

## STUDENTS' ATTITUDES TOWARDS ADVANCED LEVEL PHYSICS PRACTICAL WORK

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**Abstract-** The development of positive attitudes is one of the basic determinants of performance in any discipline of study. This paper assesses students' attitudes toward Advanced Level ('A'-Level) Physics Practical Work (PPW) and explores ways by which positive attitudes could be enhanced. A total of 96 U6 Physics students from 12 selected Harare schools participated during the study. The students' opinions were surveyed using a questionnaire. Observations on the nature of the Physics laboratories and marked practical reports of some students were made. Data was analysed using frequency counts to determine the opinion of the majority. The major findings were that students have negative attitudes towards Physics Practical work due to poor motivation as a result of limited resources and the way practicals are assessed by the physics teachers. Among many avenues, these problems may be solved by encouraging the production of affordable laboratory equipment by local companies. Abundance in material will see the students engaged in various laboratory activities thus motivating them as a way of nurturing positive attitudes towards PPW. Physics teachers are also expected to assist students during practical sessions than leaving the full responsibility with laboratory assistants who in most instances are not all that competent.

**Keyword-** attitudes, physics education, practical work. High school physics.

### Introduction and background to the study

Students' performance in 'A' level physics practical work is influenced by a number of factors during their course of study. One could be their perception of physics practical work. These perceptions could in turn be influenced by sub-factors as motivation and resource availability. The paper does not focus on this chain reaction, but is simply concerned with how students perceive practical work activities in the 'A' level Physics Laboratory environment. The study was motivated by the realization that, there is a generally poor performance by students in physics practical work both during the course of study and the final public examinations from the researcher's experiences as an 'A' level physics teacher. This could be attributed to students' negative attitudes towards physics practical work.

When students develop a negative attitude towards physics practical work, they will take the physics laboratory as a 'torture camp' rather than a place for learning inquiry, discovering and applying physics to solve daily problems in the society. Motivation becomes vital in developing positive perceptions towards physics practical work. The research aims to get answers to the following questions:

- What causes the students to develop negative attitudes towards physics practical work?
- How can students' attitudes be influenced by teacher motivation?

- How can students' attitudes be influenced by resource availability?

### The need for positive attitudes

In this paper an attitude is defined as a state of mind, a feeling or a disposition. Harrison (1980)<sup>[1]</sup> defines it as a psychological construct while Newcomb(1998)<sup>[2]</sup> considers it as individual tendencies to react either positively or negatively to a given social value.

With the importance that is attached to practical work in relation to the technological advancement of the society, it is necessary that students need to develop positive attitudes if they are to have any meaningful contributions to the technological advancement of their country. Physics educators must not only quest for better performance, but must also consider the need to have practicals which are compatible with the society's expectations and aspirations. Ogunniyi(1986)<sup>[3]</sup> concludes that, it is through practical work that students are able to use their school acquired knowledge and skills to serve society. Haussler and Hoffman (2000)<sup>[4]</sup> argue that physics students need to link physics with situations they encounter outside the classroom.

Students can only develop positive attitudes if they are motivated. Motivation is important for getting children to learn,arrant(1994)<sup>[5]</sup>. Haussler and Hoffman(2000)<sup>[4]</sup> realize the need to teach physics in a way that would

develop a positive physics related self concept and to link it with situations students encounter outside the classroom. Hodzi(1990)<sup>[6]</sup> acknowledges that attitudes of pupils in their subjects of study determine their level of achievement. Coon(1991)<sup>[7]</sup> concludes that motivation and interest in a task have a considerable effect on performance. Researchs by Koballa(1988)<sup>[8]</sup>, Piburn and Baker(1993)<sup>[9]</sup> show a strong relationship between science proficiency and attitudes towards science. Koballa(1988)<sup>[8]</sup> notes that the selection of students in science must also take into consideration student's attitude towards the subject so that students are not only scientifically literate but also technologically geared. Johnstone (1998)<sup>[10]</sup> in his studies on the students' attitude and cognition change to physics laboratory found out that demonstrations before practicals fostered a positive attitude in physics and their understanding of physics practicals improved. Motivated students will definitely develop positive attitudes towards Physics Practical Work. (PPW). Treagust (2001) <sup>[11]</sup> argues for the development of critical attitudes to promote logical reasoning. Nelson and Backer (2000) <sup>[12]</sup> through their research concluded that student's decisions to engage in effortful learning maybe affected by their beliefs about their abilities and the nature of the task. Studies on students' attitudes towards 'A' level physics practical activities are still in their embryonic stage in Zimbabwe, as the field remains inadequately explored. This is however a follow up study to researches carried out in other countries as these conclusions were reached at, under different circumstances and conditions. Through the development of positive attitudes towards physics practical work, it is the present writer's hope that this will reduce the number of disappointments inflicted on a number of candidates each year.

