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

Website:www.jriiejournal.com ISSN 2520-7504 (Online) Vol.8, Iss.4, 2024 (pp. 194 – 205)

Employing Active Learning in Physics Classroom: Enhancing Student's Behaviour and Cognitive Aspect in Lower Secondary Schools in the Rwamagana, Rwanda

Valens Tujyinama, Kalolo Yamikani, Alexandre Ndayisaba & Celestin Ntivuguruzwa
African Centre of Excellence Innovative Teaching and Learning Mathematics and Science (ACEITLMS),
University of Rwanda-College of Education Rukara Campus, Rwanda (UR-CE)
Email: valenstujyinama@gmail.com

***Abstract**: Active learning is any learning activity in which the students participate or engage in the process of learning as opposed to the passive learning of taking information. Generally, students tend to have negative behaviour and cognitive aspects toward physics subject because they lack interest in physics and the syllabus itself. This study was carried out to study the students' behaviours and cognitive aspects toward lower secondary school students in physics subject at Rwamagana district, Rwanda. A total of 246 participants participated in the data collection. Participants were selected from 4 schools selected purposively. The triangulation method was used to gather information. A qualitative research design was used to analyse and interpret the data from respondents. The study established that behaviours and cognitive aspects of the students are developed through the love and the value they express while they are learning physics subject. Positive behaviour and cognitive aspects are developed and improved depending on types of the teaching methods used by a teacher, in case the students are not satisfied or interested, teaching may be altered to the one which is helping and encouraging them to engage in the activity actively.*

Keywords: *Active learning, students' behaviour, Cognitive aspect, Physics subject, Performance.*

How to cite this work (APA):

Tujyimana, V., Yamikani, K., Ndayisaba, A. & Ntivuguruzwa, C. (2024). Employing active learning in physics classroom: enhancing student's behaviour and cognitive aspect in lower secondary schools in the Rwamagana, Rwanda. *Journal of Research Innovation and Implications in Education, 8*(4), 194 – 205. **https://doi.org/10.59765/pgqsr539gr.**

1. Introduction

Learning is the process that involves the change of behaviours, skills, behaviour and cognitive aspects and values. Learning is the process by which an individual acquires knowledge, attitudes and skills that are necessary to meet the demands of life. According to Schneider (2024), learning is defined as the acquisition of knowledge by reasoning Varguese (2018), defined as an acquisition of knowledge, habits, behaviour and cognitive aspects. Leaning is a change in the behaviour of an organism that is the result of regularities in the environment of that organism. De Houwer (2013), defines active learning as some structural activities that significantly increase the level of student participation in the learning process. Active learning engages students in the process of learning through activities and discussions in class, as opposed to passively listening to an expert (Aji, 2019). It involves active participation as well as employment of both the mental and physical faculties of the learners to acquire new skills and knowledge. Class participation has always been a critical factor in yielding positive learning outcomes for students and further developing their abilities. Participating allows students to build on their knowledge, demonstrate how they understand the curriculum, develop confidence, and apply the theory. The more they participate, the less memorization they do, and the more they engage in higher levels of thinking, including interpretation, analysis, and synthesis (Zewde Aregawi, 2017).

Physics subject is important because it is one of the fundamentals of the sciences. Physics also is basic for all engineering and technology (Ciubotaru, 2023). It will appeal to your sense of beauty as well as to your rational intelligence (Akpur, 2021). Passive students have low grades and negative misconceptions about physics subject. In physics subject, many students are not motivated to learn by thinking that the subject is not understandable or it is a difficult subject. As it is defined, physics is a science that deals with the structure of matter and interactions between the fundamental constituents of the observable universe (Suhendi, 2018), so human beings should know how, why, to whom, and when to teach and to learn. Therefore, Rwandan teachers must employ an active teaching approach in class to enhance students' behaviour and cognitive aspects toward the physics subject at secondary school.

Education plays a key role in the development of a country. Education is the foundation of the Rwandan economy. According to Education Sector Development Program IV (ESDP IV), It is necessary therefore to shift attention to quality concerns in general and to those inputs and processes which translate more directly into improved student learning and help change the school into a genuine learning environment. Physics is a worthwhile subject because it prepares students for the real world of work by providing career pathways in mechanical engineering, Construction engineering, information and communication technology, and other related fields. Physics provides skills that guide the construction of theories and laws that help to explain natural phenomena and enable the management of the environment. It also provides answers to problems faced in our modern society by empowering students to be creative and innovative, leading to independent approaches to solving daily life problems.

1.1 Statement of the problem

It is observed that there is a low level of participation of learners due to the shyness of the student, the poor background of the students, the poor communication skills, the shortage of time, the poor preparation on the sides of the students or teachers; the lack of the teaching methods used; the lack of instruments used, the lack of laboratory; and lack of motivation among learners towards physics subject. Therefore, the low number of students engaged in classroom activities, particularly in Rwanda, is attributable to students' learning challenges in physics subject matters: these constraints are numerous as follows:

Students' misconceptions about physics. The word misconception is defined as "*an assumption that is structurally important in the students' belief systems. It is something that can generate mistakes*". Therefore, A comprehensible conception that differs from the appropriate scientific concept is classified as a misperception (Arne Bewersdorff, 2023). Physics misconceptions, according to Gaguk Resbiantoro (2022), misconceptions provide the most accurate explanation for correlations and events, yet they are inconsistent with experimental evidence. All physics teachers are confronted with their students' misconceptions, and they consider ways to overcome these misconceptions to encourage their students' physics misconceptions, this applies to both physics and mathematics.

