

Teachers' and Learners' Perceptions of Utilization of Visuals on Learners' Academic Achievement in Physics in Secondary Schools in Kiambu County, Kenya

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ABSTRACT

The study investigated the perceptions of teachers and learners towards the use of visuals in Physics classrooms and their effects on learners' academic achievement in Physics in secondary schools. The study was guided by Bernice Rogowitz's visualisation Theory. According to Rogowitz (2010), learners interpret and reason about information in structures. The Theory explains how students reveal hidden concepts or knowledge while using visuals, thereby creating important learning activities. It predicts how students' perceptions of learning activities occur due to various shifts and how different representations and visuals are used in their interpretations to achieve learning objectives and improve Learners' performance. A descriptive research method was employed in the study, which was designed with mixed methods of data collection. The study targeted public secondary schools in Thika East, Kiambu County. The public schools were stratified as county and sub-county schools. The study used a questionnaire as a data collection instrument. The study targeted 294 students in Form 2 (Grade 10) and five Physics teachers from four public secondary schools. The study's objectives were anchored on the teachers' and learners' perceptions towards the utilisation of visuals in the teaching of Physics. The findings of this study will further support existing literature and previous research. The findings will also assist teachers in Kenya to enhance teaching by making it more hands-on activities instead of theoretical as the country implements Competency-Based Curriculum (CBC). The CBC anticipates that by the completion of the learning period, every learner will have acquired skills such as imagination and creativity, critical thinking and problem solving, and communication, among others. The study revealed that learners had positive perceptions of visuals in Physics classrooms. They recognised the application of visuals in Physics classrooms as an important and necessary tool for learning Physics. According to the findings of this study, using visuals in Physics classrooms makes learning more effective and easier for learners. The study recommends that The Ministry of Education in Kenya allot time for the use of visuals in teaching Physics per topic, where applicable.

Keywords: Approach, Learning, Learners, Visuals

INTRODUCTION

Physics, as an essential subject owing to its multiple applications in human endeavour, is seen as the basis of all sciences. However, many learners struggle with it. As an area of study, it experiences a high failure rate. Learners occasionally experience lower performance rates than what is desired in the Kenya Certificate of Secondary Education (KCSE Analysis Merit List, 2019). With the passage of time, new approaches and techniques have been introduced into the educational system. Teachers use a variety of tools to facilitate inclusive and effective learning. The use of different methods and approaches by teachers is very essential. According to Serroukh and Serroukh (2022), teachers cannot achieve the most favourable learning outcomes if they exclusively use traditional methods. The traditional method is insufficiently effective in meeting learners' needs and interests; it lacks opportunities for learners to participate in lessons. As a result, teachers must provide appropriate visual tools to help learners understand the lessons and improve their enthusiasm

for learning. However, how do teachers and learners perceive the use of visuals in those methods and approaches in the classroom? Visuals as instructional tools arouse learners' interest and enable teachers to quickly explain concepts. As an instructional tool, they are used in classrooms to help learners learn more effectively.

Physics as a discipline necessitates that learners acquire a broad spectrum of methods and concepts. Understanding geometry, Algebra, and Trigonometry is required for the development of process skills. In Physics, students must understand how to use visuals. The incorporation of technology in the classroom has aided in the improvement of educational standards. The involvement of modern visual aids in the process of teaching and learning has aroused learners' attention and consequently improved their academic performance. If visuals are used in the physics classroom, learners will be able to better organise and analyse abstract concepts. Learners struggle to visualise advanced Physics when studying mathematics due to a lack of connection with fundamental Physics theories (Torres & Mendes, 2017). It indicates that because they had not previously practised the mental connections of imagery in Physics that lead to some numerical computations such as graphs and other diagrams, they were unable to perform the tasks.

A wonderful teacher teaches from the heart and prioritises learners while considering their differences. He or she considers the learners' thoughts and ideas when teaching and uses the teacher-learner-centred approach. Learners' hearts and minds are inspired by wonderful teachers. According to Serroukh and Serroukh (2022), traditional teaching methods have been shown to be ineffective in the twenty-first century. Therefore, teachers who do want their students to learn more effectively and successfully will have to become students of their own classroom instruction by viewing it from a better perspective. They should begin training their students in primary school if they want them to have specific problem-solving strategies and methods in adulthood. This enables learners to transfer learning activities from one level to the next, which is critical for learning because learning can only occur when knowledge is transferred (Carden & Cline 2015). Learners' learning is also influenced by the teachers' ability to effectively communicate and combine visuals with contents (Harrison, 2019). According to Ribeiro et al. (2016), creativity is a sequential procedure that is not experienced as a single event or as a fixed attribute of a learner. Therefore, introducing visuals in Physics teaching at an earlier stage of learning provides students with multiple chances. It encourages learners to keep practising and developing their own methods of problem solving, while teachers serve as facilitators in their educational development in secondary schools.

