



Research Article

Exploring Effective Teaching Approaches in Physics: Insights from Khan-Charbagh District High Schools

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ARTICLE INFO

ABSTRACT

Keywords:

teaching physics, solving the problems of physics, laboratory experiences of physics, expert teacher

Article History:

Received: 09-02-2024

Accepted: 02-07-2024

Published: 07-07-2024

The objective of this study is to analyze the quality of physics education in the schools located in the Khan-Charbagh district of Faryab. This study utilized a quantitative approach with a survey methodology. A sample of 20 students and seven teachers was picked at random from four high schools in Khan-Charbagh: Rahman QulShahid High School, Khan-Charbagh High School, Chakman High School, and Uchtipah High School. In this study, we employed a questionnaire as the primary tool for data collecting and performed the analysis of the findings using SPSS. The results indicated that both educators and students in the Khan-Charbagh district of Faryab high schools encounter substantial challenges in the instruction of physics. The obstacles encompass a dearth of proficient educators, a restricted focus on problem-solving, a deficiency in access to instructional resources, and a scarcity of scientific courses and programs for physics classes.

Cite this article:

Saqif, A. J., Rasooli, N. R., & Nazari, Y. (2024). Exploring Effective Teaching Approaches in Physics: Insights from Khan-Charbagh District High Schools. *Sprin Journal of Arts, Humanities and Social Sciences*, 3(7), 7–11. <https://doi.org/10.55559/sjahss.v3i7.321>

Introduction

Developing a thorough understanding of the fundamentals of science is crucial for organizing the tenets and bases of science instruction, particularly when teaching physics. In order to gain a deep understanding of science, one needs to have a thorough understanding of its fundamentals. As a result, real evidence on the nature of science and its components is included in the scientific curricula of many nations, including the United States (UNESCO, 2017).

Teachers with a strong sense of motivation are needed to instruct and prepare the students of today and tomorrow. According to study, there is a definite role for teachers in sustainable development, and they should be seen as having a high social status because they create the necessary conditions. A few requirements must be met in order to produce a successful teacher who can raise the standard of instruction (Wosilait K, 1998). Teacher observing is one of these circumstances and settings, where the teacher employs his profession in practice as a result of their presence. The role that teachers play in the classroom and their ability to foster a pleasant learning environment are, in fact, the most crucial components of creative learning (Darling-Hammond, 2000). Consequently, it is thought that a teacher's caliber of work is an essential component of learning. When a teacher has the experience and drive to help students learn in the context of trying to educate them to an experienced human being, learning can be effective.

The curriculum comprised a sequence of anticipated events designed to attain educational outcomes for an individual or a cohort of learners (Shulman, 1986). While the Ministry of Education in Afghanistan implements a distinct national curriculum, it is ultimately the teacher who chooses the teaching model based on various conditions and factors that influence this field. This decision directly affects the students' learning process and their perception of the teacher's effectiveness, as well as shaping their overall perspective on school, teaching, and even their attitude towards science and learning. Adhering to suitable instructional models and effective teaching methods will undoubtedly yield excellent outcomes for an individual's future and overall existence (Hattie, 2008).

The quality and success of the teaching and learning process are heavily influenced by the patterns and methods used to teach various subjects. Hence, it is imperative to examine the significance of including theme teaching in schools as a critical matter that necessitates careful consideration, as well as explore various techniques and strategies for enhancing it. Teaching methods in schools should be flexible enough to accommodate the cultural, socioeconomic, and individual diversity of students. Additionally, teaching methodologies should possess the capacity to inspire and offer an interactive and cooperative environment for learning (DeWater, 2000). Furthermore, teaching methods should align with the most effective ideas and educational practices. Employing activating, collaborative, and exploratory approaches boosts the capacity to enhance comprehension of subjects, hence enabling students to better

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<https://doi.org/10.55559/sjahss.v3i7.321>

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grasp concepts and employ functional forms. Hence, it is imperative to examine how the curriculum in schools necessitates the application of diverse educational strategies and methodologies, which can enhance the caliber of the learning experience and academic performance. This study aims to identify the most effective strategies for enhancing the educational system, thereby improving the quality of education and promoting the growth of pupils (DeWater, 2000).

