom State

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ABSTRACT

This study determined the effects of learning strategies and location and students' achievement in Physics in public secondary schools in Mkpat Enin Local Government Area of Akwa Ibom State. Two research hypotheses guided the study. The study was a quasi-experimental using pretest and posttest non randomized design. The population was all the Senior Secondary one (SS1) Physics students for the year 2020/2021 session in the 16 public Secondary Schools in Mkpat Enin Local Government Area. A total of 150 students (82 students in the first and 68 students in the second experimental groups) constitute the sample. Purposive sampling technique was used to select the schools. A Physics Achievement Test (PAT) was used for the collection of data with reliability index of 0.79. Two learning packages (one for individualized and one for co-operative learning strategies groups) were used in guiding the students to learn the concept of motion. The instrument was validated by a panel of three experts consisting of one Physics lecturer, one Physic teacher and one Research, Measurement and Evaluation lecturer in the Department of Science Education, Akwa Ibom State University, Mkpat Enin. The hypotheses were tested at a 0.05 level of significance. The data were analyzed using descriptive statistics and Analysis of Covariance (ANCOVA). The findings showed the effectiveness of individualized learning strategy over cooperative learning strategy on students' achievement in the concept of motion in Physics. It was recommended that individualized learning strategy should be used by the students in the learning of the concept of motion in Physics.

Keywords: *Physics, location, learning strategies, students' achievement*

INTRODUCTION

Physics as a subject is offered at senior secondary school in Nigeria. It is an important component of science and technology. Physics is a branch of science that deals with the study of energy, matter and their interactions (Utibe & Onwioduokit, 2019). It is a natural science

subject that studies matter, its motion and behavior through space and time, and the related entities of energy and force. The goals of Physics are to: provide the student with a broad understanding of the physical principles of the universe, help them develop critical thinking and quantitative reasoning skills, empower them to think creatively and critically about scientific problems and experiments, and provide training for students planning careers in physics and in the physical sciences (Adolphus, Lawton & Dye, 2015).

It is one thing to teach Physics in schools and yet it is another important thing for students to learn it. Learning is very important in to students. This is because their achievement in Physics depends on how they learn it. Learning has been the subject of exhaustive investigations by psychologists. Agbi (2004) defines learning as the change or modification of behavior or response as a result of some form of experience. The basic elements in learning are the learner, the learning process and the learning situation. The learner is the most important of the three elements because without the learner the other two will not exist. Learning is a mental process by which knowledge, skills, habits, and attitudes are acquired, retained or sustained and finally utilized. It is a relatively permanent change in behavior that occurs as a result of practice.

The performance of candidates in physics examination conducted by West Africa Examinations Council (WAEC) is usually not systematic as shown in the WAEC results from 2009 to 2019. The performance of students ranges between 40.5 – 55.6%. These inconsistences can be linked to the learning styles of the students (Simsek, 2013). It is on the bases of the above inconsistences in performance of students that motivate this study on two main types of learning (individualized and cooperative learning strategies). Learning is the process of acquiring new or modified existing knowledge behavior, skills, values or preferences.

Individualized learning is a process of learning which allows the learner to pursue learning as a person without consulting other learners. This process of learning was borne out of deeper psychological knowledge of individual differences (Anih, 2007). In a study, Igwe (2017) identified the gains from individualized learning to include; learner can progress at the pace best suited to the learner, allows the bright child to accelerate ahead and the slow learner is prevented from being pursed too fast, helps the learner with special difficulties whether physical, psychological, emotional or cultural to develop initiative and independence in the learner, gives the teachers a clear idea of each learner's progress. Individualized learning is a strategy designed to provide the student with a highly flexible system of learning, which is geared to individual life, and learning styles. In such strategies, the teacher and the institution play supportive rather than central roles. The learner concentrates on processes and retains new information without recourse to anybody.