### Methodology

A case study approach was employed in this study. A total of twelve schools and ninety-six students participated during the study. Purposive stratified sampling was used to select the schools, where three former group A high schools, four former group B schools, two boys high schools, one girls high school and two private colleges (registered with the Ministry of education sports and culture) from greater Harare area participated.

The sample consisted of U6 physics students where an average of eight students participated from each school. This was a deliberate move to ensure that each school gets an almost equal number of participants. Basically, three instruments were used in collecting the data namely the questionnaire, informal interviews and observation schedule. The questionnaire was the main instrument used during the research. The main instrument was developed through stages. After compiling the questions, the questionnaire was administered to thirteen students from schools randomly selected. The students were asked to comment on the questions especially on issues of ambiguity, clarity and

length of questionnaire. The questionnaire was then modified accordingly. The pilot study helped much in refining the questions. The same was done with the interview schedule. This was a way of ensuring the validity and reliability of the research instruments. The informal interviews also helped the researcher in getting some in- depth responses and reactions or attitudes from the students thus they had a chance to explain and express their feelings about practical work in physics. These could not however be obtained from the questionnaire.

A general observation of the nature of the physics laboratory inclusive of its equipment was done with the permission of the physics teacher. This also included a visit to the storeroom and preparation room, to see the available equipment for practical work. The researcher had also the opportunity to go through students' practical exercise books. The aim was to physically check on the frequency of doing practicals. This was an important way of checking the validity and reliability of the information given by the subjects on the questionnaires.

### Results

The obtained results are summarized in table1 and figure1. The use of simple descriptive statistics was a deliberate move by the present writer to make the information more accessible and clearer to those who will be interested in the research findings.

### Discussion and Recommendations

The findings reveal that, generally, students have negative attitudes towards physics practicals mainly due to poor motivation resulting basically from limited resources and summative practical assessment by physics educators. The students' responses on questions pertaining to attitude and motivation towards practical work as indicated in table 1 are quite varied. Of concern and interest to note is the fact that 64.6% of the respondents revealed that they do not have free laboratory periods where they can do whatever interest them like repeating previous experiment, design new experiments or perform other experiments at the school. It is therefore not surprising that students find physics practicals as rather boring and difficult with 72.9% agreeing to this statement. Students must do as many practicals as possible. The fact that 10.4% of the respondents acknowledges that they only do practicals when the teacher feels like giving one is very disturbing. This sounds a bell, which is loud enough to respond to. These statistics results show that the morale of physics students is very low considering the fact that 30% of the respondents acknowledged that they are ashamed by the appearance of their physics laboratories. Schools in Harare are assumed to be some of the best equipped schools in the country considering that it is the capital city of the country- thus more saddening situations are expected elsewhere.

Motivation is very important if students are to develop positive attitudes towards PPW for them to perform better. Students develop positive attitudes towards

something that gives them pleasure. Since attitudes are learned, they are expected to change as a function of experience. Attitudes take along time to change, thus it is the role of the physics educator to ensure that learners are helped to develop positive attitudes. It is the duty of the physics teacher to make it clear to the students that physics concepts could be learnt better through practical investigations, for example, understanding of concepts on a topic like electricity can be enhanced through practical activities. Kasambira (1998) <sup>[13]</sup> asserts that school administrators widely agree that motivation is a critical determinant of attitude. Physics teachers need to motivate their students if they are to develop desired attitudes. This may be done through,

- Helping students during practical sessions than leaving everything to the laboratory assistants who Gwara and Mtetwa (2003) <sup>[14]</sup>, argue, are not all that competent.
- Having free laboratory periods where students can do whatever interests them like repeating previous experiments, design new experiments or perform other experiments not necessarily on the schedule.
- Creating a learning environment than an examination one where the teacher is interested in the final practical write up without considering the processes of experimentation.

It is sad to note that from the observations made and the informal interviews conducted with the students, there is nothing much that is done currently in schools to alleviate these problems and hopefully witness an improvement in the attitude of the students to 'A' level Physics practical work. Physics teachers need to work together with students in improvising some equipment like manometers, potentiometers, rulers, and weights among many others. Physics educators in schools may organize exchange programmes with other schools where pupils are encouraged to design some models and explain how they work. This in a way will motivate the students to develop positive attitudes towards physics practical work at the same time helping them to improve their manipulative as well as their technical skills. If students are motivated, they will develop positive attitudes towards practicals in the way, enriching their performance.

### Conclusion

Three conclusions were reached at in this research:

- Students have negative attitudes towards physics practical work.
- Students develop negative attitudes mainly because they lack motivation from the teachers as the duty of carrying out practical work is often assigned to laboratory technicians who in most cases are not all that competent.

