STUDENTS' ATTITUDE AND ITS EFFECT ON ACADEMIC ACHIEVEMENT IN PHYSICS AMONG SECONDARY SCHOOLS IN NAROK COUNTY, KENYA

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ABSTRACT

The research was inspired by the fact that students' positive attitude is important since attitude plays a critical role on academic achievement. The research aimed to explore the aspects of students' attitude on academic achievement in Physics among public secondary schools in Narok County, Kenya. The study employed quasi-experimental research design with pre-test and post-test administered to control and experimental groups. The data which was generated was analyzed using both descriptive and inferential statistics. The differences between the means of the two groups were analyzed using t-test. The statistical significance was tested at a= 0.05. The findings of the study indicated that the students who were instructed through various methods attained higher scores than their counterparts who were instructed through traditional methods of teaching. Inclusion, student's attitude towards physics enhanced their academic performance. Thus, the study recommends that the research be done on other locales to establish the effect of students' attitude towards learning school Physics on academic achievement.

Key terms: Students Attitude, Academic Achievement.

INTRODUCTION

Physics as a subject plays a central role due to its fundamental significance in engaging students to pursue technological careers considered important in modern societies. High-level on achievement in Physics and positive attitudes towards it involves a crucial challenge for formal education (Olusola, 2012). Basically, different attitudes and beliefs about Physics help in understanding the contrast between goals and decisions (DeWitt and Archer, 2015). A study by Boe and Henriksen (2015) gradually explored specific attitudes and beliefs and continuously applied the theory of motivation as an interpretive and logical system.

Attitudes are complex mental states that include beliefs (Hussain, Ramzan &Qadeer, 2011). It is significant to note that the uplifting attitude of undergraduate students is very important given that grades are related to academic performance (Cheung, 2009). On the other hand, students' academic performance is key when it comes to planning educational intervention both at national level and at classroom level. This means that student achievement in Physics subject is established within the academic performance. Various studies from the field of Physics Education Research (PER) indicates that, students' positive attitude towards Physics curriculum led to learner's improved performance in Physics (Buabeng, 2014). It is believed that, discovery method of instruction is more convenient compared to traditional method of instruction used in teaching Physics (Adeyemo, 2010).

In the United States, various studies ponder their perspectives and beliefs (often relying on certainty/assumptions, premiums, and utility values from predictive presumption models), each of which a well-understood and unmistakable cluster of studies has identified proportional spirits and beliefs that tend to be high, medium, and low (Andersen & Chen, 2016).

In Ethiopia, Sitotawi and Tadele (2016) identified ways on how to improve attitudes of learners towards careers which require the knowledge of Physics as a pre-requisite. For instance, Sitawi and Tadele (2016), identified active learning to increase students' attitude towards learning. They also proposed problem-solving technique. In this case, a student needs to think and make decisions using appropriate strategies. In Ghana, Appiah and Eminah (2021) utilized quasi-experimental analyses to show how differences in attitude and teaching methodologies exists during classroom instruction.

In Kenya, Physics and Biology are optional subjects in most secondary schools while Chemistry is a compulsory science subject in public secondary schools. Students taking Physics are supposed to do well, because it plays a critical role in many career choices. Low academic achievement in Physics prohibits students from undertaking certain professional courses which require Physics as a pre-requisite.

Statement of the problem

Science education is crucial for learners to pursue professional career courses relevant to modern societies, equipping them with technological skills. Physics is a prerequisite for many university courses, including applied science, engineering, and medical. However, low academic achievement in physics is a significant concern, particularly in Kenya and the Narok-East sub-county. The Kenyan government, through CEMASTEA, has attempted to address this issue by in-servicing Physics teachers with student-centered approaches through SMASSE projects. Despite these efforts, the performance of physics remains low, indicating that factors that have not been addressed are contributing to the underachievement of students in physics. Positive attitude towards the subject and the teaching methods are important factors. In general, negative attitudes towards a particular topic lead to indifference and ultimately negative learning motivation. However, given the variety of education-learning situations, students, teachers, curriculums, and learning environments, attitudes can influence how students perform in the final exam.