Physics education heavily relies on textbooks and other educational materials. These resources should help students comprehend and apply topics by properly communicating them in a clear and understandable way. In order to learn new things, physics is an experimental discipline. As a result, it is essential to teach physics through laboratory experiments and scientific activities. These characteristics help students relate theory to experience in the real world and help them grasp physics concepts practically. Students' engagement and active participation in the learning process can be increased by implementing active teaching tactics. To teach physics effectively, teachers must use effective teaching strategies. To ensure that students receive the best possible education, teachers should stay up to date on the most recent, established pedagogical approaches in physics teaching (Ahmadi, 2021).

Literature review

The study of a phenomena's history or literature aids researchers in identifying and comprehending the precise nature of that phenomenon. Scientific research is an ongoing and evolving process that establishes a connection between the past, present, and future aspects of a subject. Hence, the investigated facts possess such attributes. This implies that it has a historical foundation, a current relevance, and a future outlook. study was carried out in the Khan-Chaharbagh district of Faryab province. Due to my familiarity with the educators and students in the schools of this district, I deemed it imperative to highlight the shortcomings in the instruction of physics and propose an appropriate solution to the relevant authorities. Uwizeyiman et al. (2018) did a study investigating the impact of different teaching methods on the quality of physics education in five secondary schools located in Ruisi District, Rwanda. Rwanda's present policy advocates for science education as a method of constructing knowledge (Uwizeyimana, 2018). The present study examined the existing status of teaching and learning, as well as effective performance, in elementary-level physics classes. The second step was analyzing the amount to which various educational methodologies contribute to the enhancement of physics, as examined by Uwizeyiman in 2018. The findings indicated a strong correlation between the issues highlighted in students' understanding of physics and the conventional teaching methods employed by teachers in the field. The quality of physics teaching and learning is significantly impacted by these conventional approaches (Uwizeyimana, 2018). Antonio (2008) did a study titled "Drama in Physics Education." The objective of this research was to examine the comprehension of fundamental principles in physics through the utilization of conventional conceptions and representations (Antoio, 2008). The statistical population for this research comprised all educated individuals, out of whom a sample of 82 was picked using simple random sampling. The statistical sample was partitioned into two distinct groups: the experimental group and the demonstration group. The research findings indicate a strong correlation between comprehension of contemporary system concepts and the acquisition of physics concepts (Antoni, 2008). Karamustafaoglu, (2009) conducted a study entitled "Active Learning Strategies in Physics Education" in a regional city in Turkey. The objective of this study was to ascertain the viewpoints of physics educators regarding the

practicality of student activities in the instruction and acquisition of physics knowledge. Data was collected via interviews and questionnaires. An organized interview was carried out with a sample size of 6 individuals, while a survey was issued to a sample size of 40 individuals. One of the discoveries was that although the teachers were aware of the importance of the student in physics education, they heavily relied on traditional approaches (Karamustafaoglu, 2009).

Research Methodology

The present study is applied research that focuses on four schools located in the Khan-charbagh district of Faryab Province. These schools include Rahman QulShaheed High School, Zakur Khan-charbagh High School, Zakur Chakman High School, and Uch Tipeh Middle School. The statistical population for this research consists of 40 teachers and students from the specified schools who are involved in the teaching and learning of the topic of physics. Out of the total, 27 individuals were chosen as research samples and questionnaires were distributed randomly. Specifically, a sample of 5 individuals was chosen at random from the student population of the 12 specified schools, and the survey was handed out to them. The data were analyzed using SPSS version 27. Cronbach's alpha was used to ensure the validity and trustworthiness of the data.

