JRIIE Journal of Research Innovation and Implications in Education
Center for Research Implications & Practice

Website:www.jriiejournal.com ISSN 2520-7504 (Online) Vol.7, Iss.1, 2023 (pp. 43 - 62)

Assessing the Impact of Students' Attitudes on Their Engagement and Performance in Physics at Lower Secondary Schools in Rwamagana District, Rwanda

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Abstract*: The main goal of Rwanda's education is to foster intellectual growth, meet social needs, advance the nation's economy, and prepare learners for professional jobs. The current study assesses the impact of student attitude on their engagement and performance in physics at lower secondary schools in the Rwamagana district. The study adopted a qualitative design. To achieve the objectives of the study, purposive sampling method was used to select the participants and schools. 4 schools and 245 participants were selected purposively. Based on independent and dependent variables incorporated, a closed or fixed response interview was designed and administered to the senior three students, physics teachers, and DOSs for data collection. A computer software SPSS version 20 was used to analyse the data collected. The frequencies and percentages tables were obtained. The findings indicate that the students need to work hard, make efforts, and do extra activities toward physics. The majority of the students are interested and motivated to learn physics, and it shows that the students who attend class regularly and engage in teaching and learning activities toward the subjects will lead the creation of a positive attitude in the students toward the subjects. The current study suggests that the teachers and other stakeholders in education must control the attitude formation toward the subject early by using the teaching methods and teaching strategies for enhancing and controlling student interest, motivation, and eagerness. Should also discuss the importance of physics subject by linking them to real-world applications, real-world solving problems, and career applications.*

Keywords: *Attitude, Positive attitudes, Students' engagement, Academic performance, and Physics.*

How to cite this work (APA):

Tujyinama, V. and Ntinuguruzwa, C. (2023). Assessing the impact of students' attitude on their engagement and performance in physics at lower secondary schools in Rwamagana District, Rwanda. *Journal of Research Innovation and Implications in Education, 7*(1), 43 – 62.

1. Introduction

Global education, as represented in SDG4 for sustainable development, it emphasizes the need of ensuring inclusive and equitable quality education and encourage lifelong learning opportunities for all people in the modern world. Education has evolved into a tool for accomplishing one's aspirations (Leal Filho, 2018). Education plays an important role in growing human potential for self, establishing a more equal society, and fostering national progress. Universal high-quality education seems to be the most effective approach to stimulate growth and maximize a country's resources, and it is beneficial to individuals, society, and the world (MHRDGDI, 2020). Rwanda's vision for 2050 is to strengthen human capacity building for socio-economic development (MINEDUC, 2018). This aim is to encourage Rwandans to assess education at all

levels, improve education quality, and link education with labour market needs. In Rwanda, education serves to foster intellectual growth, meet social needs, advance the nation's economy, build a skilled labour force, and prepare pupils for a job or professional path for Rwandan citizens. According to ESDP (2010), it's important to focus on education quality issues in general, as well as the inputs and processes that contribute to student learning improvement and help in transforming the school into a true learning environment.

According to Reddy (2017), students must have all of the necessary information and skills, as well as critical analysis and critical thinking skills, which will enable them to learn physics as a science subject. Physics is important because it prepares students for careers in electronics, mechanical engineering, electrical engineering, civil engineering, construction, information, optical, laser, design, application engineering, high school physics teachers, data analyst, IT consultant, Lab technicians, communication technology, and other fields where physics concepts are applied in real-life situations (Kural Mehmet, 2016). Physics teaches skills and information that are necessary for the development of theories and laws. It aids in the explanation of natural events that humans encounter daily. People with physics knowledge and skills can explain physical processes like lightning, electromagnetism, rainbows, free-falling bodies, the galaxy and its implications, and so forth (Marg, 2013). Laws of Physics and principles enable individuals to overcome the effects caused by these occurrences on humans. On the other hand, it provides solutions to the challenges that people face in our modern society, the knowledge and abilities acquired via physics studies allow people to be creative and imaginative, and it aids students in developing independent methods for solving daily life problems (Veloo, 2015).

Students should have a positive attitude toward improving their academic performance in physics education. Therefore, students' performance will be a result of the student's strengths in physics education (Mbonyiryivuze, 2021).

Physics is one of the basic science courses that were taught many years ago, and it was seen to be a difficult subject due to several mathematical concepts, theories, formulas, and physics laws that govern it in nature. According to Erinosho (2013), "*Physics is defined as a discipline that requires students to employ a variety of understanding and the ability to use algebra and geometry and to go from the specific to the general and back".*

An attitude is a psychological condition that determines how a stimulus, in the form of action or behaviour, is responded to (Ajzen Icek, 2000). There are two types of attitudes: acceptance (positive attitudes) and rejection (negative attitudes) of an object (Saputra et al., 2020). Therefore, there are three components of attitude:

a) *The affective component* is the emotional or feeling segment of an attitude. It is related to the statement which affects another person. This involves a person's feelings and emotions. It deals with feelings or emotions that are brought to the surface about something, such as fear or hate (iEduNote, 2022).

b) *The behaviour component of an attitude* consists of a person's tendencies to behave in a particular way toward an object. It refers to that part of attitude which reflects the intention of a person in the short run or long run (iEduNote, 2022).

c) *The cognitive component of attitudes* refers to the beliefs, thoughts, and attributes that a person would associate with an object. It is the opinion or belief segment of an attitude. It refers to that part of attitude which is related to the general knowledge of a person (Damianus Abun, 2019).