Students' problem-solving difficulties, when there is an evident solution to the solver, problem-solving is described as a pioneer of the cognitive process to achieve the set goals (Meyer, 1992). This difficulty is related to students' mathematical incompetence and a lack of comprehension of mathematical knowledge. According to Martins (2024), Students must have all of the necessary information and skills, as well as critical analysis and critical thinking skills, which will enable them to solve physics problems or questions. To put it another way, A person should be able to read and examine the questions attentively.

Prior knowledge is defined as a dynamic, multidimensional, hierarchical object made up of multiple sorts of knowledge and abilities (Telle Hailikari, 2008). 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' performance in primary school social science and mathematics subjects can be used to predict final marks. As a result, students' prior knowledge has a favourable impact on both their mental capability to apply cognitive skills in higher-order problem-solving skills and their ability to acquire new knowledge. Prior knowledge was supposed to be a component that impacted learning and student progress. (Mc Dowell, 1997).

In the modern world, Education has been transformed to be a means for achieving one's own needs and this can be achieved by implementing active learning (Pumpo, 2024). Through the active learning method: students get knowledge; skills; behaviour and cognitive aspects while in the previous time: learners were empty recipients; a teacher will fill the knowledge by the lecturing method without the active involvement of students in the classroom. In the constructivist theory of learning, Students should play a great role in their learning and take all responsibilities. Ideas have been constructed by the learners themselves, the most important thing in this theory is that in active learning. Learners should get emphasis; and must actively develop their knowledge, not others (Jill Leonard, 2015). Learners must be responsible for their learning outcomes; their activity and liveliness will help them to stand alone in their cognitive life (p.4), through active learning, education will be very interesting and fruitful (Afzal Sayed Munna, 2021), (Alhawiti, 2023).

The following were the research objectives that guide the researcher in conducting this study:

1. To determine factors that are enclosed in active learning.
2. To employ different effective active teaching and learning approaches in physics class.

2. Literature Review

Simply defined, learning is acquiring new or modifying existing knowledge, skills, or behaviour. In other words, learning is defined as a quest for knowledge, skills, or behaviours (Mohd Yusof Abdullah, 2012). Johnson (2017) defines active learning as an approach to instruction in which students engage the material they study through reading, writing, talking, listening, and reflecting. Students must be proactive in seeking knowledge by seeking as well as receiving information in and outside the classroom. How the students seek and receive information is usually reflected in their behaviours in the classroom. The behaviours of students in the classroom may range from passive to active participation. They may just sit quietly, take notes, listen, do something else, ask questions give opinions, or answer questions posed (Abdullah, 2012).

The cognitive characteristics of a person are associated with the brain and are frequently referred to as knowledge, abilities, concepts, and so on. Cognitive components of learning relate to the thinking and mental processes involved in the learning process as a crucial aspect of learning that might make it difficult to retrieve preceding knowledge and experiences (Anon, 2020).

Learning physics necessitates the following abilities: Multiple presentations are used to effectively describe knowledge. It allows physics students to display qualitative analysis and a variety of representations to properly understand physical processes. They must depict physical processes using a variety of representations such as drawings, diagrams, graphs, maps, and mathematical symbols/equations (Eichelaub, 2019). Based on the study conducted, students studying physics require specific assumptions, unique visualization, and the use of conceptual models. It allows physics students to demonstrate their ability to use an ineffective understanding of modelling and assumptions, as well as specific visualization, to solve physics problems, including real-world difficulties (Fortus, 2009). Physics students also require efficient knowledge organization and access. As a result, they were able to organize knowledge in a very coherent, easy-to-remember, and accessible manner (Sabella, 2007; Reif, 2008). Problem-solving abilities allow physics students to practice critical thinking and numerous integrations in a variety of situations or real-world situations. It also permits individuals to make critical judgments about decision-making in their everyday lives (Evans, 2022).

Therefore, the academic achievement of the students is focused on their motivation and organisation. The inventory includes a more behavioural aspect more motivational aspect and a cognitive aspect (Gomes, 2012). These different aspects are classified into four forms of student involvement in the classroom, namely: full integration; participation in the circumstances; marginal interaction; and silent observation (Susak, 2016). However, these patterns are not static at all times and in every place. This is because some students participate in some discussions but may be passive or become silent in others' discussions. Classroom participation can be viewed as a part of an overall student participation process (Fayombo, 2012). It divided this process into five separate categories: class preparation; contribution to discussion; group skills; communication skills; and attendance. The teacher needs to create a good atmosphere that can promote student participation (Suhendi, 2018).

Factors considered for employing active learning in classrooms

There are various reasons, both speculative and empirically supported, that enhance classroom participation such as the role of the teacher or teacher motivation, teaching approach that enhances active learning, student behaviour, preparation for class, and classroom size.

The role of the teacher: Teachers who build positive relationships with their students are more likely to influence students to learn (Yilmaz, 2011). In teaching, teachers must apply four main aspects: (1) develop caring: here students must get a refresher of learning so that they are willing to accept lessons to be learned. (2) Organize and implement instruction: in this phase, the teacher arranges the material to be studied systematically so that it can be understood best by the learners. (3) Encourages students in academic participation, (4) promotes the development of student's skills and self-regulation. Teachers should be open-minded and occasionally share their own stories of success, struggles, failures, and achievements as well as satisfaction of individuals' basic need for relationships promotes intrinsic behaviour that can lead to students' motivation to learn (Johnson, 2017b).