Cooperative learning strategy is learning within a group and by the group. It is learning generated by the people to solve a problem or tackle problems given to them (Akinbobola, 2008). Cooperative learning can further be explained as a learning strategy in which small groups of students with different levels of academic ability use a variety of learning activities to improve their understanding of a subject. Here each member of a group

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is responsible not only for learning what is taught but also for helping group members learn, thus creating an atmosphere of achievement. It creates excellent opportunities for students to engage in problem solving with the help of their group members (Effandi & Zanaton, 2007).

The key elements of cooperative learning include: positive interdependence where each student must believe that they have a key role to play in the group; individual accountability where each student within a group must be accountable for mastery of the instructional content presented; group rewards that entails sufficient incentives for the group to work together; and group training where students cannot be placed together in a group situation and expected to cooperate without their being taught the social skills needed for collaboration (Chukwumah, 2008).

To experiment on the effect of learning strategies, this study used the concept of motion. It is the changes in position of a body with time. A body which does not move is said to be at rest, motionless, or stationary. An object's state of motion or rest cannot change unless it is acted upon by a force. Motion is described in terms of time, velocity, and displacement The Motion requires force to cause that change. It is the process of moving, changing place or position (Utibe, Adigwe & Akpeke, 2019). In this study, the researchers also consider the role of location in achievement in Physics. The location of a school has a big role to play in the academic achievement of students at school

Schools are located variously, some in the urban while others are in the rural areas. It is observed that schools located in the urban areas tend to have more facilities, manpower, and government attention as against those located in the rural areas. Students attending rural schools face challenges of higher poverty than those attending urban schools. In Nigeria, the Lingual Franca is English language, which in most cases is not widely spoken in rural schools. What obtains in most cases is the native language of that setting?

This can greatly affect students' achievement in Physics since it is with English language Physics is being taught and assessed in schools. Urban schools have many advantages like availability of resources, library, opportunities, good environment, and teachers. However, one of the greatest advantages of rural schools is the tendency for smaller classes, which promise increased student evaluation, and provide greater flexibility in teaching and learning strategy.

Akinyele (2011) stated that the immediate environment of a child plays a major role in his socialization. According to him, the area in which a school is located can affect the academic achievement of a student. In the same vein, Akpan (2001) has stated that school location is one of the major factors that affect students' academic achievements. A school located in a rural area is usually faced with problems like shortage of teachers, lack of laboratories, poorly equipped laboratories, among others in Nigeria. These shortcomings negatively affect both students' motivation and achievement. Evidence abound that the educational aspirations of students who study in rural area are weaker than those of their urban counterparts (Hu, 2003 & Arnold *et al.,* 2003). Macmillan (2012) found that students in rural areas place less value on studies such that their achievements are affected. This study investigated individualized, cooperative learning strategies and students' achievement in

physics (using concept of motion) in public secondary schools in Mkpat Enin local Government Area, Akwa Ibom State.

Physics is considered as the foundation of other science subjects in senior secondary school. It's important to technology is also seen from the introduction to this study. The inconsistencies in students' performance in physics in WASSCE results from 2009 to 2019 motivated this study to test the effect of learning strategies on students' achievement in physics and the effect on location.

The purpose of this study was to determine the effect of individualized and cooperative learning strategies on students' achievement in Physics in public secondary schools in Mkpat Enin Local Government Area, Akwa Ibom State. The study is designed to achieve the following specific objectives to:

1. Compare the mean achievement scores of Physics students in the concept of motion using individualized and cooperative learning strategies in public secondary schools in Mkpat Enin Local Government Area.
2. Compare the mean achievement scores of urban and rural students in the concept of motion in Physics in public secondary schools in Mkpat Enin Local Government Area.

To guide the researchers in the conduct of the study, the following null hypotheses were tested at a 0.05 level of significance:

$H_0$1. There is no significant difference between the mean achievement scores of Physics students in the concept of motion using individualized and cooperative learning strategies in public secondary schools in Mkpat Enin Local Government Area.

$H_0$2. There is no significant difference between the mean achievement scores of urban and rural students in the concept of motion in Physics.