A positive attitude "*is a state of mind that focuses on the good and potential in things, situations, and people. A positive attitude tends to be more productive. It is possible to deal with negative people, situations, and environments with a positive attitude"* (Spacey, 2021). Therefore, a student with a positive attitude is tending to always have an enthusiastic, hopeful perspective on life. However, it is believed that attitude will change as a result of experience, so even someone with a normally negative attitude might improve. In general, people who have positive attitude view are happy people who think they are responsible for good things and that good things will usually come their way (Kabil, 2018).

According to Audas (2002), engagement refers to a student's active participation in academic and extracurricular activities as well as their identification with the school and all of its components, including its beliefs, norms, and social rules. Newman (1992), defined the concept of psychological engagement, he suggested that student engagement refers to their psychological efforts in learning, capable of understanding, or mastering the knowledge, skills, or crafts that their class work is meant to promote. It can also refer to the psychological emotion required to master and fully understand the knowledge, skills, and crafts that are explicitly taught in academic institutions (Wehlage, 1989).

Students' passive engagement and student's underperformance have been linked to a negative attitude aspect toward physics subject. Students continue to do this

inadequately due to the lack of motivation, eagerness, and patience required for learning and performing associated tasks related to the subject being learnt (Langat, 2015). Many students at the lower levels fail classroom tests or exams, this failure is attributed to negative attitudes, a weak level of engagement, lack of student interest and motivation toward the subject of physics. Students' attitude has an impact on their performance as well as their engagement (Rabin, 2021). Due to the very small number of students enrolled in advanced-level sciences and mathematics as major combinations in Rwanda, the researcher was eager to assess if there is a significant relationship between students' attitudes with their engagement and performances toward physics subjects. Therefore, a summary of the students' number enrolled from primary to lower secondary and upper secondary schools from 2018, 2019, to 2020 was retrieved in Rwanda's education sector strategic plan and presented as follows:

Table 1: This Table shows the number of students enrolled in sciences subjects from lower to upper-level secondary schools in Rwanda in 2018, 2019, and 2020

Items/years	**2018**		**2019**		**2020**	
Frequency and percentage	**N**	**%**	**N**	**%**	**N**	**%**
Total number of students enrolled in lower secondary	422093	47.7	481138	53.0	521631	57.1
The total number of students enrolled in upper secondary	236192	55.9	250966	52.2	171994	32.9
The number of students enrolled in upper secondary schools in grade 4	60842	25.8	26368	10.5	65486	38.1
Total number of STEM students in upper secondary	14056	58.7	146317	58.3	143950	55.1
The total number of students enrolled in science combination	84671	3.58	90567	3.60	92405	5.37

Secondary source data

Table 1 shows a summary of student numbers enrolled in lower and upper secondary school level science subjects, and STEM since 2018, 2019, and 2020, where **N** represents the number of students and **%** represents the frequency of the number of students enrolled from lower secondary school to upper secondary schools (MINEDUC (2018), MINEDUC (2019), MINEDUC (2020)). This factor is linked with poor performance in science subjects at the end of Senior three national examinations, particularly in Physics. Therefore, the researcher was eager to conduct this study, by assessing the student's attitudes linked with their engagement as well as their performance toward the subject at lower secondary schools.

The following Research objectives were designed to guide a researcher through the whole study to be conducted:

1. To identify the attitude of the students about physics in public and semi-public lower secondary schools.
2. To assess the impact of students' attitudes on their engagement and performance in Physics.
3. To seek recommendations on how to enhance students' engagement and performance by controlling attitude formation.

2. Literature Review

Attitude formation toward learning

Cooperative learning was implemented by Akingbola (2009) to improve students' attitudes toward physics subject learning. In contrast to those who were taught using competitive and individualistic strategies, she discovered that students who were taught using cooperative strategies had a more positive attitude toward physics. Active learning was chosen by Marusic (2012) to improve the students' attitudes toward physics. Both experiment groups showed a shift in their attitude in the right direction. Different studies showed that the students' attitudes formed due to the teaching strategies used in physics class.

People with positive attitudes make things happen, make them happier than those with negative attitudes and become successful classroom members, and can make it easier to handle life troubles and make work easier (Boyuk, 2011). Everyone has weaknesses and faults, it is a fundamental aspect of human nature, so accepting that you

won't be successful in everything you try is the first step in acquiring a positive attitude. Realize that making mistakes creates wonderful opportunities to keep changing for the better. A person with a good attitude views the world as a whole rather than as a collection of different pieces, and they handle life's difficulties in a structured way, due to the ongoing activities they are practising. That person has certain feelings, thoughts, and behaviours. There are different ways in which students acquire and develop their attitudes. Some of them are mentioned as follows:

Students' interest

Interest can be defined as a sense of curiosity or worry about something that draws attention to it (Dictionary, 2004). Our world is becoming more and more dependent on physics, and it is being progressed by developments in scientific research. As technology develops, we are starting to understand the origins and destiny of the universe and learning innovative new things about the interactions of quantum particles. Unfortunately, fewer and fewer students are choosing to major in physics, which is causing a decline in public understanding of scientific insights (Awodun, 2014).

According to research, students who are interested in physics will learn the subject more effectively and will also choose to take physics in upper secondary school (Jari Lavonen, 2012). Due to students' misconceptions that physics is a challenging subject, it was found that students showed low interest in the subject, which had an impact on their academic enrollment, engagement, and performance (Bamidele, 2004). Numerous variables have been found by researchers to potentially affect students' interest in physics. For instance, they found a significant decrease in interest in physics as students' achievement through secondary school in a study on the both structural and dynamic aspects of interest development (Krapp, 2002). Similar to Bennet, research into students' attitudes and interests in physics references primarily from the 1960s and 1970s. However, fundamental questions, such as how to improve students' attitudes toward physics and encourage their interest in the field, remain unresolved (Bennett, 2003).

