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Student's Attitudes and Perceptions toward Learning Physics in Arusha City Secondary Schools, Tanzania

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Abstract: *The study's goal was to look into students' attitudes and perceptions of learning physics. Quantitative method and descriptive research design were used in the study. The study used a longitudinal survey trend, a questionnaire, and an interview with 120 sampled students from five secondary schools in Arusha City to collect data. The Statistical Package for Social Science (SPSS) was used to examine the respondent's information, and the interview was thematically analyzed. According to the study's findings, only a small number of students choose to major in physics. The study also discovered that students have a negative attitude and perception toward learning physics, which deactivates and affects their performance. The study does, however, recommend that teachers should use a variety of methods to clear students' alternative conceptions that are reducing their interest in learning physics. In addition, the government should improve human and material resources to allow students to learn more easily and enjoyably.*

Keywords: *Attitudes, Perceptions, Teaching, Learning, NECTA, STEM and Physics*

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1. Introduction

The world is changing at a rapid pace, and technology is becoming more important. Science subjects have become the most popular in terms of encouraging technological innovation. Physics is a vital subject in the fields of Science, Technology, Engineering, and Mathematics (STEM). It entails real-world knowledge in operating technological tools that are useful in communications, manufacturing, hospitals, agriculture, and schools. Classroom knowledge is required to gain the skills needed to operate the devices (Kihwele, 2020). Physics encourages students to use their cognitive skills to confront real-life problems and come up with factual, reasonable solutions. According to Kira & Nchunga (2016), students' attitudes and perceptions of physics learning become upset.

Tanzania's government values the scientific innovation that has occurred in a variety of sectors. The gratefulness draws attention to the introduction of national curriculum. Physics is researched at all levels of education, from elementary to graduate. It consists of both theoretical and practical components. Tanzania's government has increased its efforts to provide physics laboratories in schools in order to sustain practice activities. However, the quality and utilization of some schools, particularly those in rural areas, is unsatisfactory (Kihwele, 2020). Improvements have been made, but only in a few schools. The quality of physics laboratories in private schools differs from that of public schools, where learning and motivation are deactivated (Mabula, 2012).

Physics is a compulsory subject in Forms one and two, and it is optional in Forms three and four. However, in Forms three and four, it is offered as an option subject based on performance in the national assessment in Form two. The admission allows students to be registered to take the national examination for the

certificate of secondary education in Form four (CSEE). Furthermore, based on their performance in Form Four examinations, arrangements for combination are made for them to join in advanced level under the National Examination Council of Tanzania (NECTA). The trend depicts a pyramid structure in which the number of physics takers descends.

Despite the addition of physics to the curriculum, the enrolment rate is not consistent. Few students choose to study physics over other subjects (Kihwele, 2020; Mabula, 2012; Majere et al., 2012; Mbonyiryivuze et al., 2021). In order for students to take physics, their attitudes and perceptions must be considered. Mbonyiryivuze et al. (2021) demonstrate that interest in learning physics is generated by the mind's perceptions and attitudes, which increase motivations. The decrease in the number of students studying physics means a decrease in the number of experts who may potentially advance in scientific literacy (Ndunguru et al., 2013). The study attempted to achieve the goal by focusing on the following research questions: -

i. What are the trends in students taking ordinary level physics from 2015 to 2021?
ii. What are the students' attitudes and perceptions of physics learning?
iii. How do students' attitudes and perceptions motivate or demotivate them to pursue physics?

1.1 Statement of the problem

Determining students' attitudes and perceptions toward physics learning is an important part of science education. However, when students take physics as an option subject, the rate of enrolment decreases (Mushinzimana et al., 2016). When compared to the rate of conscription for other science subjects, the figure is unsatisfactory. Ndunguru et al. (2013) explain how defusing affects students' attitudes and perceptions toward learning physics, lowering their performance in the relevant subject. Motivation is essential for encouraging students' positive attitudes and perceptions toward a particular subject (Mushinzimana et al., 2016). Scholars have identified several factors that influence attitudes and perceptions, including family motives, teaching methods, and gender issues (Ndunguru et al., 2013)

According to studies, students have a negative attitude toward the subject of physics (Kaur & Zhao, 2017; Soh et al., 2010; Ndunguru et al., 2013; Mushinzimana et al., 2016). It was brought up in reference to their significant performance on their assessment exams. However, no studies have ever looked into the number of students admitted and why the rate is still so low in Tanzania. After passing the Form Two National Assessment, students in Tanzania choose to study science. When comparing the rate for physics takers when it is mandatory, it is only different because it is an option (Chetcuti & Kioko, 2012). A pyramid structure is designed to demonstrate the decrease in the number of scientists who may potentially provide advanced skills to encounter many real-world problems.