Students' behaviour: As individuals, we differ in personalities and not everybody is the same. Confidence is a key trait that students struggle with and has a direct effect on participation (Congmin, 2016). Having students' positive behaviours in classroom activities ignites and motivates students to be more active in class. Students are socialized into expectations about what kind of interaction is appropriate in class, how text should be used, and how they should engage in the teaching and learning process.

Preparation for class: Fear is an issue many students face as they may not have sufficient knowledge and may be dealing with insecurities in the classroom (Ghalley, 2019). Only students prepared in advance for the class could participate extensively and noted that they felt more comfortable expressing their opinions and thoughts if the content being taught was familiar.

Classroom size: Classroom size has been shown to have a direct and indirect impact on participation (Ghalley, 2019). In a large size classroom, there was not a sufficient amount of time to have the same opportunity to participate (Mello, 2013). It has been observed that for a small class, it is important to engage students in classroom activities.

3. Methodology

3.1. Research design

To meet the objective of this study, the researcher employed a qualitative design. A qualitative design is used when the researcher collects data using observation, interviews and questionnaires. Obtaining data is required along with a descriptive design focused on gathering qualitative data using questionnaires, with direct observations. A description type of research was used in this research, a researcher had prior knowledge and exposure to problems and information needed to explain situations regarding passive learning in class (Alzahrani, 2018).

3.2. Research participants

It was conducted in 4 lower secondary Schools, located in the Rwamagana district, in the Eastern Province, Rwanda. The schools were purposively sampled, and in turn total of 246 participants took part in this research study, 235 students, 7 physics teachers, and 4 School subject leaders. The participants were students who were taking physics subjects from purposedly sampled lower secondary schools. The participant's population comprised individuals of various ages, gender, background, and race.

3.3. Sampling approach

The purposive sampling method was employed in selecting the Schools in the Rwamagana district. 4 lower secondary Schools were selected and 246 participants were realized from selected sampled Schools.

3.4. Tools for data collection

The triangulation method was employed in data collection.

A closed-ended questionnaire was used for data collection, it was used in line to help a researcher to gather information from the students. Questionnaires for this study were pre-tested before distribution to the respondents. Two groups were randomly formulated from the sample size, comprising teachers and students respectively. Then, questionnaires administered to the two groups The aim of having two groups was to set the basis of comparison for easy analysis as the questionnaire had the same questions but in different ways from the status of the groups. Observations were also used in data collection. This method was mainly utilised in a real-time class lesson observation on lesson delivery, the nature of assessment and how marking was done. To get a deeper understanding and draw a clear picture of the topic, oral and written interviews were conducted with physics teachers and subject school leaders. Each respondent had the same questions and equal time, from the start to the end of interviews.

3.5 Data Analysis

Data were analysed and discussed empirically and objectively, with the aid of figures, and graphs where necessary. Data from the questionnaire, observation, and interview were analysed thematically. The conclusions were drawn from the information presented.

3.6. Validity and reliability

This research utilized a construct validity test. The developed research instruments were piloted before being used in actual research. The pilot study was done on Schools not sampled for the actual research study. To measure reliability, a test-retest method was used where the instrument was given twice to the other group for piloting purposes to compute the convergence. The reliability was determined from the results obtained from the piloting of the research instruments.

4. Results and Discussion

4.1. Demographic data of the participants

Table 1 Demographic data of the participants

Learners				Physics teachers and school subject leaders			
Variables	G-A	No	%	Variables	G-A	No	%
Gender	Male	59	25.1	Gender	Male	9	81.8
	Female	175	74.5		Female	2	18.2
Age range	Below 15	35	14.8	Age range	Below 25	3	27.3
	Between [15-20]	169	71.9		Between [25-30]	3	27.3
	Above 21	31	13.2		Between [31-35]	3	27.3
	Total	235	100		Between [36-40]	1	9.1
					And above 41	1	9.1

Keywords: **No-**Number of participants, **%-** Percentages, **G-R-** Gender and Age range

The finding in Table 1 shows the demographic data of the participants in the study. The participants were learners, physics teachers, and school subject leaders. The total number of participants in the study were 246. Variables were gender and age range; it shows the total number of participants and the percentages.

Table 2 Academic degrees of physics teachers and school subject leaders

Academic qualifications of the physics teachers and school subject leaders		
Variables	No	%
Bachelor's degree (Ao) degree in education	6	54.5
Bachelor's degree (Ao) in sciences and mathematics	3	27.3
Others	2	18.2
Total	11	100.0

Keywords: **No**-Number of participants and **%**- percentages

The findings in Table 2 show demographic data related to the academic qualification of physics teachers and school subject leaders. It indicated that 54.5% of physics teachers and school subject leaders completed university and all have bachelor's degrees (Ao) in education and 27.3% indicated that they have bachelor's degree degrees (Ao) in a related field but, they did not attend education studies. In addition, 18.2% indicate that they have other qualifications like a diploma (A1) in education, sciences and mathematics, and others completed university studies in fields not related to sciences and mathematics.

Table 3 Physics teachers and School subject leader teaching experience

Physics teachers and school subject leaders' teaching experience		
Variables	**No**	**%**
1-3 years	6	54.5
4-7 years	3	27.3
8 and above	2	18.2
Total	11	100.0

Keywords: **No-**Number of participants and **%-** Percentages

The finding in Table 3 shows that 54.5% of physics teachers and school subject leaders have experience teaching physics subject and other sciences in three years and below. It indicates that 27.3% of them show experience teaching physics between four and seven years. It also, indicates that 18.2% of physics teachers and school subject leaders have experience teaching physics for eight years and above.

4.2. Effects of Student's Behaviour and Cognitive Aspects on Active Learning Toward Physics Subject

4.2.1 Students' perception of active learning toward physics subject

This study sought to determine student participation in physics subject, they are different items that were given to them, and they were requested to choose the collected responses according to their perceptions of the items given.

Table 4 Student's perception toward Physics teaching and learning

Students' perception of teaching and learning		SA	A	D	SD	NS
When I receive a poor grade in physics, I try to understand where I went wrong.	No	148	68	8	4	6
	%	63.2	29.1	3.4	1.7	2.6
When I study physics, I try to elaborate on the subject matter in my own words.	No	86	119	14	10	5
	%	36.7	50.9	6.0	4.3	2.1
I'm making questions about physics for myself, to make sure I understand the subject matter well.	No	74	128	15	14	9
	%	31.6	51.2	6.4	6.0	3.8
I solved multiple problems to make sure I understood the subject matter.	No	54	118	29	12	9
	%	23.1	57.6	12.4	5.1	3.8
I follow the lessons attentively.	No	121	64	24	13	12
	%	51.7	27.4	10.3	5.6	5.1
I am trying to do my best in physics teaching.	No	128	76	0	15	15
	%	54.7	32.5	0.0	6.4	6.4
I do not put much effort into physics teaching.	No	66	81	37	29	21
	%	28.2	46.6	15.8	12.4	9.0
I pay attention to the physics teaching.	No	119	43	34	20	18
	%	50.9	18.4	14.5	8.5	7.7
During teaching and learning, I think about other things.	No	35	51	46	75	25
	%	15.0	21.8	19.7	32.1	11.5
My thoughts often wander about during teaching and learning.	No	38	58	51	52	35
	%	16.2	24.8	21.8	22.2	15.0
Generally, I feel well during a physics lecture.	No	100	71	26	22	15
	%	42.7	30.3	11.1	9.4	6.4
I am nervous when I study physics.	No	64	69	44	31	26
	%	27.4	29.5	18.8	13.2	11.1
I feel relief after the physics teaching and learning.	No	68	67	33	36	30
	%	29.1	28.6	14.1	15.4	12.8

Keywords: **SA**-Strongly Agrees**, A**-Agree**, D**-Disagree**, SD**-Strongly Disagree, and **N**-Not Sure

The finding of this study in Table 4 is about the student's participation in teaching and learning physics subject. It indicates that 63.2% of students strongly agree that the item stated that when they receive poor grades in physics, they try to understand where they went wrong. It indicates that 57.6% of students agree that they solve multiple problems to make sure that they understand the subject matter well. It indicates that 56.4% of students agree that they are nervous when they are studying physics subject. It indicates that 51.8% of students strongly disagree that during physics teaching and learning, they think about other things. It indicates that 51.7% of students agree that they follow the physics lessons attentively when a teacher is delivering them. It indicates that 50.9% of students agree that when they are studying physics, they try to elaborate on the subject matter in their own words.

It indicates that 51.2% of students agree that they ask questions about physics subject for themselves, to make sure they understand the subject matter well. It indicates that 42.7% strongly agree that generally, they feel well during a physics lecture. It indicates that 29.5% of students agree that they are nervous when they start working on a new physics subject matter. It indicates that 29.1% of students strongly agree that they feel relief after physics teaching and learning. It indicates that 24.8% of students agree that they are trying to do their best during physics subject teaching and learning and their thoughts often wander about during teaching and learning.

The findings show that the students' participation in the physics subject is due to their analysis of the grade attained through thinking and questioning themselves about how they can improve their performance, they try to explain to themselves the physics contents and translate in their words for making sure that the lesson is understandable. They also highlight that students solve multiple problems related to physics subject. Through these different indicators, the study findings show that a small number of students' positive behaviour and cognitive aspects were developed and improved while they were engaged in classroom activities actively. However, a small number of students argued that their thoughts become wonders while they are teaching and learning and they think about other things not related to physics, and they want to learn other lessons while the physics lesson is taking place, this indicator shows that negative behaviour and cognitive aspect is created due to their misconception toward the physics subject.

Therefore, the teachers should use positive comments and address the students regarding the purposes of physics

education in their future career opportunities, and how physics skills and knowledge impact their lives in the future. Guido (2013**),** suggests that most students find that they feel good when they are successful in physics and they are fully succeeded in the subject when this endeavour becomes fruitful. Factors that reflect this are that their professors explain a lot of detail in their class, and they also find it enjoyable to study because they find it useful for problems of everyday life (Chang, 2019). Guang Yang (2017), found that students' confidence in their abilities in science, students' perceived benefits of science and technology, students' views about science and scientists, students' out-of-school experience, and the job orientation of self-actualization are among the best set of variables to predict students' engagement in science in Abu Dhabi.

According to Jonson (2017), found that teachers help students develop personal interest, involvement, and ownership of their work, which aid in motivation. Teachers also help students to learn by increasing their responsibility and participation in their learning by letting them create their own goals and objectives. Thien Trang Truong Le (2022), argued that the rate of students' knowledge acquisition and active learning increases when multi-sensory is applied to learning, exchanging ideas, and interacting highly, between students and between students-teachers.

4.2.2 Physics teachers and School subject Leaders' perception of Teaching Motivation

The researcher sought the opinion on how physics teachers and school subject leaders teach physics subject in lower secondary schools and how they motivate students to learn, by doing different activities on the subject. The researcher posed different items to be responded, to by ticking to the suggested responses.

Table 5 Teacher's and School subject leaders' perceptions toward physics subject teaching

Items	Participants responses	No	%
As a physics teacher, how do you like teaching?	Very much	11	100.0
	Very little	0	0.0
	Moderately	0	0.0
	Not at all	0	0.0
Do your students give a lot of value to physics when compared to other subjects?	Yes	11	100.0
	No	0	0.0
What is the general behaviour and cognitive aspect of your students toward physics subject?	Very positive	2	18.2
	Positive	9	81.8
	Negative	0	0.0
	Very negative	0	0.0
Regarding the physics syllabus from S1, S2, and S3. Is the syllabus content relevant to societal needs?	Very relevant	2	18.2
	Relevant	7	63.6
	Somehow relevant	2	18.2
	Not relevant	0	0.0

Keywords: **No**-Number of participants**, %-** Percentages

The finding of the study in Table 5 indicates that 100.0% of teachers and School subject leaders said that students like physics subject at a lower secondary level and they like it very much while they are learning a subject. Also, it indicates that 100.0% of physics teachers and School subject leaders said that their students give a lot of value to physics when compared to other subjects. It indicates that 90.9% of physics teachers and School subject leaders said

that they do change teaching methods and use another one to motivate them, this is being done in case they realized that the students are not interested in the physics lesson delivered. It indicates that 81.8% of physics teachers and School subject leaders said that the general behaviour and cognitive aspect of the students toward physics subject is positive. It indicates that 63.6% of physics teachers and School subject leaders said that students like the subject content of physics subject. It indicates that 63.3% of physics teachers and School subject leaders said that physics subject content is relevant to societal needs so they like the skills and knowledge acquired from physics subject due to the reason that it is relevant to society's demands.

The study findings show that the positive behaviour and cognitive aspects of the students were developed through the love and lot of value they expressed while they were learning physics subject, and positive behaviour and cognitive aspects were developed and improved depending on the teaching method used by a teacher, in case the students are not satisfied or interested, method of teaching may be altered to the one which is helping and encouraging them to engage in the activity actively. They also argue that the general behaviour and cognitive aspect of the students is positive, depending on how the students like and enjoy physics content instead of the physics teacher or other school educators and a positive behaviour and cognitive aspect is developed due to the reason that they observe how physics skills and pieces of knowledge are related to the everyday life situations, and how it is linked to societal demands.

According to Jachalee (2022), the respondents felt that learning activities are very useful for students. They had opportunities to use language and felt free when they engaged in their learning. The active learning activities provided the chance for students to be leaders. Also, active learning activities let students think and share their ideas and make them think creatively. Active learning can be used to enhance student learning outcomes in a range of school settings and can occur both inside and outside the classroom. The analysis shows that about 50% of the students believe that using active engagement strategies has enhanced their skills across a range of domains (Alhawiti, 2023). Study finding that about 70% of the students agree that the usage of pedagogical strategies has improved their knowledge level and even provided them with in-depth information about the concept (Afzal Sayed, 2021).

Teaching methods for enhancing students' active participation in physics learning

This study preferred physics teachers' and School subject leaders' views on how to motivate students in teaching and learning physics. These teaching methods were to enhance the students' positive behaviour and cognitive aspect formation towards physics subject.