- Limited resources act as a major barrier for students to engage in various practical activities, impacting negatively on their attitudes.
- A new physics laboratory environment, free from examination fever, full of teachers' assistance and with basic laboratory equipment must be the starting point to witness any change. It must be noted in conclusion that, it is not only the duty of the physics educators of motivating the students. Different stakeholders including parents, school administrators and the society at large are expected to support the innovations by the physics teachers in an endeavor to alleviate the current problems hence redress the existing scenario in 'A' level physics laboratories.

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Students' attitudes towards advanced level physics practical work

No	Statement	Responses				
		1	2	3	4	5
1	I am ashamed of the appearance of our physics laboratory	11	17	12	35	21
		11.5	17.7	12.5	36.5	21.80%
2	What is done in the regular physics class is unrelated to laboratory work	5	12	19	36	24
		5.2	12.5	19.8	37.5	25%
3	The time allocated for practicals at this school is enough	7	29	14	36	10
		7.3	30.2	14.6	37.5	10.40%
4	We have laboratory free periods when we can do whatever interest us e.g. repeat previous experiments, design new experiments or perform other experiments at the school	13	19	2	36	26
		13.3	19.8	2.1	37.5	27.10%
5	Physics practical work is more difficult than theory	36	45	5	7	3
		37.5	46.9	5.2	7.3	3.10%
6	Physics practicals teach and give me courage to try and solve problems	45	36	5	2	8
		46.5	37.5	5.2	2.1	8.60%
7	Physics practicals are time consuming and a waste of time for other important things.	2	5	5	17	67
		2.1	5.2	5.2	17.7	69.80%
8	Practicals in physics are more interesting than lessons in theory	27	31	24	12	2
		28.1	32.3	25	12.5	2.10%
9	Practical work in physics helps me in understanding theoretical concepts	29	46	14	7	0
		30.2	47.9	14.6	7.3	0%
10	Influence of practical work helps me to make careful observations and enables me to interpret observations logically	43	43	5	5	0
		44.8	44.8	5.2	5.2	0%
11	I usually do well in physics practicals	10	7	10	36	29
		10.4	7.3	10.4	37.5	30.20%
12	Practical work in physics is rather boring and difficult	48	22	14	3	9
		50	22.9	14.6	3.1	9.40%
13	The teacher makes practical work in physics more interesting	2	12	29	43	10
		2.1	12.5	30.2	44.8	10.40%
14	My physics teacher does not assist me during practical work and is only interested in marking final scripts	21	41	19	10	5
		21.8	42.7	19.8	10.4	5.20%
15	I feel nervous when doing practical work in physics	5	12	26	29	24
		5.2	12.5	27.1	30.2	25%
16	I usually look forward to my physics practical work	22	48	14	2	10
		22.9	50	14.6	2.1	10.40%
17	Sometimes the experiments are so long that one forgets what they were meant to demonstrate	3	12	24	31	26
		3.1	12.5	25	32.3	27.10%

**Key to table 1 Attitude and Motivation.(n=96)**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly Disagree.
- 1 and 2: positive responses  
4 and 5 negative responses

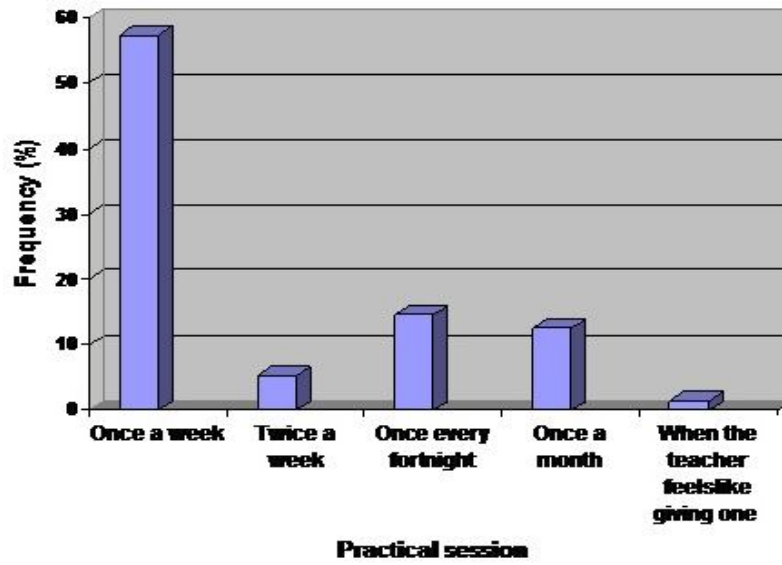


Fig. 1-The Frequency of Carrying out Practicals from Pupils' responses