Esiobu (2005), asserts that the understanding of students about physics is constructed in the first years of secondary school and loses quality over time. The fact that so few individual people ever actually admit to teaching and learning physics is one factor contributing to the general lack of familiarity with physics. In addition, a positive reaction toward science "leads to a favourable commitment to science that influences lifelong interest and learning in science." This is one reason why major reform initiatives in the field of science education have placed a strong emphasis on transforming students' attitudes (Science, 1990).

Students' peer pressure

Peer pressure is "*the influence by other people to act in a certain way"* (Beniwall, 2017). Peer pressure is a very major problem that many teenagers face in today's world. It is a typical developmental period. Social pressure is essentially what peer pressure is. It could come from workmates, friends, or family members. Peer pressure is when friends or classmates try to convince others to do something that is out of character for them. Peer pressure is the direct influence of peers on individuals, who are influenced to change their behaviour, values, and behaviour to follow their peers. Peer pressure is especially important when a person is a "teenager". Both positive and negative peer pressure are possible.

The issue of parents' ability (or inability) to influence their children's choices and decisions directly collides with the influence of their children's peers when it comes to peer pressure, a common nightmare for many parents (Joao Guassi Moreira, 2018). The majority of the time, peer pressure is linked to challenging or problematic behaviour, but it's important to remember that peer pressure is intrinsically tied to adolescents' development of their unique sense of self and identity. Early in life, this process begins, and it never really ends. Even if a person is uninformed of it, spending time with peers can influence his/her life. Both from them and their peers, people learn. People normally listen to and collect knowledge from those who are comparable to them in age. Peer pressure pushes people to act similarly to those in the same age group and social group to gain their respect or similarities (Poonam Dhull, 2019).

According to Thomas Kindermann (2018), both academics and professionals have mainly concentrated on the negative effects of peer influence or bad behaviour. However, there are two different views on the component of peer relationships: a) Negative influences may result in behaviour that neither parents nor the general public find acceptable, such as anti-social behaviour, poor work habits, and neglect of classwork. b) Positive influence: Supports young people as they move from a dependent childhood and parental protection to more independence of thought and action Experience

Observation

Students learn attitude by observing other students around them. For example, young children develop attitudes by observing how their parents behave and begin to copy them, usually beginning to show similar outlooks.

Possible involvement

Lower secondary students' attitude formation toward physics subject is not easy, as it was highlighted by many researchers that physics is a difficult subject. Therefore, all stakeholders in education, parents, teachers, and school administration should ensure that the learning environment is created for the improvement of academic engagement and performance in physics. The following interventions are necessary for positive attitudes and developments toward physics subject.

Students learning

The process of learning science should be given preference over actually simply acquiring knowledge. Physics classes should be able to present a common phenomenon that can teach and inspire students to think more critically and creatively as they learn about science. Science process skills are skills acquired through science-based activities (N Diana, 2019). Process skills and a scientific attitude are used in scientific work, which includes science process skills. This is a useful technique for learning physics because it simultaneously enhances the cognitive, psychomotor, and affective aspects of learning.

As a consequence, students react positively toward physics subject and their science teachers. If this reaction is linked to a positive attitude toward physics, it emphasizes that students who have a positive attitude toward physics subject will be willing to engage in physics class. This, in turn, leads to them thinking positively and increasing their level of performance (Lacambra, 2016). Numerous studies by Chieu (2005), and Reeve (2014), found that engagement is a good predictor of frequent school attendance, school completion, resistance, and life satisfaction. The changes in student attention in physics class activities will be led by the student's misconceptions. If prior knowledge is changed to later knowledge, the student's poor performance in physics improves into a good performance. Therefore, students should be heavily involved in the conversation.

Thus, the interaction between students' knowledge, abilities, motivation, and inclinations (desire) is essential for self-regulated learning. They have an energetic exchange of ideas. Because some learning strategies require a significant amount of time and effort to implement, students' motivation to learn, for instance, has a great influence on their choice of learning strategies (Javier Dı´ez-Palomar, 2022)**.** There are particularly strong correlations between approaches to learning and performance, according to studies examining how students regulate their learning and use effective strategies. Students' attitudes and behaviours associated with self-regulated learning, such as their motivation and propensity (tendency) to use particular strategies, are also associated with performance, though generally less strongly. These relationships are less direct but easier to measure.

Students' prior knowledge and experience in physics education

Prior knowledge is defined by Nkwo (2008) as a dynamic, multidimensional, hierarchical object made up of multiple sorts of knowledge and abilities. Students will acquire knowledge or encounters if they link new learning items to prior knowledge already stored in their memory. Students will need math and scientific prior knowledge. Students at the primary level, science and mathematics performance subject, can be used to predict final grades (Mc Dowell, 1997). Researchers discovered that individuals who excelled in elementary school science, with a strong emphasis on science, are more likely to pursue science in lower secondary school. As a result, students' prior knowledge has a favourable impact on both their mental capability to apply cognitive skills in higher-order thinking skills and their ability to acquire new knowledge (Dressel, 1998).

The student's attitude toward the learning experience is on
e of the characteristics of the students
that have an important impact on learning (Altinok, 2004). The students' positive attitudes toward physics were positively associated with their academic performance. The student's understanding and knowledge of common viewpoints, as well as providing additional recommendations for improving performance through attitude modification. Because an attitude is implicit, low performance and low engagement in physics class may indicate that the attitude change has not been achieved not only that but different factors are given priority. The attitude should continue to be a source of concern for all stakeholders in education. This study will serve as a benchmark for additional investigation into some of the students' attitudes toward learning and the factors that impact it. It also requires the creation of educational efforts to enhance student attitude and engagement, as well as the teacher support system.

Students' ability and competence in physics education

According to the social cognitive theory, learning occurs when the observer and the models are closely identified, and the observer has a high level of self-efficacy (Zhou, 2017). According to Bandura (1973), self-efficacy is "*the belief in one's capabilities to organise and execute the course of action required to manage the situation (p.2)"*.

Self-efficacy, according to Bandura and other researchers, determines how people approach goals, initiatives, and challenges. People with strong self-efficacy feel they can overcome challenging difficulties and recover quickly from setbacks and disappointments. Individuals with low self-efficacy are insecure and don't believe they can perform better (Zhou, 2017) . As a result, self-efficacy plays a critical influence on behaviour and performance. Observers with a high sense of self-efficacy are more inclined to engage in observational learning. Mastery experience, social modelling, enhancing physical and emotional states, and verbal persuasion are all ways to establish or strengthen self-efficacy.

The performance also depends on one's self-efficacy, or confidence in one's capacity to complete a task. According to Bandura, "Self-regulatory skills will not contribute much if students cannot get themselves to apply them consistently in the face of difficulties, stressful situations, and competing attractions" (Susan Janssen, 2014). Self-efficacy for self-regulation, or the confidence that self-regulation is possible and successful, is extremely important (Klassen, 2007). They discover that self-efficacy for self-regulation is positively linked to higher academic results and negatively correlated with procrastination (academic stress).

Students' efforts and behaviours

If self-confidence simply reflected performance, there would be much less observed variation in student levels of self-related attitude across nations, schools, and classes. This means that in any group of other students, even those who perform physics at very low levels, the stronger performers are likely to have relatively high self-confidence, indicating that they base this on the social rules they observe around them. This demonstrates how important one's immediate surroundings are in promoting the self-confidence students require to become successful learners.

Maslow (1970), defined a person's motivations as the force that pushes people to work toward a goal and is essentially the hierarchy of human needs from both an intrapersonal and an environmental point of view. The drive to achieve one's goals is among the most crucial factors. This motivation is for achievement. Academic achievement is a significant aspect of human action that tries to explain the factors that influence the magnitude, direction, and persistence of behaviour (Dagnew, 2017). According to Hoskins and van Hoof, students with an "achieving orientation" are competitive, organized, strategic, able to work well, aware of the implications of academic demands, and highly motivated to achieve (Hoskins, 2005). These students had a higher willingness (tendency) to interact with other students and access course materials using the website. According to the authors' review, "*a strategic student may be disposed to use any tool that might facilitate their achievement*".

It is reasonable to suppose that motivation affects self-regulatory behaviours and learning strategies, which in turn impact performance. The strategies themselves have been the subject of another line of research. What methodologies do self-regulated students utilise? Which actions are effective? How exactly do they impact the performance? Personality students put in additional effort by finishing homework, using their time effectively, and asking for assistance when they encounter difficulties (Susan Janssen, 2014).

Students' previous performance

Lower secondary schools all over the world have been concerned in recent years about students' poor academic performance in physics. Various authors attribute this poor performance to a variety of factors, including a poor learning environment, poor teaching methods used, inexperienced teachers, learning approaches, students' cognitive styles, career aspirations, parental and peer pressure, the student's poor ability, socioeconomic factors, and far more (Croix, 2016). However, the majority of them confirm that a significant factor in this ineffective performance is students' attitudes toward physics.

The students who have a negative attitude toward science education; also, don't like physics teachers or their courses. Teachers in schools have frequently commented that students' lower achievement in physics is due to their negative attitude and lack of interest in the subject (Veloo, 2015). As a result, the higher number of students enrolled in upper secondary social sciences, and languages combination leading to more advanced certificates in physical sciences are typically indicators of students with a negative attitude toward physics and little interest in science. As a result, fewer students are pursuing and sticking with careers in physics during their upper secondary and also at undergraduate studies.

A negative attitude toward physics has been discovered to be a contributing factor in physics underperformance, students continue to do it inadequately due to the lack of motivation, eagerness, and patience required for learning and performing associated tasks related to the subject as a result of the negative attitude about physics. Findings on the student's performance in physics have mainly pointed to the fact that the student's negative attitude is a strong indicator, even though it has gained little if any, attention (Langat, 2015). In addition, some of the causes of poor physics underperformance include a lack of teaching and

learning resources, a lack of student enthusiasm, and a shortage of skilled high school physics teachers. As a result, students become disappointed (Vilia, 2017).

The link between attitude, engagement and performance

An attitude is a psychological condition that determines how a stimulus, in the form of action or behaviour, is responded to. There are two types of attitudes: acceptance (positive attitude) and rejection (negative attitude) of an object (Saputra, 2020). Several researchers defined an attitude as a person's attitude probability judgment that can lead to them doing something or taking specific action. The strength of an individual's intention can be measured by the person's probability of doing or engaging in a certain action, and the substance that is contained in an individual's intention can be observed as their behaviour (Motanya, 2018).

Engagement in this sense includes external activities that the school starts to enhance student learning, not just those that take place in the classroom. Academic engagement places a strong emphasis on participation and identification. Academic participation includes both inside- as well as outside activities like group projects, homework, attending all planned scheduled classes, etc.

Studies found that students with a positive attitude toward physics and science performed much better academically. They discovered that if they want their students to achieve well, it is extremely important to incorporate in them a positive attitude toward physics as well as sciences (Arsaythamby Veloo, 2015). A study by Magno (2003), supported the above idea, she demonstrated that students who had a positive attitude toward physics achieved good grades in physics. Students who had a positive attitude considered physics important and useful, while those who had a negative attitude considered physics unnecessary.

Students' hope creation

Students with positive attitudes believe in themselves that they can perform better while they are solving physics problems. When other students complain about physics concepts and their teachers, the students with positive attitudes only discuss how problems can be sorted out, and they are motivated to help others and focus on their studies and seek help if it is required.