2. Literature Review

The section provides conceptual definitions of key words guiding the study, such as the meaning of attitude, perception, and learning, as well as a discussion on how they are important in teaching and learning.

2.1 Conceptual definition

2.1.1 Attitude

Several scholars provided a coherent definition of attitude. An attitude is a point of view or feeling about something or someone (Tadele et al., 2016; Mushinzimana et al., 2016). The feelings that cause the behavior that has an effect on something. A positive attitude results in motivation and habits, which bring love and appreciation. Similarly, students' ability to perform and engage actively in the subject is dependent on the attitude that they cultivate in their minds (Kwarikunda et al., 2020). Otherwise, if the attitude toward the subjects is negative, poor performance will result.

Teachers, in their role as coordinators and facilitators of all classroom activities, should guarantee that the best acts taken throughout the lesson promote a good attitude. The characteristics of snubbing the subjects and reducing their interests will be eradicated in this component, and full attention will be conveyed. Negative thoughts will never be discussed in class, but love, confidence, and hard effort will inspire students to improve their performance and grow as scientists

2.1.2 Perception

The majority of individuals mistake perception for attitude, which is just erroneous. The ability to observe or be aware of something is referred to as perception (Mbonyiryivuze et al., 2021). It refers to how something is interpreted or comprehended. The human brain is constantly operating and interpreting things in accordance with what the mind accepts. It may accept things in the correct or incorrect manner at times. Depending on the actions that take place in the classroom, the mind may perceive the subjects to be extremely challenging, causing fear (Ndunguru et al., 2013). The interpretations that lowered the subject's interest and the rejection concepts that were developed.

Physics students are few and far between in many schools, especially when compared to other subjects. Students' perceptions of difficulty are working against them, causing them to lose interest. Other students, on the other hand, compare their achievements to those of other students, causing them to completely disregard physics. That view should be eradicated from learning since it lowers willpower, which reduces the number of scientists. According to Ndalichako & Komba (2014), students' interest in science topics has waned in comparison to arts disciplines. While the ministry of education, science, and technology works to expand the number of scientists, the action remains a mystery.

2.1.3 Learning

Learning is defined as a gradual shift in behavior involving the acquisition of new knowledge and abilities as a result of new experiences (Haugen, 2010). The consideration of students' attitudes and views should be relevant for learning to occur satisfactorily (Kaur & Zhao, 2017). The majority of teachers ignore their students' perceptions or interpretations of the subject or lesson. Many factors, including their family origins, teaching methods, mob psychology, and personal concerns, influence their negative opinions (Majere et al., 2012; Crawford et al., 2017; Ndalichako & Komba, 2014). The goal of generating a good attitude and perspective in students is required for optimum and volatile learning.

However, it is important to think about what happens during teaching and learning. Teaching and learning is viewed as a dynamic process in which ideas are exchanged in a reciprocal manner (Ahmed, 2015). Students have their own views and perceptions based on their unique experiences. In order to understand what students are thinking during the learning process, motivating techniques should be used to track their interests and feelings. When this is done correctly, performance and the quantity of scientific students will both improve.

2.2. The impact of student attitudes and perceptions on physics learning

Teaching and learning are viewed as an active process that is dependent on the activities that take place in the classroom (Ahmed, 2015). Most of the time, students' attitudes and perceptions are not taken into account during the teaching and learning processes, allowing them to create negativity in the lesson. According to Ndalichako and Komba (2014), students have negative attitudes toward science subjects because the majority of them see it as a difficult aspect. Scholars, like Kihwele (2020) and Majere et al. (2012), found students perceive negative attitudes and perceptions toward learning physics as impediments to their performance. It warns to install fear, which kills interest in pursuing physics in those with limited mobility. Simply put, many students have a poor mathematical foundation, which discourages them from studying physics because it requires computations (Mabula, 2012).

Furthermore, favourable attitudes and views motivate students to pursue physics. It also encourages them to participate actively in the teaching and learning process, which improves their problem-solving abilities (Mbonyiryivuze et al., 2021). Positive attitudes drive students to pay full attention during the session, which leads to good learning (Tadele et al.,2016). In order for expected outcomes to occur in teaching and learning, students' attitudes and perceptions must be taken into account. To improve learners' attitudes and perceptions, teachers should guarantee that all classroom activities result in the establishment of a positive mindset in them.