Teaching Methods

In order to instruct students in the compelling and comprehensible principles of physics for grades 10 to 12, educators must employ pedagogical approaches that facilitate comprehension of intricate concepts and foster profound learning. Several efficacious approaches to teaching physics in schools include:

i. Teaching Based on Real Examples

One of the effective ways to teach physics is to use real and similar examples from students' daily lives. By using examples that have real-world relevance, complex concepts can be explained to students and facilitate gaining a deeper understanding of the topics. In fact, using real examples from everyday life in teaching physics can help learners better understand complex concepts. For example, to explain Newton's second law, we can use the movement of a car on the road at different speeds (Penn, 2016).

ii. Using interactive tools in teaching physics

Due to the advancement of technology, the use of interactive tools such as simulations and educational videos is an efficient way to draw students' attention to physics concepts. These tools allow students to practically experience concepts and improve their learning (Wosilait, et al, 1998).

iii. Make complex questions simple

In teaching physics, complex questions can be broken down into simpler questions and taught to students gradually. This method requires students to think and analyze more deeply and gradually master more complex physics concepts (Petticrew, 2011).

In addition, in teaching physics, encouraging students to ask questions and think about natural phenomena can strengthen their research spirit. Teaching by ordering questions that are continuously related to each other and reach from simple to difficult can help students to focus and learn (Petticrew, 2011).

iv. Use of pictures and diagrams

In teaching 10th, 11th and even 12th grade physics, images and diagrams can be used as helpful tools to explain concepts and principles. By means of pictures, students can be shown the

real experiences of book concepts, and this helps students to get to know the concepts better and faster. In addition, graphs can clearly explain changes over time or relationships between variables. For example, in the issue of the movement of objects, the path and speed diagrams can help students to better understand the laws of motion and see the relationship between variables (Ahmadi, 2021).

The use of pictures and diagrams allows students to become more visually and practically familiar with physical concepts related to the real world. This method can also add attractiveness and variety to the middle school physics teaching process and help learners to enjoy these lessons and understand the concepts more accurately (Ahmadi, 2021).

Methods of Assessment

Diversity in assessment methods is crucial for teaching physics to middle school students, particularly in the 12th grade **Analysis**

when students are getting ready for final exams and entrance exams to universities. When assessments are done correctly, teachers can gain important knowledge about their students' performance and comprehension in addition to letting students see their preparation and progress. Students can evaluate their comprehension of several physics' ideas with these tests. Students can completely comprehend the relationships between topics on assessment examinations, which are designed based on their comprehension of physics concepts and principles (Good, 1979). These exams pose questions that call for a more in-depth comprehension of physical principles and a comparison of those concepts to actual circumstances. For instance, students must use the concepts and laws of physics to respond to a question concerning the application of Newton's law in a particular circumstance (Good, 1979).

Table (1) Validity of the questionnaire

Cronbach's Alpha	N of Items
.805	14

Table (1) shows the validity of the questionnaire. The findings show that the value of Cronbach's alpha obtained is equal to 0.8; Therefore, it is at a good level and the number of disturbing variables is very small and the questionnaire was distributed.

Table (2) Kolmogorov Smirnov-Shampirolek test

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Teaching by expert and professional teachers	.291	27	.000	.868	27	.003
Using projectors and slides in teaching	.442	27	.000	.566	27	.000
Provision of study materials to students	.384	27	.000	.686	27	.000
Using practical laboratory experiences in physics teaching	.226	27	.001	.878	27	.004
To what extent is the teaching of physics in the form of theory?	.229	27	.001	.834	27	.001
To what extent is the student-centered method used in teaching?	.375	27	.000	.736	27	.000
Using the teacher-centered method in teaching physics	.336	27	.000	.820	27	.000
Using problem solving method in physics teaching	.255	27	.000	.776	27	.000
To what extent do the students benefit from the scientific course?	.241	27	.000	.891	27	.008
Using group work in teaching physics	.313	27	.000	.842	27	.001
To what extent is the curriculum adapted?	.221	27	.002	.894	27	.010
How many capacity improvement programs do students have?	.214	27	.003	.881	27	.005
Seminars related to physics courses	.284	27	.000	.736	27	.000
Students' participation in the teaching of physics	.268	27	.000	.850	27	.001

Table (2) shows the results of the Kolmogorov Smirnov and Shapier-Wilk test, since the significance level or P-Value is smaller than 0.05; Therefore, the data does not have a normal distribution. Therefore, non-parametric tests are used for data analysis.