Due to low achievements, a study was conducted to explore the effect of student attitudes on academic performance in KCSE Physics and to provide recommendations.

Objective of the study

The objective of this study was to explore the effect of students' attitude towards learning school physics on academic achievement.

Research Hypothesis

The study was guided by the following null hypothesis, which was tested at alpha level of 0.05.

HO1: There is no significant difference in students' attitude towards learning school Physics.

LITERATURE REVIEW

At the global level, some nations like the United Kingdom (UK), India, United States of America (USA), Australia, and Canada, are changing their views and desires on the subject of open elective school Physics. For example, in the United States, various undergraduate studies ponder their perspectives and beliefs (often relying on certainty/assumptions, premiums, and utility values from predictive presumption models), each of which a well-understood and unmistakable cluster of studies has identified proportional spirits and beliefs that tend to be high, medium, and low (Andersen & Chen, 2016). In the UK, virtually identical exams that take into account student attitudes towards Physics broadly reflect the second example (DeWitt & Archer, 2015). In addition, Sheldrake and Reiss (2019) identified similar trends across different quasi experiments in England, with analyses showing secondary school student's positive attitudes towards Physics, but the retention of learnt concepts in Physics topics could not be detected, hence, this lead to low academic achievement in Physics. In India, Siddiqui and Khan (2018) reported strong correlations between student experiences of effective teaching, attitude and achievement in Physics.

In Canada, Moll and Milner (2019) have set up an introductory Physics course on students' academic performance and attitudes towards Physics. This course used the Force Concept Inventory (FCI) and recent grades to estimate academic performance. Undergraduate prospects were estimated using the Colorado Scientific Research Learning Attitude (CLASS). The FCI results showed positive changes overall (almost normal in intuitive courses), but we believe that teaching methods alone are not sufficient to develop learners' attitudes towards Physics as a whole.

In Africa, most researchers report unachieved physical education. This is due to many factors ranging from learners' attitudes towards the subject, skills to show the subject, lack of inspiration in teacher relationships, and lack of scientific foundations in primary school. School and educator processes considered important variables (Omebe & Akani, 2015). In Ethiopia, Sitotawi and Tadele (2016) identified ways on how to improve attitude of learners towards careers which require the knowledge of Physics as a pre-requisite. In Ghana, Appiah and Eminah (2021) utilized quasi-experimental analyses to show how differences in attitude and teaching methodologies exists during classroom instruction.

In Kenya, Physics is an optional subject in most secondary schools while Chemistry and Biology are both compulsory science subjects in all public secondary schools. Students taking Physics are supposed to do well, because it plays a critical role in many career choices. Low academic achievement in Physics prohibits students from undertaking certain professional courses which require Physics as a pre-requisite.

Theoritical Framework

The research was guided by component theory of attitude whose proponent is (Feger, 1979) and self- efficacy theory whose proponent is (Bandura, 1997). The structure of attitude consists

of three types of components. Cognitive part (knowledge), emotional part (emotion), and conative part (behavioral tendency). The cognitive part is information about the behavioral object, whether it is accurate or not. The emotional part is the taste of the article, whether you like it or hate it. The action part is the activity directed to the article, the simple action that accompanies our inner thinking (Zanna & Rempel, 1998).

Zanna and Rampel (1998) argue that attitudes are created in different ways. The first is to notice and hear the relationship with the mentality object, the second is the direct relationship with the propensity object, and the third is to allow others to report on their attitudes. Finally, attitudes are driven by the need to resolve conflicts between beliefs and emotions.
Attitudes contrast in three ways. First of all, in aggressiveness, it's just that the propensity object is considered good or bad. Second in complexity, it is a set of recognizable elements of ideality that involves some of the behavior. Some may find it a great article on the one hand and a terrible one on the other. Finally, the end, the degree to which the action is at both ends of the continuum. Therefore, attitude means the thinking process of how they think about Physics and expect to behave towards Physics. When studying the human behaviour, great considerations should be given to attitude since it plays a key role in human behaviour. Therefore, the component theory of attitude is important in this study. Attitude consists of three aspects; affective, cognitive and behavioural.

Self-efficacy theory is characterized as an assessment of the ability to achieve a certain level of achievement (Bandura, 1982). The hypothesis is tied to the belief that the ideal result can be achieved. Self-efficacy assessments are clearly defined for the specific spaces we think we can do. For example, you can make English look good, but you may not be very good at making Physics look good (Bandura, 1982). Self-efficacy improves behavior in several ways, one of which is stimulating. Self-efficacy is a determinant of behavioral choice because it affects the attitude of behavioral choice. When people feel that coordination is inadequate to care for a weakened situation, they remain away from the situation. Understanding the components of Bandura's hypothesis, which determines obvious self-validation, is important for understanding the educator's attitude toward Physics.

RESEARCH METHODOLOGY

Research Design

The research utilized a quasi-experimental approach with pre-test and post-test primarily to determine circumstances and logical outcomes. For easy comparison of experimental and control group, quasi-experimental design was considered suitable for this research. Cooperative method which is part of experimental group was included various activities during Physics lessons. The control group employed conventional methods of teaching for a period of four weeks. It is very important to note that both the experimental and control groups was taught utilizing the same topics that is, refraction, linear motion and equilibrium and centre of gravity and attitude indicators assessed for each group.

Table 3.1 Quasi Experimental Designs for the Study

R_E	Experimental Group	O_1	X	O_3
R_C	Control Group	O_2	⊗	O_4

KEY:

O_1 and O_2 : Pre-tests (Physics lessons)

O_3 and O_4: Post-Tests after Three Weeks

X - Intervention (Cooperative learning)

⊗ - No intervention (Conventional learning)

R_E, RC. **Randomized** Population Of Almost Same Ability.

Experimental group was treated while control group was not.

Sampling technique and sample size

This is a specific gathering of the population that share comparative attributes. The study, targeted a population of 8 secondary schools, 3000 Form Three students, 115 teachers and 8 principals in Narok-East Sub-county, schools.

To identify the settings and participants in the current research; stratified, simple and purposive sampling was utilized. To organize the population into homogeneous subsets and appropriately select elements from each zone, the researcher utilized strata. On the same note, the sample schools from the two zones, was selected using random sampling technique. Random sampling was used to choose two girls' school from zone A and two boys' school from Zone B. Form Three Physics instructors was purposively chosen since they were teaching the picked Form Three classes. Sampling strategy is clearly indicated as in Table1.

Table 1: Respondents by School Category

School Type	Categories Regions	Control Group	Experimental Group	Physics Teachers	Principals
Zone A	School 1		40	1	1
Girls School	School 2	40		1	1
Zone B	School 1		40	1	1
Boys School	School 2	40		1	1
Total		**80**	**80**	**4**	**4**

Research instruments

Student Achievement Tests (SAT), questionnaires, observation and interview schedule was utilized in this survey to assess learners' attitude and academic attainment in Physics.

a)Student Achievement Tests (SAT)

Student grade tests include pre-tests and post-tests to explore the learning capacity in both experimental and control groups. Pre-tests ensure that learners have virtually the same abilities in basic Physics before receiving treatment. Post-tests are given to the two congregations as instructed and are intended to determine if the intervention has worked. Comparisons were made using KCSE mean scores between the years 2013 - 2020.

Data analysis techniques

The quantitative information from the pre- and post-tests and questionnaires was analyzed using the Statistical Package for Social Science (SPSS) version 24 and inferential statistics. Differences was tested using t- tests and ANOVA.

Examination of qualitative data obtained from observation guides and interview exclusively done to ascertain any ambiguity and correct them to ensure accuracy and completeness. The responses were tailed and frequency distribution tables were used to calculate the measures of central tendency that is the mode, mean, and percentage. Further data were analyzed as per the objectives:

Table 2: A Summary of Methods of Data Analysis as Per the Study Hypotheses

Hypotheses	Independent Variable	Dependent Variable	Statistical test
HO_1: There is no significant difference in students' attitude towards learning school Physics and academic achievement.	Academic achievement	Questionnaire responses	ANOVA
HO_2: There is no significance difference between students' attitude towards learning methods and academic achievement in Physics.	Academic achievement	Post- test score means.	t-test

RESEARCH FINDINGS

Effect of Learners' Attitude towards Learning School Physics on Academic achievement

With regard to the first objective, which stated that: Data was gathered utilizing a students' achievement test and questionnaires in order to investigate the impact of students' attitudes toward learning school physics on academic accomplishment. Student achievement test included pre-tests and post-tests to explore the learning capacity in both experimental and control sessions. Pre-tests ensured that learners have virtually the same abilities in basic Physics before receiving treatment. Post-tests was given to the two groups in order to explore if the treatment given worked.

The pre-test was on Form Three term one topics. The test were marked out of a maximum of 20 marks and scores converted into percentages. The generated data was then analysed using descriptive statistics. Descriptive statistics of pre-test scores per group is as exhibited in Table 3.

Table 3: Pre-Test Mean Scores for all Groups

Group	Count	Mean Score	Standard Deviation (SD)
EG1	38	37	9
EG2	39	42	6
CG1	38	41	8
CG2	37	35	9

Table 3. data show the pre-test mean score for EG1 was 37, EG2 was 42, CG1 was 41 and CG2 was 35 with standard deviations of 9, 6, 8 and 9 respectively. The results reveal that both the experimental and control groups are comparable because they have almost the same performance.

Table 4 show that the academic performance in Physics in all group categories was low. This could be attributed to learners' negative attitude which affect the ability of learners' to learn Physics (Bejah,1998). The independent t-test findings for the pre-test are provided in Table 4. The independent t-test outcomes for the pre-test were computed using the mean scores of the pre-test CAT.

Table 4: Comparison of Pre-Test Mean Scores of EG1 and CG1

Group	N	Mean	T	Df	Sig. (2-tailed)
EG_1	38	36.61	.2604	74	.379
CG_1	38	41.00			

The outcomes in table 4 reveals that when the academic performance of experimental group and control group A schools are compared, there is no significant difference; t (74) = 0.748, p = 0.2604, α = 0.05. Hence, **HO_1**: There is no significant difference in academic achievement between experimental and control groups was accepted implying that the student learning Physics was similar for the two groups. A t-test was done for the schools in category 2. Table 5 uncover that the outcomes for the comparison of mean scores of experimental and control groups for category 2.

Table 5:Comparison of Pre-Test Mean scores of EG2 and CG2

Group	N	Mean	T	Df	Sig. (2-tailed)
EG_2	39	42.31	.4915	74	.379
CG_2	37	35.78			

Table 5 reveals that the independent t-test obtained was t (74) = 0.4915, p = 0.379, α = 0.05. This infers that the mean scores of the experimental and control groups had no significant difference in category two schools. This is because the p value (p = 0.379) generated by SPSS was greater than the critical alpha (p = 0.05)

In order to decide on the impact of learners' attitude towards learning school Physics. Only the Physics teachers of the experimental group underwent three weeks attitude change training organized by the study. The training involved utilization of cooperative learning and other learner centered methodologies during Physics lessons as an intervention. The control group utilized conventional teaching techniques for the same amount of time.

Learners' Academic Achievement on Post-Test

A student Achievement test 2 (Post-Test) was given after the conclusion of the anticipated learning time, and attitude indicators were evaluated for the two groups separately. The Post-test was on the topics: refraction, linear motion and equilibrium and centre of gravity. The study scored the CAT tests out of 20 marks and scores were converted to percentages. The generated data was analysed using descriptive statistics. Descriptive statistics of the results were as shown in Table 6.

Table 6:Post-Test Mean Scores for all Groups

Group	Count	Mean Score	Standard Deviation (SD)
EG1	38	57	9
EG2	39	60	8
CG1	38	36	11
CG2	37	38	12

Table 6 uncovered that the post-test mean score for EG1 was 57, EG2 was 60, CG1 was 36 and CG2 was 38 with standard deviations of 9, 8, 11 and 12 respectively.

the experimental groups performed better in the post-test assessment than the control groups did. The control group's mean was 36 compared to 57 for the experimental group 1. The control group's mean was 38, compared to 60 for the experimental group 2. This implies that the treatment or intervention had a positive effect on the learners' attitude towards learning Physics. This leads to performance of above average. Cooperative learning instruction approach is therefore more effective compared to the conventional instruction methods.