Students' positive reaction creation

Students with positive attitudes influence other students positively. When there is a physics problem presented to them, they are eager to help each other by solving the issues as they are interested in the subject. This will enable them to improve their academic performance as well as their classroom involvement (engagement). Those with negative attitudes spend their time discussing and discouraging others to read the other subject, this will lower their performance as well as classroom activities.

Students' happiness creation

All the above positive attitudes help students improve their abilities when they are studying physics as a science subject and when their negative attitudes about physics courses convert to positive ones. Changes in student involvement in physics class activities will be led by the students, this helps students to improve cooperation, which leads to better learning results and increased confidence. As a result, as their attitude (behaviours) and cognitive features toward physics subjects alter, their degree of engagement (involvement) in in-class activities increases, they will be more successful in physics subjects, and their engagement and performance will improve.

3. Methodology

Research design

A qualitative design was used to study people's feelings, thoughts, and attitudes about specific aspects, which was relevant for this study because attitude cannot be directly measured or observed but can be inferred from certain cues that depict the implicit nature of students' characteristics. The purpose of this study was to look at some of the students' views and perspectives regarding physics. A researcher also collected qualitative data by administering a closed or fixed response interview in a form of a questionnaire, the secondary data from other authors who are experts in this field were used in the literature review of this study. Data were collected from students, physics teachers, and DOSs from 4 public and semi-public lower secondary schools located in the Rwamagana district. The data collected was evaluated and interpreted qualitatively.

Target population

This study was carried out in 4 secondary schools, where these schools were selected by using the purposive random sampling method. Lower secondary students from senior three in the schools selected were involved in this research, as well as all of their physics teachers, and DOSs. A researcher employed closed or fixed-response interviews and observation approach as the tools for data collection. The researcher and teachers requested the students to feel free while they are feeling the questionnaires as a tool.

Data collection methods

This research used interviews and observation as a means of collecting data:
The interview is widely used as a data collection approach that involves the researcher and the respondent discussing verbally. In this study, the researcher employed one of the highly structured interview methods named a closed or fixed-response interview (McNamara, 2022). A closed or fixed-response interview is one in which all participants are offered identical questions and must select responses from the same range of options (Kumar (2006), Kerlinger (1979;)). This format is beneficial for people who aren't used to interviewing. Structured interviews allow the interviewer to ask the same questions to each respondent in the same way (Patton, 2002). A well-structured set of questions were presented, much like a questionnaire, and the goal was frequently to use a qualitative data analysis tool. Interviews and observation were used to assess the degree of public and semi-public schools where students recognize physics concepts, and how they were engaged and performing. The observation was used by the researcher to check if the responses given by the students were accurate.

Sample and sampling techniques

Purposive sampling technique was employed to interview all senior three students, physics teachers, and DOSs from four different schools located in the Rwamagana district, in the Eastern province of Rwanda. In each school, participants were asked to respond to the questions. The sample size of the schools to be considered was chosen by using the purposive sampling method. The real cause of the problem was the students' negative attitude toward the physics subject, not lack of funding.

Validity and reliability

The instrument was validated through piloting and peer reading by the postgraduate students and a college supervisor. During data collection, all participants were provided explicit instructions to ensure that all procedures were understood by all respondents. This was to lower the number of errors, and outliers in the data obtained increased the data's reliability. The proofreading and re-editing of the data collected were utilized to determine the reliability of the instrument used for data collection and analysis. The instrument was given to the items once, a closed or fixed responses interview and classroom observation were used and the reliabilities were collected in the findings. A check was carried out by changing the questions to eliminate ambiguity and incorrect question phrasing, as well as exposing the instrument to an expert or supervisor. All respondents were able to understand the same meaning of the questions.

Data analysis methods

For ease of analysis and conclusion, similar data in qualitative methodologies were grouped into similar themes and then given a code. Computer software SPSS was used in the data analysis by inserting codes. A hierarchy analysis of attitude was carried out by computing the percentage strength of each variable to identify the important element. On open-ended, questions descriptive narration was used. Based on the findings and the analyses performed, a summary, conclusions, and a set of suggestions were made. In addition, Data was empirically and objectively analysed and discussed with the use of Figures and graphs as appropriate. The qualitative data was analysed as thematic data, from the outcome.

4. Results and Discussion

Table 2: Demographic data of the respondents: students, physics teachers, and DOSs

Students				Teachers and DOSs			
Variables		**No**	**%**	**Variables**		**No**	**%**
Gender	Boys	99	42.3	Gender	Male	10	90.9
	Girls	135	57.7		Female	1	9.1
Age range	Below 20	221	94.4	Age range	[20-25]	1	9.1
	[20-25]	13	5.6		[26-30]	5	45.5
	Total	234	100.0		[31-35]	3	27.3
					Above 36	2	18.2

Student- Physics teacher-DOS

The majority gender of the students was 99 boys and 135 girls, percentage of the students was 42.7% and 57.7% respectively. The gender of the teachers compiled by the DOS 10 was male and 1 was female with a frequency of 90.9% and 9.1% respectively, in total were 11. The age range of students who participated in this study was classified into two groups: below 20 94.4%, and between [20-25] 5.6%, and the age range of teachers and DOS was [20-25], [26-30], [31-35], and above 36 years, the corresponding frequency was 9.1%, 45.5%, 27.3%, and 18.2% respectively.

Question 1: What are the positive attitudes of lower students toward the physics subjects?

