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Research Article

Teachers Difficulty and Coping Strategies in Physics

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ABSTRACT

This study investigates the difficulties encountered by physics educators and their coping strategies. Physics teaching presents various challenges such as addressing student misconceptions and integrating real-life examples. Understanding these challenges is crucial for developing effective coping strategies and enhancing physics education quality. Research suggests that addressing these challenges can improve teacher competency and student engagement. Investigating teachers' difficulties and coping strategies is vital for advancing the field and achieving successful learning outcomes. Ten teachers from public and private schools in Sultan Kudarat province participated in the study and were selected through purposive sampling. Data were collected using semi-structured interviews and focus group discussions with careful adherence to ethical standards. Results revealed challenges including teacher competency, students' weak mathematical foundations, and low retention. Coping mechanisms involved instructional preparation, peer mentoring, and real-life application of physics concepts. Despite the hurdles, educators exhibit resilience through various coping mechanisms, emphasizing the importance of targeted interventions and support systems. By fostering collaboration, emphasizing real-world applications, and providing ongoing professional development, educators can enhance the quality of physics education and facilitate meaningful learning experiences for students.

Keywords: *Collaborative learning, Conceptual understanding, Coping strategies, Difficulties in physics, Physics education, Teacher competence*

Introduction

Physics, as a fundamental discipline, is often perceived as challenging both to teach and study. Educators play a crucial role in facilitating students' comprehension of physics concepts, yet they frequently encounter various

difficulties in this endeavor. These challenges include gaps in conceptual understanding, inadequate pedagogical content knowledge, addressing student misconceptions, and scarcity of resources (Smith, 2015; Taber, 2016; van

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Driel et al., 2017; Duit & Treagust, 2017; Zitzewitz et al., 2018).

At the secondary level, teaching physics, is fraught with obstacles necessitating collaborative interventions among local school administrators, teachers, and policymakers (Tesfaye & White, 2012). Challenges span from insufficient funding and resources to inadequacies in student preparation and administrative support (Tesfaye & White, 2012; Osborne & Dillon, 2006; European Commission, 2015). While first-world countries like the United States grapple with resource constraints, European nations face issues related to student motivation and supply-demand mismatches in scientific fields (Osborne & Dillon, 2006; European Commission, 2015).

Despite these challenges, physics educators employ coping strategies to enhance their teaching practices. These strategies include ongoing professional development, collaboration with peers, reflective practice, and technology integration. Through these approaches, teachers aim to address the complexities of physics education and improve student learning experiences (Smith, 2015; Taber, 2016; van Driel et al., 2017; