EFFECT OF ATTITUDE ON SECONDARY SCHOOL PHYSICS STUDENTS' PERFORMANCE IN PHYSICS AS A SUBJECT

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ABSTRACT

This paper aims at unraveling the relationship between a student's attitude towards Physics and his or her performance in the subject. The findings indicate that there is a very strong relationship between a student's attitude towards physics and his or her performance. While students with positive attitude towards physics are high achievers, those with negative attitude towards the subject are low achievers. Some causes of negative attitude towards a subject have been discussed. Conclusively, and in the light of the research findings, the paper recommends some remedial measures for enhancing high performance.

INTRODUCTION

Physics results in most certified examinations like the former General Certificate of Education (G.C.E.), Senior School Certificate Examination (S.S.C.E), the present West African Senior Certificate Examination (WASCE) and National Examination Council (NECO) have not been satisfactory for the past number of years. This is in consonance with the reports of the likes of Oyekan (1993) and Zwalde (1997) on underachievement in science and mathematics. This trend indicates a performance level contrary to expectations. According to Olarinoye (2000) "Physics has always been one of the worst hit in terms of mass failure in WAEC SSCE year in year out" An editorial in STAN bulletin (1999) confirms that the students who scored credit and above in the 1998 May/June S.S.C.E. Physics examination constituted 11.3% of the total number of candidates who sat for the examination. Adeyegbe (1993) cited the percentage of those who scored credit and above in S.S.C.E. Physics examination as 31.5% out of 26,297 students in 1988, 9.5% out of 28,525 students in 1989 and 20.7% out of 63,161 students in 1990.

In most cases, students who manage to pass in such examinations as cited above do so through fraudulent means. Reports on irregularities and examination malpractices are received before, during and after the conduct of the examinations (W.A.E.C: Test Development Division, 1998). Nevertheless, not all cases of irregularities and malpractices are detected for reports to be written on.

In agreement with Abbott (1977) Physics as a science subject should be presented to students as human intellectual discipline with indepth roots in the past and largely responsible for our nation's technological development. In the words of Olarinoye (2000:16) "Physics is the most utilized basic science subject in most technology and technology related professions". Therefore, the importance of physics in most spheres of national development cannot be under-estimated. There is the need to point out that while some students are low performers in Physics as a subject, others are high performers.

BACKGROUND OF THE PROBLEM

The motivation of this study began to crystallize when the researcher took up teaching appointment in a secondary school in 1994, during which time informal interviews were obtained with the physics students and the one Physics teacher in the school. It was discovered that students have diverse opinions about Physics. While some felt that they enjoyed the subject and would like to pursue courses relating to it, others admitted they disliked Physics due to its difficulty. Yet others had some other reasons.

The researcher felt that a positive attitude on the part of the students is necessary for effective learning and subsequent high performance in Physics. Where a negative attitude prevails, learning of physics, willingness to respond to what is learnt and commitment to such responses cannot be achieved.

ATTITUDE IN RELATION TO ACADEMIC ACHIEVEMENT

In many instances, students dislike and fear Physics as a subject. Such attitudes have been known to relate with performance in the subject. The assessment of attitude towards Physics would be of less concern if attitude is not thought to affect performance in some way. Despite the rhetoric and evidence demonstrating the significance of positive attitudes towards school subjects, little research has been conducted concerning these attitudes. According to Vernon (1953) attitude can be regarded as specific rather than general; they are formed about particular persons, objects or issues and because of the varied contexts, he wrote "there is no agreed definition". On attitudes, Wall (1968) wrote that they develop gradually, incidentally and generally unconsciously, and at any given time they predispose the person to perceive, think, feel and behave in particular ways, when faced with specific situations.

In the context of this research, attitude means opinions, likes and dislikes, interest, fear and other tendencies that predispose a student towards Physics as a s school subject. A student's attitude towards Physics include his notions about physics, its satisfaction of human intellectual curiosity, his interest and disgust whenever discussions are centred around Physics and the benefits that can be obtained from his endeavors. It includes also the relationship between the student's self-concept and the entire concept of the discipline. The experience of specific situations itself fosters attitudes which tend to spread over related situations and to become generalized. For example, in learning situations, satisfying or frustrating experiences become self-reinforcing, facilitating or frustrating further learning as positive or negative attitudes develop. Recurring experiences that produce negative attitude towards a subject or teacher can spread throughout the curriculum to the certificate examination resulting in low performance.

Evaluating of students' achievements is one of the teachers important responsibilities if a low academic performance is to be curtailed. At all levels of schooling and among all social groups there are numerous individuals whose attitudes towards school or science subjects are negative. This state of mind merely guarantees that students will learn a little that is expected of them. One of the problems confronting any teacher is to know the

performance level of his students. He has to know what level of achievement can reasonably be expected of any given student, and whether the student is performing as well as could be expected. According to Thorndike and Hagen (1969) both written tests and a variety of informal appraisal are required to evaluate completely the objectives of the modern curriculum. Therefore, it is important that teachers' evaluation devices be well thought out and constructed, as poorly conceived or executed evaluation instruments may bring about a student's negative attitude towards the subject.

Negative attitude could also arise from the groups in which the student is a member. The culturally deprived student may simply reflect the anti-intellectual attitude of his community. He or she may discover more social and dating opportunities in extracurricular activities than they do in class work.

Parental and sibling attitudes can be mirrored in their children. A considerable number of students attend school with negative attitudes towards it and this is continually reinforced by parents, older brothers and sisters. A curriculum meaningless in terms of such students' goals and purposes, out of harmony with the orientation of their home and community, can too easily further reinforce their negative attitudes thereby leading to low performance (Wall, 1968).

Trauma may account for another group of negative attitudes. There are times when teachers devoid of intent, embarrass, ridicule or hurt a student such that the student becomes estranged from the subject matter being taught (Blair et al. 1968).

NULL HYPOTHESES OF RESEARCH

To facilitate the research, these null hypotheses were made:

1. There is no significant difference in the mean attitude scores of students with positive attitude and those with negative attitude towards Physics.
2. There is no significant relationship between students' attitude and performance in Physics.
3. There is no significant difference in the mean scores on achievement test of students with positive attitude and those with negative attitude toward Physics.

THE SAMPLE

A sample of thirty Physics students each from four secondary schools in Jos Local Government Area of Plateau State, Nigeria were randomly drawn from SS3 class of each of the schools selected randomly for the research. All the students were in SS3 class because it was thought that they had selected the subjects they intended to offer for S.S.C.E. and that they should have formed their opinion about Physics.

METHODOLOGY AND DATA ANALYSIS

A total sample of 120 Physics students responded to a 20-item Physics Attitude Questionnaire (PAQ) and a 20-item Physics Achievement Test (PHAT). As the researcher was interested in students' attitudes towards Physics in general rather than their attitudes

towards Physics examinations alone, PAQ was first administered.

For a positive statement in PAQ, the items were scored as follows: Strongly Agree (SA) - 4 points, Agree (A) - 3 points, Not Certain (NC) - 2 points, Disagree (D) - 1 point and Strongly Disagree (SD) - 0 point. The order was reversed for a negative statement (See Appendix for the PAQ).

PHAT comprised 20 objective - type items in Physics with each correct option awarded five (5) marks such that PHAT was rated over a hundred percent.

To determine the appropriateness of PAQ, the items were subjected to criticism by two senior lecturers in the Faculty of Education, University of Jos, Nigeria. PHAT was constructed using WAEC Physics syllabus and the National Scheme of Work on Physics.

The researcher administered PAQ and PHAT to a sample outside the research sample, a pre-test, for instrument reliability. Reliability for PAQ and PHAT was 0.79 and 0.87 respectively.

In analyzing the data, the student t-test

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(N_1-1)S_1^2+(N_2-1)S_2^2}{N_1+N_2-2}\left[\frac{1}{N_1}+\frac{1}{N_2}\right]}}$$

was administered on hypotheses one and three while hypothesis two, on correlation coefficient for attitudes and performance, was subjected to the student t - test.

$$t = r\sqrt{\frac{N-2}{1-r^2}}$$

ANALYSIS OF RESULTS

Since each of the sampled students sat for both PAQ and PHAT, the required data on each student was complete. For the purpose of confirmatory analysis the sample was divided into two groups with respect to attitude and achievement. These groups were:

1. Positive attitude and Negative attitude
2. High achievers and Low achievers.

Subjects were assigned to one of these groups based on the normalized standard score value on both PAQ and PHAT results.

TABLE 1: t- test analysis performed on mean scores of PAQ results shown below:

Attitude	N	$\bar{X}$	S	t-cal	t-table	df	L
Positive Attitude	64 (N_1)	63.195 ($\bar{X}_1$)	10.615 (S_1)	8.19	3.73	120	0.001
Negative Attitude	56 (N_2)	44.360 ($\bar{X}_2$)	14.495 (S_2)				

N_1 = number of sample with positive attitudes towards Physics.
N_2 = number of sample with negative attitudes towards Physics.
$\bar{X}_1$ = mean score of PAQ result for sample with positive attitudes towards Physics.
$\bar{X}_2$ = mean score of PAQ result for sample with negative attitudes towards Physics.
S_1 = standard deviation of PAQ result for sample with positive attitudes toward Physics.
S_2 = standard deviation of PAQ result for sample with negative attitudes toward Physics.
df = degree of freedom
L = level of significance

The null hypothesis is rejected on the basis of t-cal > t- table. That is the calculated value of t is greater than the value of t from table. This implies that there is difference between the mean scores of the students with positive attitudes towards Physics and those with negative attitudes towards the subject.

TABLE 2 : t- test analysis administered on correlation coefficient for attitude and performance in Physics shown below.

df	L	r	t-cal	t-table
120	0.001	0.83	16.16	3.73

r = Pearson product moment correlation coefficient

As a result of t-cal > t- table from table above, there is a very significant relationship between a student's attitude towards Physics and his or her performance in the subject. The null hypothesis is therefore rejected.

TABLE 3: t- test analysis performed on mean scores for PHAT results, by attitude dimension shown below.

Attitude	N	$\bar{X}$	S	t-cal	t-table	df	L
Positive Attitude	64	49.078 ($\bar{X}_1$)	10.733	3.77	3.73	120	0.001
Negative Attitude	56	36.640 ($\bar{X}_2$)	8.908				

$\bar{X}_1$ = mean score of PHAT result of students with positive attitude towards Physics
$\bar{X}_2$ = mean score of PHAT result of students with negative attitude towards Physics.

The null hypothesis is rejected on the basis of t-cal > t-table. Therefore, there is difference in the mean scores of achievement test of students with positive attitude towards Physics and those with negative attitude towards the subject.

CONCLUSION AND RECOMMENDATIONS

From the analysis of the data, the following conclusion can be drawn: The relationship between a student's attitude towards Physics and his or her performance in Physics is positively strong (t-cal = 16.16 > t-table = 3.73 from table 2). A student's performance in Physics relates to his or her attitude towards the subject. This implies that students with favorable (positive) attitude achieve high scores in Physics while those with unfavorable (negative) attitude achieve low scores.

From table 3, there is no significant difference in the PHAT mean scores of students with positive attitude towards physics (49.08%) and those with negative attitudes towards the subject (36.64%). Although 36.64% is a failure, according to W.A.E.C rating, 49.08% is not an excellent score.

The poor performance of a Physics student in the subject is not always linked to his or her negative attitude towards the subject. From the findings there is no much difference in the mean scores of PHAT results of students with positive attitudes towards Physics and those with negative attitude towards the subject (t-cal = 3.77 as compared to t-table = 3.73 from table 3).

Following the research outcome, the recommendations below are profferred:

1) Physics teachers should identify and encourage students with negative attitude towards Physics. Since attitude change is a function of reinforced learning (Lesson, 1973), extra teaching periods should be created for such students that exhibit low performance in Physics.
2) Physics teachers should endeavor to reward students that show favorable attitude or perform high in the class as such action may lead to the development of positive attitude in the students with negative attitude towards physics.
3) Physics teachers should learn to employ appropriate teaching methods in order to facilitate the learning of concepts. According to Josiah and Kakmena (2002) "Teachers who adopt appropriate and well-researched methods of teaching science stimulate and motivate their students to learn".

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APPENDIX

The PAQ used in the research is as below:

		SA	A	NC	D	SD
1	Anytime we have Physics I am always happy.					
2	I sometimes feel like running away from my physics problems					
3	Physics is something I enjoy a great deal.					
4	I cannot understand how some students think that physics is interesting					
5	I like to be given assignments in Physics					
6	Whenever it is time for Physics, I feel like packing my books and going home					
7	Physics is useful for me outside school.					
8	Physics should be one of my school subjects					
9	I think Physics helps me in some of my other subjects					
10	No matter how much I try, I can never understand Physics					
11	I would like physics better if it were not made so hard in class					
12	Physics is easier for me than my other subjects					
13	Only people with a very special brain can learn Physics					
14	Physics is a subject which is more difficult than any other subject.					
15	I like doing Physics more than anything else					
16	I like reading novels and writing essays more than solving problems in Physics					
17	I hate a problem like this: Define the terms "Velocity" and "Acceleration". Choose one of the terms and explain what is meant when the quantity is said to be uniform.					
18	I enjoy answering other types of questions as much as mathematical questions in Physics.					
19	I like Physics because it is accompanied by practicals in the laboratory					
20	I like to be called on in Physics class					