Table 3: Perceptions of students' learning abilities and competencies toward physics education

Learning ability and competencies		Students' responses				
		SA	**A**	**D**	**SD**	**NS**
Learning physics subjects involves a lot of memorisations of facts, theories, and formulas	**No**	121	57	35	10	11
	%	51.7	24.4	15.0	4.3	4.7
Physics concepts are discrete and not related to activities in my environment.	**No**	45	44	63	62	20
	%	19.2	18.8	26.9	26.5	8.5
I have no ability or talent to succeed in physics subjects.	**No**	45	58	49	63	19
	%	19.2	24.8	20.9	26.9	8.1
Not everyone can be good in all the subjects	**No**	102	46	30	33	23
	%	43.6	19.7	12.8	14.1	9.8
I know I can get a good grade in physics if I work hard.	**No**	170	38	12	6	8
	%	72.6	16.2	5.1	2.6	3.4

SA- Strong Agree, A-Agree, D-Disagree, and NS-Not Sure.

The findings in Table 3 indicate that 88.8% of students strongly agree that if they worked hard, they can get good grades in physics subject. It indicates that 76.1% of students strongly agree that learning physics subjects

involve a lot of memorisations of facts, theories, and formulas that are difficult to remember, explain, and grasp. In addition, it shows that 63.3% of students strongly agree that not everyone can be good in all subjects. Moreover, it indicates that 53.4% of students disagree by showing that physics concepts are discrete and not related to the activity being done in their environment and also, it indicates that 47.8% of students disagree that they have no ability or talent to succeed in physics subjects.

Depending on their skills and knowledge, students develop different mindsets. High-confidence physics students believe that their hard work and effort are the only way to success. Hard work and effort are the true sources of their success than their capabilities or abilities. The students appear to be in charge of their learning because they see physics as a subject that can be learned, done, and isn't too difficult to understand. As a result, they feel that they can perform in the subject because they can work hard. Students who struggle with fact recalling may believe they would perform better in subjects other than physics because such subjects don't need formula memorization, which is what physics involves. According to (Abebe Adugna Chala, 2022), a Negative attitude towards a certain subject makes learning difficult, while a positive attitude stimulates students to do an effort and leads to high achievement in that subject Relative to Physics, Godwin and Okoronka (2015), showed that a significant relationship exists between students‟ attitude and their corresponding academic performance in physics. Determining students‟ attitude towards a subject is. Therefore, a useful task if one wishes to improve the performance of students in that subject. The estimation of students‟ attitudes towards natural sciences has been carried out by many researchers.

Students struggle to make connections between ideas because they believe that the only way to grasp the material is to memorize all of the necessary formulas, which they perceive as being beyond their level of ability. They don't realize that thoughts and knowledge can be internalized through regular practice rather than being forced upon them immediately. This is also consistent with a study showing that students' perceptions of their competence and expectations for academic achievement are strongly related to their levels of engagement and the emotional states that either support or hinder their capacity for academic success (Schenkel, 2009).

Table 4: Students' perception on previous performance and ranking in physics education

Statements of the previous performance		Students' responses				
		SA	**A**	**D**	**SD**	**NS**
Physics is always ranked among the least performed subjects in our school.	**No**	62	52	45	39	36
	%	26.5	22.2	19.2	16.7	15.4
Previous failures in the subject exams imply that it is very difficult to pass physics.	**No**	44	53	72	45	20
	%	18.8	22.6	30.6	30.8	8.5
Normally, the majority of students fail the subject of physics.	**No**	41	61	56	42	34
	%	17.5	26.1	23.9	17.9	14.5

SA- Strong Agree, A-Agree, D-Disagree, and NS-Not Sure

The findings in Table 4 show that in the previous performance toward a physics subject, 48.7% of students strongly agree that physics is always ranked among the least performed subjects in their school, it also indicates that 43.6 % of students agree that the majority of the students fail in the physics subjects, and 61.4% of students strongly disagree that previous failures in physics subjects or exams or tests imply that it is very difficult to perform well in physics.

The results demonstrate that students' attitudes change in response to how well they engage and perform physics at the lower secondary school. According to the students, continually poor performance in physics becomes established in the school's tradition and an inevitable fact of life. Since their perception of their performance level is predefined, the students will not put in any personal effort to improve, and failing physics exams will therefore become the usual. Due to their own educational experiences in school, where the subject consistently receives the lowest grades, students have grown to connect the subject with failure. They have accepted that performing poorly in physics subjects at the school level is normal because they believe that it is the norm, and as a result, they won't make an effort to improve and will instead turn their attention to other subjects where they believe they would perform better. The research reported that the students have negative attitudes toward problems solving (Agnes, 2021).

The results further show that even though most students realize that they can succeed in the subject if they put in a personal effort to do better, the majority of them will reject professions in physics. They acknowledge that everyone has the potential to face physics depending on the situation and that their poor performance is not about capabilities or natural abilities, it is linked to the school's previous poor performance. The study done by Norezan Ibrahim (2019), shows that students with favourable learning attitudes toward physics subject score low grades and those who have negative attitudes toward the subjects score high grades.

Question 2: What were the impacts of positive attitude on students' engagement and performance toward physics subjects?

Table 6: Previous performance and ranking in physics education

Statements of the previous performance		Students' responses				
		SA	**A**	**D**	**SD**	**NS**
Physics is always ranked among the least performed subjects in our school.	**No**	62	52	45	39	36
	%	26.5	22.2	19.2	16.7	15.4
Previous failures in the subject exams imply that it is very difficult to pass physics.	**No**	44	53	72	45	20
	%	18.8	22.6	30.6	30.8	8.5
Normally, the majority of students fail the subject of physics.	**No**	41	61	56	42	34
	%	17.5	26.1	23.9	17.9	14.5

SA- Strong Agree, A-Agree, D-Disagree, and NS-Not Sure

The findings in Table 6 show that in the previous performance toward a physics subject, 48.7% of students strongly agree that physics is always ranked among the least performed subjects in their school, it also indicates that 43.6 % of students agree that the majority of the students fail in the physics subjects, and 61.4% of students strongly disagree that previous failures in physics subjects or exams or tests imply that it is very difficult to perform well in physics.