The findings indicate that the average mean scores of post-test scores of experimental group were greater than those of control groups. This shows that the students who were instructed using cooperation learning after attitude change intervention attained higher scores than their counterpart did who were taught using conventional approaches.

Hypothesis **HO_1** which stated," There is no significant difference in learners' attitude towards learning school Physics" was tested through computation of ANOVA for the experimental and control group. This was to ascertain the performance differences that arouse after the study. The findings were exhibited in Table 7.

Table7:ANOVA for the Post-Test Examination

Category	N	Post-Test Mean Score	Variance	F	D.F	P
Experimental	77	58.34	81	1.778	76	1.35

Control	75	36.91	144	74

Table 7 above shows the Post-test mean score, variance, F ratio, Degree of Freedom and F critical value (P) for the experimental and control groups. For the hypothesis **HO_1** which stated," There is no significant difference in learners' attitude towards learning school Physics", is the F ratio of the study (1.778) greater than the P-value (1.35) at $\alpha = 0.05$ hence the null hypothesis was rejected. The survey embraced the alternative hypothesis **H_1**: there is a significant difference in academic attainment between experimental and control group.

This finding agrees with Normah and Salleh (2006) found that learners' attitudes and interests play a decisive role in science performance. To establish the students' attitude towards Physics in the sampled schools categories', students questionnaire administered during the post-test required them to show their level of agreement on the attitude measuring statements utilizing 5-Likert scale from Strongly Agree to Strongly disagree. The results for the students in control group category were as shown in Table 8.

Table 8:Attitude towards Physics for Students in Control Group Category

Statement	**SA**		**A**		**UD**		**D**		**SD**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Physics is useful in my future life	30	40	14	19	10	13	8	11	13	17
I do not like Physics	13	17	21	28	27	36	6	8	8	11
I enjoy Physics practical lessons	9	12	29	39	13	17	14	19	10	13
Physics is a difficult subject	12	16	12	16	35	47	9	12	7	9
I often study Physics on my own	6	8	12	16	15	20	14	19	28	37
I like my Physics teacher	8	11	34	46	15	20	14	19	3	4
My Physics instructor influenced me to pick Physics	10	13	13	17	23	31	21	28	8	11
Physics is a difficult subject	11	15	15	20	27	36	13	17	9	12

For the exploration of the attitude level of the learners in control group category, the Likert agreement level was assigned points with SA=5, A=4, UD= 3, D=2 and SD=1. Table 4.8 above was utilized to evaluate the mean attitude of the learners. The outcomes were exhibited in table 9.

Table 9:Agreement Level Tally for the Control Group

Agreement Level	**SA**	**A**	**UD**	**D**	**SD**	**Total**

Total	100	150	165	99	86	600
Score	100x5=500	150x4=600	165x3=495	99x2=198	86x1=86	1879
Mean Score	$\frac{1879}{600}$ = 3.132					

Table 8 and 9 above implies that the attitude of the control group tends towards negative. The findings for the students in experimental group category were exhibited in Table 10.

Table 10:Attitude towards Physics for Learners in Experimental Group Category

Statement	**SA**		**A**		**UD**		**D**		**SD**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Physics is useful in my future life	34	44	15	19	7	9	9	12	12	16
I do not like Physics	19	25	26	34	6	8	11	14	15	19
I enjoy Physics practical lessons	36	47	29	38	7	9	1	1	4	5
I enjoy Physics theory lessons	14	18	13	17	9	12	19	25	22	28
Physics is a difficult subject	24	31	15	19	10	13	12	16	16	21
I often study Physics on my own	10	13	11	14	9	12	19	25	28	36
I like my Physics teacher	13	17	28	36	11	14	13	17	12	16
My Physics instructor affected me to pick Physics	16	21	12	16	25	32	5	6	19	25

Table 4.10 was also utilized to evaluate the mean agreement level. The outcomes were exhibited in table 4.11.