Teachers' Perceptions Toward The Use Of Visuals In Teaching Physics

The use of visuals supports teachers in executing the process of teaching as well as in managing their time both before and during the lesson. They use different kinds of visuals to assist them in conducting a better learning situation in order to provide effective time management in teaching. According to Dewanti *et al.* (2019), the use of visuals can assist teachers in creating a better learning environment. Their findings also suggest that teachers should consider visuals as a device that saves teachers' instructional time and allows teachers to make better use of their time, and that using visuals allows teachers to broaden their experience horizons. Teachers' use of visuals may be related to their perceptions of how engaging and appropriately challenging the visuals are for learners and usable for teachers (Kaufman *et al.*, 2020).

Learners' Perception Toward The Use Of Visuals In Learning Physics

Learners' perception is their point of view or reaction to certain phenomena or everything that occurs during the learning-teaching process. It includes the learning process, the learning contents, the demands of the learners, etc. According to Bijlsma (2019), learners' perceptions of teaching are valid for assessing the quality of instruction in both primary and secondary schools. Learners' ratings of their teachers' instruction methods can be used for investigation and to measure performance. Therefore, assessing learners' perceptions is proportionally significant in determining what they prefer because various learners have

varied acceptability categories. Learners want learning activities that will allow them to gain experience and improve their performance. The use of technology to promote learning is vital. It is also important to examine strategies for combining technological visuals in learning with other learning strategies to create an effective learning experience for learners (Heflin *et al.*, 2017). It results in learners’ successful outcomes. Learners expect teachers and institutions to provide a favourable learning atmosphere.

METHODOLOGY

The study employed a descriptive survey using mixed methods of data collection. The descriptive survey research method was suitable for this study since it captures current issues such as students’ perceptions towards the utilisation of visuals in secondary schools’ Physics teaching in Thika East. A descriptive survey study concentrates on answering the how, what, when, and where concerns (Smith, 2021). Kothari (2009) claimed that the aim of descriptive survey methodology is to gather relevant information on aspects of teaching and learning that are of interest to researchers, policy experts, and curriculum designers. A descriptive study strives to fully reflect the characteristics of a specific situation. It is concerned with the perceptions, viewpoints, feelings, and perspectives of a study’s chosen sample of the population (Akhtari, 2016). Data was gathered using self-created questionnaires for both teachers and learners. Teachers’ and Students’ opinions were measured using a five-point Likert scale. Two public secondary schools were used to test the instruments. The instruments were validated, and the alpha Cronbach reliability was .78, indicating that the study’s questionnaires were reliable.

Participants

Stratified sampling was used in this survey to divide the eight public secondary schools in Thika East into county and sub-county schools. The researcher chose stratified sampling to represent each stratum in the study in order to provide a complete picture of what is going on in Thika East. According to Mugenda and Mugenda (2019), whenever the study population is heterogeneous, a stratified technique is required. As a result, public secondary schools in Thika East vary greatly. The study sampled two hundred and ninety-four (294) Form Two (Grade 10) learners at random and five physics students purposefully from four public secondary schools.

FINDINGS AND DISCUSSION

Teachers’ Perception Toward The Use Of Visuals In Teaching Physics

Teachers’ beliefs towards the use of visuals in teaching Physics were surveyed. The findings revealed that teachers have positive perceptions. To begin, 60.0% of teachers are willing to experiment with new methods of teaching Physics in order to improve students’ performance in the subject. Table 1.0 presents the findings.

Table 1.0 Teachers’ Perceptions of Utilization of Visuals in Teaching Physics

Statements:	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
I like to work with new methods of teaching Physics.	0.0%	20.0%	20.0%	60.0%	0.0%
The use of visuals should be a priority in teaching Physics.	0.0%	40.0%	0.0%	60.0%	0.0%
Teaching Physics using visuals can be challenging.	0.0%	60.0%	20.0%	0.0%	20.0%

The use of graphs, diagrams or animations would offer advantages over traditional method of teaching Physics.	0.0%	0.0%	20.0%	80.0%	0.0%
The use of video games or animations enhance students learning in Physics classrooms.	40.0%	0.0%	0.0%	60.0%	0.0%

In order to determine the Physics teachers' perceptions towards the use of visuals in teaching Physics, 60.0% of the teachers agreed that the use of visuals should be a priority in teaching Physics. Based on their positive perception, 80.0% of teachers agreed that using graphs, diagrams, or animations would provide advantages over traditional methods of teaching Physics. Furthermore, 60.0% agreed that using video games or animations in Physics classrooms improves student learning. However, 60.0% of teachers disagreed that teaching Physics with visuals can be more difficult, and 40.0% disagreed that visuals should be a priority in teaching Physics. Teachers are aware that visuals create boundaries between learners and abstract concepts in physics. They also believed that external representations are undeniably important in Physics education. This finding implies that the majority of secondary school teachers have a positive perception of visuals when teaching Physics.