3. Methodology

The section intends to discuss research design, population and sampling, instruments for data collection, data analysis method, validity and reliability and ethical considerations used in the study.

3.1 Research Design

The research used a quantitative method and a descriptive design. However, in order to address the study issue, the following steps were taken: -

Step 1: Five-year trend evaluation from 2015 to 2021, the project examined trends in students taking ordinary level physics. The purpose of the review was to look at the statistical data on the five-year enrolment rate.

Step 2: Fill out a questionnaire. The goal of the study was to provide a broad picture of students' attitudes and perceptions about learning physics. The goal was to help students navigate their feelings and enthusiasm for learning physics. The questionnaire allowed students to express their own views on physics. Furthermore, the topic of why and how allows students to examine their emotions.

Step 3: To conduct an interview. Students were given access to the interview and were given time to answer to the questions. The goal of the interview was to determine how students' views and perspectives stimulate or demotivate their desire to pursue physics. Students were given the opportunity to express their thoughts on the researcher's set of structured questions.

Finally, three processes aided the researcher in properly responding to the research questions.

3.2 Population and Sampling

The research was carried out in five secondary schools in Arusha City under the purposive sampling. As a population, students from ordinary level secondary schools were included in the study. Furthermore, 120 students were chosen for the study using a simple random sampling method where grouping was conducted through the counting number procedure.

3.3 Instruments for data collection

Questionnaires, interviews, and a longitudinal survey trend were employed in the study. The researchers created a questionnaire with a set of prepared questions to assess students' attitudes and perspectives regarding learning physics. Students were given enough time to react to the questions that were presented to them. Structured questions were asked during the interview to determine how students' attitudes and perceptions activate or deactivate their enthusiasm in learning physics. Finally, the longitudinal trend survey was examined to determine the enrolment rate of physics students over the course of five years.

3.4 Data analysis method

The results of the trends and questionnaire were presented using descriptive statistics (frequency and percentage), while an interview was thematically analyzed. The information was examined using the Statistical Package for Social Sciences (SPSS).

3.5 Validity and Reliability

To ensure the validity and reliability the study was piloted in two schools. The face validity was conducted while the team of experts reviewed the items. However, the test-retest method was conducted to check the consistency of the results during the study pilot.

3.6 Ethical considerations

The study took ethical considerations into account. The University of Rwanda, the President's Office, Regional Administration and Local Government (PO-RALG)-Dodoma, the Regional Authoritative Secretary (RAS), and the Arusha City Council District permit were among the authorities and institutions that granted the study permission to collect data.

For the sake of anonymity and secrecy, participant consent was considered. To maintain anonymity, the codes were issued to both the schools and the participants. The hard copy information was secured in the cabinet for confidentiality, while the soft copy was saved on an external hard drive with a unique pin for privacy.

4. Results and Discussion

The chapter presents the finding obtained in the study and its corresponding discussion related to the findings obtained by other researchers.

(a) Results

What are the trends of ordinary level physics takers students from 2015 to 2021?

The results of a longitudinal survey trend to explore the number of students who sat for a national examination (Certificate for secondary education examination-CSEE) during a five-year period from 2017 to 2021 were tallied as shown in table 1. The schools were coded as A, B, C, D, and E to maintain anonymity and secrecy.

Table 1: Trends of ordinary level physics takers students from 2015 to 2021 in five schools

	School codes				
Year	***A***	***B***	***C***	***D***	***E***
2017	*30*	*33*	*46*	*21*	*12*
2018	*45*	*39*	*57*	*19*	*31*
2019	*77*	*65*	*80*	*40*	*19*
2020	*46*	*43*	*78*	*39*	*26*
2021	*23*	*65*	*101*	*43*	*31*

What are the students' attitudes and perceptions toward learning physics?

The questionnaire was created as a tool to study students' attitudes and perceptions towards learning physics. The respondent might fill in YES for the correct response and NO for the erroneous response on the questionnaire. A total of 120 students from five schools participated as respondents. The results, however, were tabulated in frequency-f and

percentage-% as shown in Table 2 below; -

Table 2: Students' attitudes and perceptions toward learning physics

Item	YES		NO (%)	
	f	%	f	%
Learning physics changes my ideas about how the world works	34	28.3	86	71.7
I develop interest in physics lesson	49	40.8	71	59.2
I can apply physics concepts in a real-life situation	36	30	84	70
I feel enthusiastic to learn physics	17	14.2	103	85.8
I study physics just to pass examination	106	88.3	14	11.7
Topics in physics encourage me to continue learning physics courses	57	47.5	63	52.5
I can summarize the important points of the content in physics	44	36.7	76	63.3
Solving problem of physics is an enjoyable and self-satisfying experience	21	17.5	99	82.5
We learn interesting things in physics lesson	80	66.7	40	33.3
I like physics lesson more than the others	16	13.3	104	86.7
I use to fail physics exams	77	64.2	43	35.8
Physics lesson are boring	60	50	60	50

How students' attitudes and perceptions motivate or demotivate their interest in pursue physics subject?