METHOD

This study adopts a quasi-experimental design using pretest and posttest non randomized design. Students from two purposively selected schools were selected to form the two experimental groups (experimental group 1 and experimental group 2 respectively). This design, according to (Nworgu, 2015) is a type of design that contains different levels of factors and can be used in an investigation to establish the combined effects of two or more independent variables. An important characteristic of this design is that several hypotheses can be tested at the same time.

This study was conducted in Mkpat Enin Local Government Area. It is one of the Local Government Area in Akwa Ibom State. It has 16 public secondary schools, two tertiary institutions, (Edar polytechnic and Akwa Ibom State University) (Statistics Department, Mkpat Enin LGA, 2022). The choice of this local government area is that it has the population requirements for this study.

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The population for the study comprised of all the Senior Secondary one (SS1) physics students for the year 2020/2021 session. The population is 1,791 students (Local Education Committee Mkpat Enin LGA, 2022).

A total of 100 students (54 students in the first and 46 students in the second experimental groups) constitute the sample for the study. Purposive sampling technique was used to select the schools. The criteria were:

i. Schools that have at least one professional physics teacher and have been teaching physics consistently for the past two years
ii. Schools which the concept of motion has not yet been taught to the SS1 2020/2021 session students and
iii. Schools with functional Physics laboratory and trained Laboratory staff.

From the preliminary survey of the schools, only five schools were found to have met the above criteria. Two schools among those that met the above criteria were selected by simple random sampling technique. All physics students in the two selected schools were used in the study. The researchers using a flip of a coin determined which of the school intact class become the experimental group one and the one that becomes the experimental group two.

A researcher's made instrument titled: Physics Achievement Test (PAT) was used for this study. PAT consist of two sections, sections A and B. Section A consists of information on demographic variables such as gender and learning strategies. Section B consists of 25 multiple choice questions lettered A – D with only one correct option and three distracters. The test was used to gather scores of students that learn Physics using individualized and cooperative learning strategies. Two learning packages were designed for use in guiding the students to learn the concept of motion in physics for both groups. The contents of the learning packages were similar but the main difference was in the area of students' learning strategy. The teacher's role in this context was to guide the students and encourage them to adopt individualized learning strategy for the individualized learning strategy group and cooperative learning strategy for the cooperative learning strategy group.

The Physics Achievement test (PAT) was subjected to face validation. This was done by a panel of three experts consisting of one Physics lecturer, one Physic teacher and one Research, Measurement and Evaluation lecturer in the Department of Science Education, Akwa Ibom State University, Mkpat Enin. The valuators were expected to read through the test for correctness of tenses and ability of the contents to help in providing solution to the study. In the learning packages, the valuators were expected to read through and see if it would be able to guide the students in the learning of the concept of motion. The suggestions from the three valuators were incorporated into the final production of the instrument and learning packages. The content validation was done by the researchers using the table of specification.

To further strengthen the validity of the above instrument, the instrument was administered to a trial testing group of 30 students who were not part of the main subjects for the study but were found to be equivalent in all respects to the subjects in the study.

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The researchers made use of two of the schools that met the criteria for sampling but were not used for the main study. The internal consistency of Physics Achievement test (PAT) was determined using KR_{20} Statistics. The value of 0.79 was obtained, with this value; the instrument was adopted for used in the study.

The procedures followed during the students' learning and administration of the instrument was:

i. The Director of schools in the area was informed about the study. The Principals of the selected schools were contacted for proper arrangement for use of the Physics teachers, students, and relevant facilities in the school for the conduct of the study, having briefed them of the purpose of the study and the benefit of the study to the students, school and the Ministry of Education.
ii. At least two professional physics teachers from each of the four selected secondary schools were recruited and briefed on the learning package, test administrations and evaluations. They were used as research assistants in the four selected schools for the proper conduct of the study.
iii. In order to predict the effects of the learning strategies pretest was administered to the students (intact classes) at the beginning of the study and the result used to test a possible effect of the treatment and as covariates in subsequent analysis.
iv. The actual guiding of the students on the concept of motion was done by the research assistants under the supervision of the researchers using the standardized learning package developed by the researchers for two weeks. The use of standardized or pre-prepared learning package by the team was to standardize the contents and quality of learning strategies used by the students.