Table (3) one-sample t-test

Responder	N	Mean	Std. Deviation	Std. Error Mean	
Students	Teaching by expert and professional teachers	20	3.35	.813	.182
	Using projectors and slides in teaching	20	1.9500	.82558	.18460
	Provision of study materials to students	20	2.7000	.47016	.10513
	Using practical laboratory experiences in physics teaching	20	2.2500	.85070	.19022
	To what extent is the teaching of physics in the form of theory?	20	2.2500	1.16416	.26031
	To what extent is the student-centered method used in teaching?	20	2.8000	1.00525	.22478
	Using the teacher-centered method in teaching physics	20	2.9000	.64072	.14327
	Using problem solving method in physics teaching	20	3.3500	.93330	.20869
	To what extent do the students benefit from the science lesson?	20	3.1500	.98809	.22094
	Using group work in teaching physics	20	2.6000	1.18766	.26557

	To what extent is the curriculum adapted?	20	2.9000	1.11921	.25026
	How many capacity improvement programs do students have?	20	2.9000	.96791	.21643
	Seminars related to physics courses	20	3.5000	.51299	.11471
	Students' participation in the teaching of physics	20	2.8000	1.36111	.30435
Teachers	Teaching by expert and professional teachers	7	1.86	1.069	.404
	Using projectors and slides in teaching	7	2.2857	1.25357	.47380
	Provision of study materials to students	7	2.0000	1.00000	.37796
	Using practical laboratory experiences in physics teaching	7	2.4286	.97590	.36886
	To what extent is the teaching of physics in the form of theory?	7	1.4286	.78680	.29738
	To what extent is the student-centered method used in teaching?	7	1.8571	.69007	.26082
	Using the teacher-centered method in physics teaching	7	2.2857	.95119	.35952
	Using problem solving method in physics teaching	7	2.5714	.97590	.36886
	To what extent do the students benefit from the science lesson?	7	2.1429	1.46385	.55328
	Using group work in teaching physics	7	2.2857	.75593	.28571
	To what extent is the curriculum adapted?	7	1.8571	1.06904	.40406
	How much do students benefit from capacity building programs?	7	3.0000	1.41421	.53452
	Seminars related to physics courses	7	3.0000	1.15470	.43644
	Students' participation in the teaching of physics	7	2.5714	.78680	.29738

Table (3) shows the results of a sample t-test, including 27 respondents, 20 of them were students and 7 of them were teachers. The average value of the teaching questions of specialized and professional teachers is 3.35, The use of a slide projector in teaching average value 1.95, the availability of textbooks to students average 2.70, the use of practical experiences in the laboratory in teaching physics 2.25, the teaching of physics in the form of theory 2.25, the student-centered method in teaching average 2.8, the teacher's method Core in physics teaching average 2.90, problem solving method in physics teaching 3.35, use of scientific course 3.15 average value, group work in teaching average value 2.60, curriculum is adapted. The average is 2.90, the average value of capacity-building promotion programs is 2.90, the average value of seminars related to physics courses is 3.50, and how much is the participation of students in the teaching of physics, the average value is 2.80, and the lowest average value is 1.85 in the respondents' section. And the highest average value is 3.

Discussion

The research findings indicate a high level of agreement between students and professors, with minimal divergence of opinions. However, there is ongoing debate regarding other studies that explore the potential methods of teaching physics in schools and institutions in Afghanistan and other nations. In 2016, Khatire Barez authored his master's thesis titled "Exploration of diverse pedagogical approaches through the lens of Kabul University of Education and Training students". According to Barez (2016), the process of learning leads to a gain in knowledge or skills (Barez, 2016). Imaq conducted a study titled "Examining the impact of laboratory work on the learning of physics topics" from the viewpoint of students and professors in the physics department of the Faculty of Natural Sciences at Kabul University of Education and Training. One of the research findings indicates that incorporating laboratory experiences in the study of physics and encouraging active