In Table 1.2, the findings also indicated that 60.0% of the teachers disagreed that using diagrams or graphs in teaching Physics would make the subject matter more interesting to students. However, 60.0% of the teachers agreed that the use of the demonstrative method can save time and effort in teaching Physics. The findings are presented in Table 1.2, as indicated below.

Table 1.2 Teachers' Perceptions of Utilization of Visuals in Teaching Physics

Statements:	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Using diagrams or graphs in teaching Physics would make the subject matter more interesting to students.	0.0%	60.0%	0.0%	40.0%	0.0%
The use of demonstrative method can save time and effort in teaching Physics.	20.0%	20.0%	0.0%	60.0%	0.0%
The use of diagrams or drawings can improve the quality of learning Physics.	0.0%	40.0%	0.0%	60.0%	0.0%
Experiments are time consuming in teaching Physics.	0.0%	40.0%	0.0%	60.0%	0.0%
Teaching Physics using videos is more time consuming.	0.0%	60.0%	0.0%	40.0%	0.0%

In order to improve the quality of learning Physics, 60.0% of the teachers agreed that the use of diagrams or drawings can improve the quality of learning physics, but 60.0% agreed that experiments are time-consuming in teaching Physics. They require time and effort to analyse and get results. Moreover, 60.0% of the teachers disagreed that teaching Physics using videos is more time-consuming. This implies that Physics teachers have a positive perception of the role that visuals play in learning and teaching Physics. The study findings confirm the findings of Utami (2018), who found that an instructional model seems to be an effective and important element that can influence the functioning and efficiency of both the teachers and the learners based on positive perception. The modern classroom requires the best teachers who are creative in their instructional approaches. Visuals play an important role in bringing creativity to teaching approaches, and their effective application assists teachers and students in meeting learning goals. Therefore, teachers' perceptions will determine the effective use of visuals in modern classrooms.

Learners' Perception Toward The Use Of Visuals In Learning Physics

Students' perceptions towards the use of visuals in teaching physics were surveyed. The findings reveal that 47.8% and 45.0% of students agreed and strongly agreed that when a teacher uses a picture or diagram to teach, they remember the lesson very well. Furthermore, 42.2% and 38.4% of learners agreed or strongly agreed that the use of diagrams helps students visualise abstract concepts in physics. Table 1.3 presents the findings.

Table 1.3: Students' Perceptions of Utilization of Visuals in Learning Physics

Statements:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Whenever my teacher uses picture or diagram to teach, I remember the lesson well.	2.1%	4.8%	0.3%	47.8%	45.0%
The use of diagrams helps me to picture abstract concepts in physics.	6.9%	6.9%	5.5%	42.2%	38.4%
I learn more when teacher demonstrates and gives opportunity to students to investigate.	5.5%	6.2%	2.1%	33.2%	52.9%
Using diagram or graph to solve questions makes the problem-solving in physics easy and interesting.	13.5%	14.5%	1.4%	35.3%	35.3%

Learners learn best when their teacher demonstrates and gives them the opportunity to investigate. This is accounted for by 33.2% and 52.9% of the students who agreed or strongly agreed that whenever a teacher uses a picture or diagram to teach, they remember the lesson very well. Furthermore, 35.3% of students agreed or strongly agreed that using diagrams or graphs to solve questions makes physics problem-solving easier and more interesting. According to the findings, learners confirmed positive perceptions of visuals and expressed admiration for the role visuals play in learning Physics. The vast majority of students agreed and strongly agreed that when a teacher uses a picture, video, or diagram to teach Physics, they remember the lesson very well. The findings of this study contradict the findings of an earlier study by Klein et al. (2018), who observed that many students' admiration for models in Physics education is limited.

Learners are essential assets for any institution. Learners' perceptions have the potential to influence their achievement or performance, either positively or negatively. The study found that learners in Physics have positive perceptions of visuals. The majority of the learners agreed strongly that they remember the lesson very well when the teacher uses a picture or a diagram to teach or demonstrate. Moreover, many strongly agreed that using diagrams helps students visualise abstract concepts in physics. Learners believed that when teachers demonstrated and gave them the opportunity to investigate, they learned better.

CONCLUSIONS

According to the study's findings, the researcher concludes that:

1. When learners have a successful and enjoyable learning experience in the classroom, they build and expand their personal understanding of the subject.
2. Visuals are essential in the study of Physics in secondary schools; learners require perceptual stimulation to help them comprehend and recall abstract concepts in Physics. The effective use of visuals in Physics teaching replaces cumbersome learning environments.
3. When visual sessions are directly related to course content, they are effective and relevant to students.

RECOMMENDATIONS

According to the study, visuals are very important in the teaching and learning of Physics in secondary schools in order to improve learners' academic performance. The research was carried out in Thika East, Kiambu County, Kenya.

Hence:

1. The national government should issue a policy proclamation regarding the availability, distribution, and maintenance of visuals for teaching Physics in all public secondary schools.
2. The Ministry of Education should allot time for the use of visuals in teaching Physics per topic, where applicable.
3. The same study should be repeated in other sub-counties or counties to validate the study's findings.

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