At the end of the guidance for two weeks the students were given the posttests. The data collected in the course of the study were analyzed using descriptive statistics and Analysis of Covariance (ANCOVA), using pretest and posttest scores as covariates. All hypotheses were tested at a 0.05 alpha level of significance.

RESULTS

Research Question One

What is the difference in the mean achievement scores of Physics students in the concept of motion using individualized and cooperative learning strategies in public secondary schools in Mkpat Enin local government area?

Table 1: Pretest/Posttest of the effect of individualized and cooperative learning strategies on mean achievement scores of Physics students in the concept of motion

		Pretest		Posttest		
Learning Strategies	**N**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	**Mean Difference**
Individualized	82	14.44	4.29	66.92	10.71	52.48

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Cooperative	68	12.56	3.28	60.72	9.92.	48.16.

The result presented in Table 1 shows the pretest and posttest mean score of the effects of individualized and cooperative learning strategies on the mean achievement scores of Physics students in the concept of motion in pubic secondary schools in Mkpat Enin local government area. From the result, the group exposed to individualized learning had a pretest mean score on the concept of motion of ($\bar{x}$ = 14.44, SD = 4.29) and a posttest mean score of ($\bar{x}$ = 66.92, SD = 10.71). The mean difference was 52.48. On the other hand, the cooperative learning group had a pretest mean score of ($\bar{x}$ = 12.56, SD = 3.28) and a posttest mean score of ($\bar{x}$ = 60.72, SD = 9.92). The mean difference was 48.16. The mean difference of 52.48 and 48.16 for those exposed to individualized and cooperative learning groups respectively shows that individualized strategy was more effective in increasing the mean achievement scores of students in the concept of motion in Physics more that the cooperative strategy.

Research Question Two

What is the difference in the mean achievement scores of urban and rural students in the concept of motion in Physics?

Table 2: Influence of location on mean achievement scores of students in the concept of motion in Physics

		Pretest		Posttest		
Location	**N**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	**Mean Difference**
Urban	80	13.48	3.59	64.44	10.03	50.96
Rural	70	13.52	4.25	63.20	11.46	49.68

Table 2 shows the pretest and posttest mean scores of the influence of location on the mean achievement scores of students in the concept of motion in Physics. The result showed that the urban students had a pretest mean achievement score of $\bar{x}$ = 13.48 (SD = 3.59) and a posttest mean score of $\bar{x}$ = 64.44 (SD = 10.03). The mean difference was 50.96. The result also showed that the rural students had a pretest mean achievement score of $\bar{x}$ = 13.52 (SD = 4.25) and a posttest mean score of $\bar{x}$ = 63.20 (SD = 11.46). The mean difference was 49.68. From the result, the mean difference of 50.96 and 49.68 for urban and rural students respectively showed that the mean achievement scores of urban students on the concept of motion in Physics increased during the treatment period more than the rural students.

Hypothesis One

There is no significant difference between the mean achievement scores of Physics students in the concept of motion using individualized and cooperative learning strategies in public secondary schools in Mkpat Enin local government area.

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Table 3: Analysis of Covariance (ANCOVA) of the effect of individualized and cooperative learning on the mean achievement scores of Physics students in the concept of motion

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5083.172[a]	8	635.396	9.152	.000	.446
Intercept	17520.962	1	17520.962	252.376	.000	.735
Pretest	759.130	1	759.130	10.935	.001	.107
LearningStrategies	527.527	1	527.527	7.599	.007	.077
Location	20.470	1	20.470	.295	.588	.003
LearningStrategies* Location	6.173	1	6.173	.089	.766	.001
Error	6317.588	141	69.424			
Total	418700.000	150				
Corrected Total	11400.760	149				

a. R Squared = .446 (Adjusted R Squared = .397)