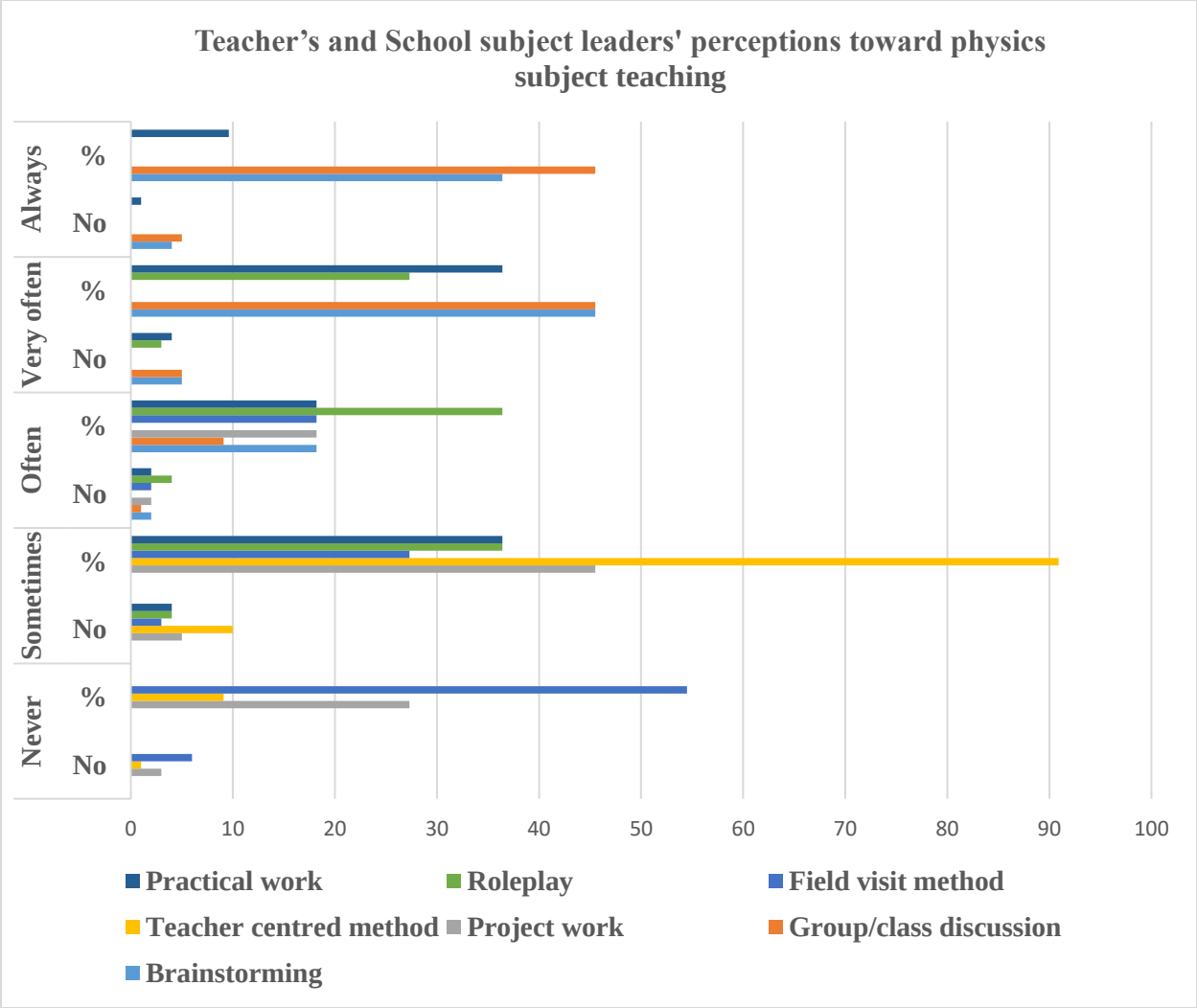

Figure 1 Teachers and school subject leaders' views on different teaching methods used to motivate and enhance student participation

The findings in Figure 1 indicate that 90.9% of physics teachers and School subject leaders said that teaching methods like the teacher-centred approach are used sometimes. It indicates that 45.5% of physics teachers and School subject leaders said that teaching methods like group/class discussion are used always and very often in physics teachings. It shows that 45.5% of physics teachers and School subject leaders said teaching method like brainstorming is used very often and project work is used sometimes. It shows that 36.4% of physics teachers and School subject leaders said that teaching method like practical work is used very often and sometimes in physics practice and other methods like role-playing are used often depending on the topic being taught as well as teaching methods like study work is used very often, and role-play is used sometimes depending on the topic to be taught.

The findings show that teaching methods like teacher-centred are used sometimes in physics class, which means it lowers their participation and leads to the creation of negative behaviour and cognitive aspects. Also, it shows that group/class discussion when used frequently, helps students to be motivated and creation of interest in the subject. Also, the study's findings show that the student's behaviour and cognitive aspect toward physics improved depending on the teaching methods frequently used in class, this leads to the creation of a positive behaviour and cognitive aspect of the students toward the subject, which causes student participation as well as improved performance in the subject. The positive behaviour and cognitive aspects toward the subject were created and improved, which upper (higher) their participation and performance, these methods are not used frequently in physics teaching.

According to Sunaryanto (2020), The change from passive behaviour in the classroom to being active is one of the effects of applying one active learning method. The

difference in the percentage of use of learning methods in each study program is the variation in the learning process. This can occur because the use of learning methods applied by lecturers in the classroom depends on the learning material presented. Hargraves, Afzal, and Victoria, ((2021)**,** (2021)**,** (2023)**),** suggested that the contribution of students' behaviour and cognitive aspect development depends on the teaching methods to be used: practical work, role play, and study work**.** Alhawiti (2023), suggests that every participant recognized the value of engaging actively in promoting one's professional attributes. There are many attributes, however, communication, professionalism and ethics are the attributes students should achieve in their program of study satisfactorily (Ciubotaru, 2024).

5. Conclusion and Recommendations

5.1. Conclusion

The findings show that the students' participation in the physics subject is due to their analysis of the grade attained through thinking and questioning themselves about how they can improve their performance, they try to explain to themselves the physics contents and translate in their words for making sure that the lesson is understandable. The study findings show that the positive behaviours and cognitive aspects of the students were developed through the love and value they expressed while they were learning physics subject, and positive behaviour and cognitive aspects were developed and improved depending on the teaching method used by a teacher, in case the students are not satisfied or interested, method of teaching may be altered to the one which is helping and encouraging them to engage in the activity actively.

The findings show that teaching methods like teacher-centred are used sometimes in physics class, which means it lowers their participation and leads to the creation of negative behaviour and cognitive aspects. Also, it shows that group/class discussion when used frequently, helps students to be motivated and creates interest in the subject. Also, the study's findings show that the student's behaviour and cognitive aspect toward physics improved depending on the teaching methods frequently used in class, this leads to the creation of a positive behaviour and cognitive aspect of the students toward the subject, which causes student participation as well as improved performance in the subject.

5.2. Recommendations

The study findings show that active learning improves student's cognitive capabilities in physics.

1. Student's behaviour and cognitive aspects of the students should be taken into account as the students enrolled in lower secondary school, in senior one.
2. To improve students' behaviour and cognition towards physics, physics teachers and science educators should always incorporate learner-centred methods in all their lessons.

References

Abdullah, M. Y. (2012). Student's Participation in Classroom: What Motivates them to Speak up? *Procedia - Social and Behavioral Sciences*. doi:https://doi.org/10.1016/j.sbspro.2012.08.199

Afzal Sayed Munna, M. A. (2021, 7). Impact of Active Learning Strategy on the Student Engagement. *GNOSI: An Interdisciplinary Journal of Human Theory and Praxis*, *4*(2), 14-16. Retrieved 10 19, 2024, from https://files.eric.ed.gov/fulltext/ED614302.pdf

Afzal Sayed, A. K. (2021). Teaching and learning process to enhance teaching effectiveness: a literature review. *International Journal of Humanities and Innovation*, 3.

Aji, C. A. (2019). The Impact of Active Learning on Students' Academic Performance. *Open Journal of Social Sciences*(07(03)), 204-211. doi:https://doi.org/10.4236/jss.2019.73017

Akpur, U. (2021). Does class participation predict academic achievement? *English Language Teaching Educational Journal*, 2-3.

Alhawiti, N. M. (2023, 2 1). The Influence of Active Learning on the Development of Learner Capabilities in the College of Applied Medical Sciences: Mixed-Methods Study. *Advances in Medical Education and Practice*, 8-10. Retrieved 10 19, 2024, from https://pmc.ncbi.nlm.nih.gov/articles/PMC9910096/pdf/amep-14-87.pdf

Alzahrani, M. A. (2018). The Learning Experience of International Students in Canada: Progressive Educational Theory and Passive Learning Styles. *y Canadian Center of Science and Education, 11*, 3-8. doi: 10.5539/elt.v11n7p76

Anon. (2020, 7 25). *What is the cognitive aspect?* Retrieved 12 23, 2021, from https://www.verywellmind.com/what-is-cognition-2794982#:~:text=Cognition%20is%20a%20term

%20referring,imagination%2C%20perception%2C%20and%20planning.

Arne Bewersdorff, X. Z. (2023). Myths, mis- and preconceptions of artificial intelligence: A review of the literature. *Elsevier*, 2-3.

Bernadette Van Hout-Wolters, R.-J. S. (n.d.).

Chang, B. (2019). Reflection in Learning. *Online Learning*, 3. Retrieved 10 20, 2024, from https://files.eric.ed.gov/fulltext/EJ1210944.pdf

Ciubotaru, A. (2023, 5 12). *StudyPortals Master*. Retrieved 7 23, 2024, from A Comprehensive Guide to the Different Types of Engineering Disciplines: https://www.mastersportal.com/articles/3140/a-comprehensive-guide-to-the-different-types-of-engineering-disciplines.html

Ciubotaru, A. (2024, 7 23). *A Comprehensive Guide to the Different Types of Engineering Disciplines*. Retrieved from StudyPortals Masters: https://www.mastersportal.com/articles/3140/a-comprehensive-guide-to-the-different-types-of-engineering-disciplines.html

Congmin, Z. (2016). Factors Influencing Student Participation in Classroom Interaction. *Higher Education of Social Science, 11*(3), 20–23. . doi:https://doi.org/10.3968/8804

De Houwer J, B. H. (2013). What is learning? On the nature and merits of a functional definition of learning. *Psychonomic Bulletin and Review*, 631-642.

Dressel, M. &. (1998). Gender differences in science education: The double-edged role of prior knowledge in Physics. *Roeper revolution*, 21, 102-107.

Eichelaub, M. &. (2019). Blending physical knowledge with mathematical form in physics problem-solving. in Pospiech G., Michelini M., BS,(eds) mathematics physics education. *Springer, Cham.*, PP 127-151.

Evans, H. K. (2022). Integration of critical thinking and reasoning skills into lessons through block factor game for finding factors of a number. *Journal of Mathematics and Science Teacher*, 2-5.

Fayombo, G. A. (2012). Active learning strategies and student learning outcomes among some university students in Barbados. doi:https://doi.org/10.5901/jesr.2012.v2n9p79

Fortus, D. (2009). The importance of learning to make assumptions. *Science education*, 93,86-108.

Gaguk Resbiantoro, R. S. (2022). A Review of Misconception in Physics: The Diagnosis, Causes, and. *Journal of Turkish Science Education*, 1. Retrieved 7 22, 2024, from https://files.eric.ed.gov/fulltext/EJ1360557.pdf

Ghalley, L. R. (2019). Factors Influencing Classroom Participation: A Case Study of Bhutanese Higher Secondary Student. *Asian Journal of Education and Social Studies*, 1-6. doi: https://doi.org/10.9734/ajess/2019/v4i330118

Gomes, A. J. (2012). A study on students' behaviours and attitudes towards learning to program. Annual Conference on Innovation and Technology in Computer Science Education. *ITiCSE*, 132–137. doi:https://doi.org/10.1145/2325296.2325331

Guang Yang, M. B.-M.-R. (2017, 8 16). Science as Interests but not for Career: Understanding High School Students' Engagement in Science in Abu Dhabi. *EURASIA Journal of Mathematics Science and Technology Education*, 14. doi:10.12973/eurasia.2017.00749a

Guido, P. R. (2013). Attitude and Motivation towards Learning Physics. *International Journal of Engineering Research & Technology (IJERT)*, 6.

Hargraves, D. V. (2021, 3 17). *Piaget's theory of education*. Retrieved 7 2024, 23, from The Education Hub: https://theeducationhub.org.nz/piagets-theory-of-education/

Jachaleee, M. T. (2022). *A Survey of Teachers' Perceptions of Active Learning Activities at Public Schools in Bangkok.* Bangkok. Retrieved 10 20, 2024, from http://ethesisarchive.library.tu.ac.th/thesis/2021/TU_2021_6121040452_16087_21085.

Jill Leonard, M. S. (2015). *Introduction to Active Learning and Active Learning Classrooms.*

Johnson, D. (2017). The Role of Teachers in Motivating Students to Learn. *BU Journal of Graduate Studies in Education*. doi:https://doi.org/10.1080/07303084

Johnson, D. (2017). The Role of Teachers in Motivating Students To Learn. *BU Journal of Graduate Studies in Education, 9*(1), 1. Retrieved 10 20, 2024, from https://files.eric.ed.gov/fulltext/EJ1230415.pdf

Martins, J. (2024, 7 22). *Asana*. Retrieved from How to build your critical thinking skills in 7 steps (with examples): https://asana.com/resources/critical-thinking-skills

Mc Dowell, L. (1997). Assessment as a tool for learnig. *Study education evaluation*, 23, 271-298.

Mello, D. &. (2013). Effectiveness of active learning in the arts and sciences. *Jurnal PTK dan Pendikan*. Retrieved 10 20, 2024, from https://journals.indexcopernicus.com/search/article?articleId=3913806

Meyer, R. (1992). Thinking problem-solving, cognition. Retrieved 01 01, 2022

Mohd Yusof Abdullah, N. R. (2012). Student's participation in the classroom: What motivates them to speak up? *Elsevier*, 2. Retrieved 10 22, 2024, from https://core.ac.uk/download/pdf/82406316.pdf

Pumpo, A. (2024, 7 22). *Europass Teacher Academy*. Retrieved from Holistic Education Guide for Teachers: https://www.teacheracademy.eu/blog/holistic-education/

Reif, F. (2008). Applying cognitive science to education: Thinking and learning in scientific and other complex domains. *MIT Press*.

Sabella, M. R. (2007). Knowledge organisation and activation in physics problem-solving. *American Journal of Physics*, 75,1017-1029.

Sachdev, P. S. (n.d.). *What is Learning?* Government PG College For Women. Retrieved 10 20, 2024, from Government Women College Gandhinagar: https://gcwgandhinagar.com/econtent/document/1587181853LEARNING.pdf

Schneider, K. (2024). What is Learning? *Psychology*. Retrieved 10 20, 2024, from https://doi.org/10.4236/psych.2024.155047

Suhendi. (2018). Constructivist Learning Theory: The Contribution to Foreign Language Learning and Teaching. *KnE Social Sciences*. doi:https://doi.org/10.18502/kss.v3i4.1921

Suhendi, A. &. (2018). Constructivist Learning Theory: The Contribution to Foreign Language Learning and Teaching. *KnE Social Sciences*. doi:https://doi.org/10.18502/kss.v3i4.1921

Sunaryanto, D. M. (2020). Perception of Students on Active Learning. *Science and Technology* (p. 5). SCITEPRESS. doi:10.5220/0008786700970101

Susak, M. (2016). Factors that Affect Classroom Participation. doi:http://scholarworks.rit.edu/theses

Telle Hailikari, N. K.-Y. (2008). The Relevance of Prior Knowledge in Learning and Instructional Design. *American Journal of Pharmaceutical Education*, 3-5.

Thien Trang Truong Le, T. H. (2022). Students' Perceptions of Active Learning in Introduction to Literature. *European Journal of English Language Teaching, 7*(6), 5. Retrieved 10 20, 2024, from https://oapub.org/edu/index.php/ejel/article/view/4516/7151

Varguese, D. M. (2018). *Learning and Teaching.*

Victoria Omenebele Kaizar, C. O. (2023). Understanding the Role of Play In Promoting Cognitive, Social, and Emotional Development in School Children: Implications for Counsellors and Evaluators. *University of Delta Journal of Contemporary Studies in Education*, 3-4.

Yilmaz, K. (2011). The Cognitive Perspective on Learning: Its Theoretical Underpinnings and Implications for Classroom Practices. *: A Journal of Educational Strategies, Issues and Ideas, 84*(5), 204–212. doi:https://doi.org/10.1080/00098655.2011.568989

Zewde Aregawi, B. &. (2017). How to improve students' participation in chemistry class: The case of 2nd Year Chemistry students taking the course Practical Organic Chemistry. *In International Journal of Engineering Development and Research, 5*. Retrieved from www.ijedr.org