The results demonstrate that students' attitude change in response to how well they engage and perform physics at the lower secondary school. According to the students, continually poor performance in physics becomes established in the school's tradition and an inevitable fact of life. Since their perception of their performance level is predefined, the students will not put in any personal effort to improve, and failing physics exams will therefore become the usual. Due to their own educational experiences in school, where the subject consistently receives the lowest grades, students have grown to connect the subject with failure. They have accepted that performing poorly in physics subjects at the school level is normal because they believe that it is the norm, and as a result, they won't make an effort to improve and will instead turn their attention to other subjects where they believe they would perform better. The students won't make any efforts to address this condition since they think it can't be changed and is deep-rooted (established) in school culture. The study conducted by Dagnew (2017), indicated that students have positive and significant attitudes towards school, values education and achievement motivation. There was a positive and significant relationship between students' attitudes towards school, values of education, achievement motivation and academic achievement. Other research finds that motivation and ability explain variation in both homework and exam scores. Attitudes and behaviours, such as procrastination and working with others directly, affect homework scores, but not exam scores. These effects are not the same within all motivation and ability groups. Given that homework is the strongest predictor of exam scores, we conclude that graded homework is beneficial to learn, and attitudes and behaviours related to homework may have an indirect benefit for exam performance (Susan Janssen, 2014).

Table 7: shows students' efforts and behaviours toward physics education.

Students' efforts and behaviours statements		A	S	N
I ensure that I complete all class activities such as homework, exercises, and group work.	**No**	93	124	17
	%	39.7	53.0	7.3
I read for other subjects if the teacher fails to come for the lesson or is delayed.	**No**	104	80	50
	%	44.4	34.2	21.4
I pay attention when a physics teacher is teaching	**No**	141	75	18
	%	60.3	32.1	7.7
I feel like missing the lesson it is a physics lesson	**No**	40	73	121
	%	17.1	31.2	51.7
I work hard to get good grades in physics subject.	**No**	127	80	27
	%	54.3	34.3	11.5
I find additional time for working on extra activities toward physics education.	**No**	44	80	44
	%	18.8	34.2	18.8

A-Always, S-Sometimes, and N-Not Sure

The findings in Table 7 show that 60.3% of students always pay attention when a physics teacher is teaching and guiding them in classroom activities toward physics subjects, which also indicates that 54.3% of students are always working hard for getting good grades in physics subjects. Also, it indicates. In addition, it indicates that 53.0% of students ensure that they complete classroom activities such as physics homework, exercises, and group work sometimes. It indicates that 51.7% of students feel like they are missing the lesson when it is a physics lesson. it indicates that 47.0% of students are not sure about the statement: I find additional time for working on extra activities toward physics education. On other hand, always 44.4% of the students read the other subjects if their physics teacher fails to come for the lesson or they delay physics class.

Students are motivated in their studies, do additional work, pay attention in class, never miss a lesson, and are always prepared for class even when the teachers are absent or unavailable. A student who likes and enjoys physics is motivated to work hard toward the subject; as a result of getting good grades or good performances in physics subject, they will actively participate in tasks or activities that lead to success. The students who are interested and motivated in the subject find additional time for doing extra activities such as homework, extra exercises, and asking questions from other students from other schools this led to the creation of positive attitudes toward the subject and increases the subject's involvement. As student improvement led to the improvement of performance in the subjects. The research finds that students with negative s attitude interests and attitudes toward physics experiments have low interest in the subjects, expectations, and success in physics experimentations (Hasan Kaya, 2021).

A low percentage of respondents agreed with the aforementioned points. However, it is generally apparent. It is evident that even if homework is neither difficult nor a waste of time, most students are unable to finish it or find other additional time that is necessary for practicing, even though they are aware that physics needs such a commitment to succeed. The fact that students read for other subjects while the teacher is running late shows that they have preferences for other subjects or extracurricular activities, which demonstrates a lack of enthusiasm and dedication in physics and leads to the subject's underachievement. According to (Norezan Ibrahim, 2019), shows the learning attitudes test showed the majority of the students have favourable attitudes toward learning physics. However, the majority of students hold poor scores on physics tests, probably due to low science grades obtained by students in "Penilaian Pentaksiran Tingkatan 3" (PT3).

Question 3: In which way could the positive attitude of the students be influenced for controlling improved better engagement and performance?

Table 8: Perception of physics teachers and DOS on controlling positive attitudes formation for enhancing/ motivating students' engagement and performance

Items	Never		sometimes		Often		Very often		Always	
	No	%	No	%	No	%	No	%	No	%
Using positive comment	0	0.0	1	9.1	0	0.0	2	18.2	8	72.7
Using teaching aid	0	0.0	0	0.0	0	0.0	8	72.7	3	27.3
Giving frequent feedback	0	0.0	0	0.0	1	9.1	2	18.2	8	72.7
Providing individual intention	0	0.0	0	0.0	1	9.1	6	54.5	4	36.4
Giving incentives	0	0.0	5	45.5	3	27.3	2	18.2	1	9.1
Knowing students by names	0	0.0	0	0.0	2	18.2	4	36.4	5	45.5

Never- Sometimes- Often- Very often- Always

The findings in Table 8 indicates that 72.7% of physics teachers and DOSs said that they use positive comments, use teaching aid, and give frequent feedback always in teaching and learning physics, especially in physics subjects. It shows also that 54.5% of physics teachers and DOSs said that they provide individual intentions to their students very often. 45.5% of physics teachers and DOSs said that sometimes they give incentives and always they know the names of their students.