The result on Table 3 shows the ANCOVA of the effect of individualized and cooperative learning strategies on the mean achievement scores of Physics students in the concept of motion in Mkpat Enin local government area. The result shows that an f-ratio of (F (1, 91) = 7.599, $p < 0.05$, $\eta^2_p = 0.077$) was obtained. Since the associated probability value of 0.007 is less than 0.05 set as level of significance, the null hypothesis was rejected. Thus, inference drawn is that there is a significant difference between the mean achievement scores of Physics students in the concept of motion using individualized and cooperative learning strategies in public secondary schools in Mkpat Enin Local Government Area. Individualized learning significantly increased the mean achievement scores of Physics students in the concept of motion than the cooperative strategy. The result further showed an effect size of ($\eta^2_p = 0.077$), indicating that 7.7 percent (7.7%) variance of the increase in the mean achievement scores of students in the concept of motion in Physics was due to the treatments.

Hypothesis Two There is no significant difference between the mean achievement scores of urban and rural students in the concept of motion in Physics.

The result on Table 3 shows the ANCOVA of the influence of location on the mean achievement scores of students in the concept of motion in Physics. The result showed that an f-ratio (F(1, 196) = 0.295 ($p > 0.05$, $\eta^2_p = 0.003$) was obtained. Since the associated probability value of 0.588 is greater than 0.05 set as level of significance, the null hypothesis was not rejected. Thus, it is concluded that there is no significant difference between the mean achievement scores of urban and rural students in the concept of motion in Physics. The result further showed an effect size of $\eta^2_p = 0.003$ which means that only 0.3 percent (0.3%) of the variance in the mean achievement scores of students in the concept of motion in Physics was due to the influence of location.

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Discussion of Findings

The findings of this study in Table 3 shows that there is a significant difference between the mean achievement scores of Physics students in the concept of motion using individualized and cooperative learning strategies in favour of individualized learning strategy. This implies that hypothesis one is rejected. The initial differences in the mean achievement score between those exposed to individualize and cooperative learning strategies was found to be significant when subjected to hypothesis testing. The finding of this study collaborated with the work of Christian and Pepple (2012) which investigate the effects of cooperative and individualized learning strategies on students' achievement in chemistry in Rivers State. The results of the study show statistical significant effect of learning strategies on students' achievement in chemistry. This result shows further that both strategies which are student based are not yielding the same result in a practical situation in the learning of physics.

The findings of this study in Table 3 also shows that there is no significant difference between the mean achievement scores of urban and rural students in the concept of motion in Physics. The null hypothesis was not rejected; this result might be due to the fact that most well equipped schools are located in the rural areas. The rural and urban schools are well equipped with modern learning facilities. The finding of this study collaborated with the work of Ikechuku and Abamba (2021). The study examines the effects of School location on students' academic achievement in senior secondary Physics based on the 5E learning cycles and found out that there is no significant difference between rural and urban students' achievement taught using 5E learning circle.

Recommendations

Based on the results of the study, the following recommendations were made:

1. Due to the effectiveness of individualized learning strategy over cooperative learning strategy on students` achievement in the concept of motion in Physics it is recommended for use by the students in the learning of the concept of motion in Physics.
2. Individualized and cooperative learning strategies should be used in male schools in the learning of the concept of motion in Physics. This is because it helps them to achieved more than the female counterparts.

Conclusion

Both Individualized and cooperative learning strategies improved achievement in the concept of motion in Physics, but students in individualized learning outperformed their counterparts in cooperative learning strategies. Students could learn individually before participating in group exercise. It was discovered that male students significantly achieved more than the female students in the concept of motion in Physics. Teacher of Physics needs to have good understanding of these learning strategies so as to use them maximizing male achievement. In order not to disadvantage female students in the class, it is pertinent that other forms of learning strategies that will make female students perform at maximum should be explored.

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