student participation in these activities facilitates problem-solving skills. This approach also fosters curiosity, creative thinking, and the ability to innovate and be creative among students (Imaq, 2016). This topic is consistent with the conclusions of this investigation (Ogunleye, 2009). The researcher conducted a study titled "Enhancing Teachers' and Students' Comprehension of Students' Problem-Solving Challenges in Physics: Implications for Enhancement." The findings of the study were highly successful, revealing that students have a deficiency in comprehending problem-solving tasks and skills. The pupils' lack of proficiency in mathematics poses a significant challenge in their ability to solve physics problems (Ogunleye, 2009). The outcomes of this study are consistent with the findings of my own research. The research titled "Perceptions of medical students at Shahid Sadougi University regarding changes in the curriculum of medical physics in 2013" by Fethullah Bozar Jamhari and Reza Nafisi Moghadam reveals the average assessment of students regarding the instruction of medical imaging principles (Reza, 2013). With regards to the current contents of medical physics, a value of 3.92 indicates a high level of agreement. The students' assessment of the practical training for CT and MRI radiology imaging techniques and nuclear medicine is 4.04, indicating their agreement with the program (Penn, 2016). Based on this research, the individuals stated exhibit striking similarities to the findings of my own research. Specifically, practical instruction proves to be more effective than theoretical instruction, and students demonstrate enhanced learning outcomes when taught by experienced professors, engage in well-equipped laboratory experiences, benefit from scientific advancements, and utilize supplementary literature, among other factors.

Conclusion

Although education may face numerous challenges in the future, it is widely regarded by society as an essential investment in attaining objectives such as social equity and harmony. In light of technological progress and ongoing societal shifts, it is crucial to develop the necessary conditions for facilitating

societal transition. The initial prerequisite in the realm of knowledge and awareness is to undergo a transformative process, which is thereafter accompanied by intentional strategizing in order to attain the intended result. Researchers in the field of educational science have long been dedicated to enhancing the significance and efficacy of teaching and learning practices. Promoting the cultivation of logical and creative thinking abilities in children is a fundamental objective in all societies. Promoting the utilization of suitable educational materials, laboratories, experiential learning, interactive teaching methods, practical applications, and diverse evaluation methods is of utmost importance. Furthermore, it is imperative for educators to consistently stay informed and well-versed in the most recent advancements in the field of physics. The study findings indicate that pupils in the Khan-charbagh district of Faryab Province encounter several challenges when it comes to learning physics. The challenges encompass the insufficiency of proficient and seasoned instructors, the limited availability of teaching materials, the inadequate implementation of problem-solving methodologies in the educational setting, the absence of science curricula and initiatives for students, and the irregular scheduling of physics-oriented seminars and workshops. In the Khan-charbagh district of Faryab province, educators assert that the lack of physics seminars conducted by the administration and the limited involvement of students in capacity building initiatives hinder the effectiveness of physics instruction. The execution of these schools has been inadequate.

Recommendations

To ensure the effective instruction of physics in the Khan-charbagh region of Faryab province, it is essential to consider the following factors:

- Priority should be given to programs aimed at enhancing capacity, as they are crucial for improving the efficacy of teaching scientific disciplines such as physics. These programs provide educators with the tools and resources necessary to implement effective teaching methods in their classrooms, thereby enhancing the learning experience for students. These programs may encompass seminars, workshops, training materials, dissemination of specialist information, and chances for interaction and knowledge sharing with peers and subject matter experts.
- Conducting seminars and instructional workshops for physics classrooms can significantly enhance the teaching and learning of this topic. These courses provide educators with the opportunity to acquire knowledge about contemporary physics teaching methodologies and how to utilize state-of-the-art resources to elucidate scientific principles to pupils.
- In order to acquire technical and scientific information, it is crucial for teachers to consider their areas of competence. Equipped with this expertise, they possess the ability to employ techniques rooted in strong scientific reasoning and elucidate intricate concepts in physics to students.
- By focusing on resolving physics obstacles, students can get a personal comprehension of academic issues through practical applications. This approach enhances comprehension of the topics and the correlation between theoretical principles and real-world implementations.

- By focusing on conducting laboratory experiments in the classroom, practical exercises and physics lectures are strengthened. It is imperative for every physics department to mandate that its professors conduct laboratory experiments for their students. Deliver a curriculum that is concise and easily understandable, tailored to the students' level of comprehension, to ensure optimal learning from the teachers' instruction.

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