Table 4. 11:Agreement Level Tally for the Control Group

Agreement Level	**SA**	**A**	**UD**	**D**	**SD**	**Total**
Total	166	149	68	89	128	600
Score	166x5=830	149x4=596	68x3=204	89x2=178	128x1=128	1936

Mean Score	$\frac{1936}{600} = 3.227$

Table 10 and 4.11 above implies that the attitude of the experimental group tends towards positive improvement from their control group counterpart. This means that, if different methods of teaching are incorporated during classroom instruction, there will be a positive academic achievement compared to when traditional methods of teaching are used.

Physics teachers were also inquired to specify their agreement level on the attitude of learners towards learning Physics using 5-Likert scale from Strongly Agree to strongly disagree. The outcomes were as shown in Table 12 on the next page.

Table 12: Physics Teachers View on Students' Attitude towards Physics

Statement	SA		A		UD		D		SD	
	F	%	F	%	F	%	F	%	F	%
Student say that Physics is for the bright only	1	25	2	50	0	0	1	25	0	0
Students tell me that Physics is difficult	1	25	1	25	0	0	1	25	1	25
Student like Physics because it has a wide range of carrier choices	1	25	0	0	0	0	2	50	1	25
Students know that Physics is applicable in their daily life situation	2	50	1	25	1	25	0	0	0	0
Few students choose Physics in my school because they have an alternative	1	25	0	0	0	0	1	25	2	50
Students like spending more time studying Physics	0	0	0	0	0	0	2	50	2	50

Table 12 was also used to calculate the mean agreement level for the Physics teachers. The outcomes were exhibited in table 13 below.

Table 13:Agreement Level Tally for the Physics Teachers

Agreement Level	SA	A	UD	D	SD	Total
Total Score	6 6x5=30	4 4x4=16	1 1x3=3	7 7x2=14	6 6x1=6	24 69
Mean Score	$\frac{69}{24} = 2.875$					

Table 12 and 13 infers that the attitude of the Physics teachers towards learners learning school Physics tends towards negative. Hence requires remedy measures so as to improve.

Principals were also required to comment on the attitude of learners towards Physics in general. Only one rated it average, the other three rate it poor and very poor.

These findings implied that generally the attitude towards Physics was very negative. This agrees with SMASSE (2003) which highlighted that attitude affects performance. For instance, negative attitude contributes mainly to low scores and positive attitude attributes to high scores in Physics. This positive attitude towards Physics is very important for any student aspiring to do well.

The study argues that attitude affects the ability of learners to learn Physics. This is in agreement with Bajah (1998) and Craker (2006) who stated that the main reason for the misunderstanding of Physics is the spirituality of research. Research has shown that trends toward science evolve with the level of scientific openness, but the outcome of progress can vary depending on the degree of openness, the educational setting, and the presentation of technology.

The study findings also echo Smith (1996) who found that attitude is important in determining one's behavior, Normah and Salleh (2006) who show that learner attitudes and interests can play a decisive role in science and Gonen and Basarah (2008), report that argued that learners' uplifting attitudes towards science are very consistent with their achievements in science. The study reported that learners' uplifting attitudes towards science are closely linked to their achievements in science.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The research concluded that there is a significant difference in students' attitude towards learning school Physics. Students taught using conventional methods had a negative attitude towards learning school physics compared to those taught using Cooperative method. Use of cooperative based learning as means to create positive attitude towards learning of Physics creates positive impact hence better academic achievement compared to conventional methods of teaching.

Recommendations

The study recommended that teachers of Physics, Heads of Science department and Principals should encourage use of Cooperative learning methods more often. This is because it enhances students' comprehension and better students' performance.

The learning methods adopted by physics teacher has been proved to significantly influence learners' attitude towards Physics therefore teachers of Physics, Heads of Science department and Principals should encourage use of more learner centred learning methods as intervention to existing negative attitude towards Physics.

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