The majority of the teachers highlighted that they use positive comments, use teaching aids, and give frequent feedback always in physics subject teaching and learning, which contributes to the student's attitude improvement. Nowadays lower secondary students are not motivated to learn science subjects. Therefore, teachers encourage their students to the recreation of subject involvement, and when their involvement increases will lead to better performance. In addition, teachers are important to describe how they can learn sciences, solve physics problems related, and how they are working on the subjects' activities such as homework, exercises, and tests by showing the purpose of education and how it will be used in their future. Therefore, the provision of the student's motivation, positive comments, and frequent feedback develop positive attitudes in the student and it will improve their engagement and performance toward the subject learned. The research indicates that students show a high general interest in science and technology and a preference for student-centred teaching methods rather than teacher-centred ones; however, few of them perceive the utility of school science and technology for everyday life, want to spend more time doing science and technology in school or intend to pursue science and technology related studies or careers (Abdelkrim Hasni, 2015).

Table 9: Teachers' and DOSs' views on teaching methods that motivate and enhance students' engagement as well as their performance

Teaching methods	Never		Sometimes		Often		Very often		Always	
	No	%	No	%	No	%	No	%	No	%
Brainstorming	0	0.0	0	0.0	2	18.2	5	45.5	4	36.4
Group/class discussion	0	0.0	0	0.0	1	9.1	5	45.5	5	45.5
Project work	3	27.3	5	45.5	2	18.2	0	0	0	0.0
Teacher centered method	1	9.1	10	90.9	0	0.0	0	0.0	0	0.0
Field visit method	6	54.5	3	27.3	2	18.2	0	0.0	0	0.0
Roleplay	0	0.0	4	36.4	4	36.4	3	27.3	0	0.0
Practical work	0	0.0	4	36.4	2	18.2	4	36.4	1	9.6
Study work	0	0.0	2	18.2	2	18.2	4	36.4	3	27.3

Never- Sometimes- Often- Very often- Always

The findings in Table 9 indicate that 96.0% of physics teachers and DOSs said that teaching methods like group/class discussion are used always in physics teachings. It also indicates that 90.9% of physics teachers and DOS said that teaching methods like the teacher-centered approach are used sometimes. It shows that 72.5% of physics teachers and DOSs said that teaching method like practical work is used very often in physics practice and other methods like role-playing are used often depending on the topic being taught. It shows that 45.5% of physics teachers and DOSs said teaching method like brainstorming is used very often and project work is used sometimes. It shows that 36.4 % of physics teachers and DOSs argued that teaching method like study work is used very often, and role-play is used sometimes depending on the topic to be taught.

The teaching methods used in physics teaching and learning; this study shows that group/class discussion comes first which means that when it is used frequently it helps the students to be motivated toward subjects. The findings show that the students' attitudes toward physics improved depending on the teaching methods, this leads to the creation of a positive attitude of the students toward the subject, which causes student engagement as well as improved performance in the subject. The contribution of students' attitudes development depends on the teaching methods to be used: practical work, role play, and study work. The positive attitudes toward subjects when created will improve their engagement and performance. In addition, this study shows that if a teacher's centered approach is used, it creates negative attitudes toward the subjects that lower their engagement and performance. According to Mekbib (2020), students are forced to assume more passive roles and believe that they are expected to copy the note from the chalkboard and receive the knowledge dispensed by the teacher from the front stage. What the student thinks, in this case, is that knowledge emanates from the teacher and the student's responsibility is to accept that knowledge and memorize it as it is to recite it during an assessment. Researcher shows that students' attitudes implied that applied physics would be the most understandable to students and that innovative teaching methods would improve their attitudes and learning outcomes in physics (Sanja Martinko, 2017).

5.Conclusion and Recommendations

5.1Conclusion

This study found out that the students recognize the importance of physics subjects. Therefore, the attitude is related to parents, peer pressure (social factors), previous learning, conditioning, observation, experience, and due to interest in learning. These different attitudes influence learning in negative or positive ways, teachers and other educational officers need to be aware of controlling some of them, because some affect students' engagement and performance negatively. They can control these by using teaching strategies and teaching methods that are prerequisites for enhancing students' interest, motivation, eagerness, and patience toward the subject like positive comments, and frequent feedback. Students should be given challenging questions that boost their minds to improve their reasoning capacity and develop critical thinking and problem-solving abilities.

The students need frequent reminders of the importance of physics subject, for getting good performance in the subject hard work, and extra activities they also discussed the importance of physics subjects by linking to real-world applications, for motivating them by observing the reality of how physics knowledge and skills are applicable in real life situations. This requires extra work for teachers and other education officers to develop positive attitudes in the students, by highlighting good teaching methods depending on the student's abilities and capabilities. It also observed that the attitude of the student must be controlled early because it can affect students' engagement and performance negatively or positively. This study shows that some students do not relate the knowledge acquired from the subject due to the reason that they don't know how, where, and when are applicable in real-life situations.

5.2 Recommendations

The study makes the following recommendations:

1. Positive attitudes such as students' interest, student hope creation, and motivation should be adopted by physics teachers and others school educators for enhancing their engagement and performance toward physics education.
2. The teacher should use appropriate teaching methods and teaching strategies depending on the subject content and ability of the learners while they are teaching physics subjects, this is for the creation of positive attitudes toward the subject.
3. Government and other stakeholders in education should invest in the school infrastructures, such as school materials, and provision of teachers training for empowering them the capacities and raising their level of confidence.

Suggestion for the further research

This study is carried out in the Rwamagana district, a similar study can be conducted in other districts of the country.

Research funding

I would like to acknowledge the African Centre of Excellence Innovative Teaching and Learning Mathematics and Sciences (ACEITLMS) for funding this study.

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