A few students from each of the five schools were interviewed. The analysis was done thematically, and their thoughts were recorded. The purpose of the interview was to learn how students' attitudes and perspectives stimulate or demotivate their desire to pursue physics. Respondents were coded as P, R, S, T, U, V, W, X, Y, and Z, while schools were coded as A, B, C, D, and E. Positive and negative replies were separated. The following were some of the negative responses: -

Student R from school E responded;

"Physics is not easy to learn, and I am not interested in it because it requires complicated computations and rigorous exams."

Student T, W and Z from school A and D responded;

"Mastering physics issues is extremely difficult because it necessitates the use of complex apparatus and experiments that take a long time to complete."

Student U and S from school C added;

"Physics is not my strong suit because it covers concepts that are difficult to cover in class and that appear on exams."

Student T and P from school B and A explain that;

"We only have one physics teacher that teaches the entire school, so we are not covering all topics, while some topics are unrelated to our experiences."

However, very few students provided the positive response about learning physics.

Students V from school A commented;

"Learning the concepts of physics fascinates me since it provides me with knowledge that is directly relevant to my experiences."

Finally, student X and Y from school Cand E said;

"Physics is very interesting, and I intend to work hard in order to pursue physics-related courses in higher education. Again, the practical activities found in physics help to increase my interest in the subject."

(b) Discussion

It is unsatisfactory when compared to the overall number of students who sat for the national examination, which includes both science and arts takers, because very few students pursue science disciplines (Ndunguru et al.,2013). Because physics is not a compulsory subject and students are given the option to choose following their Form Two national examination results, there is a high dropout rate, resulting in a fall in the number of students. The pyramid structure, on the other hand, is well-designed, as only a small percentage of students continue to take advanced physics combinations. Kihwele (2020) investigated whether the figure is reasonable in relation to the government's efforts and found to be contrary.

According to the findings, we have evidence to suggest that students' attitudes and perceptions of learning physics are unfavourable, as the majority of students responded negatively to various items. The students are aware that physics is of little value to them and that they are uninterested in it. Furthermore, some argue that they are studying physics solely to pass final exams, rather than to gain scientific cognitive knowledge that may be applied in real-life circumstances. Students perceive adversely about studying science subjects, according to Ndalichako & Komba, (2014). As a result, the number of scientists who can progress and threaten knowledge to bring about positive changes is reduced.

According to Mushinzimana et al. (2016), a negative attitude toward learning physics has an impact on student's performance. The impact is well known, as many students put insignificant amount of work in learning physics, which demotivates their enthusiasm. However, the hope that physics is for geniuses and intelligent people is fading (Ndunguru et al., 2013). When one's certainty is eroded, pursuing happy sentiments becomes a significant affair. In reality, perfection will never be achieved at the peak of greatness.

Finally, the findings of the students show that only a small percentage of pupils have a good attitude toward learning physics. Meanwhile, their pessimism dampens their desire to understand physics (Soh et al., 2010). It simply has an effect on their psychological intimacy, making people believe that understanding physics is of no use to them. As a result of the impact, less people are interested in studying physics, which could lead to changes in other sectors.

5. Conclusion and Recommendation

5.1 Conclusion

The goal of the study was to find out how students felt about learning physics. According to the data, the enrolment rate of physics students is insufficient when compared to the total number of students enrolled in the class. Students, on the other hand, have been discovered to have a negative attitude and perception about learning physics. Their lack of constructiveness demotivates their enthusiasm in learning physics, since many do not opt for it and only a few appreciate it. It is good when we increase the numbers of physics takers to encourage the increase of the experts who may advance in science field to support innovations.

5.2 Recommendation

The study advises teachers to employ a variety of strategies to dispel students' erroneous beliefs about physics, which are reducing their enthusiasm for the subject. Furthermore, the government should strengthen human and material resources to allow students to learn more conveniently and enjoyably. As a result, the number of scientists will be available to contribute to diverse areas will expand, resulting in national progress.

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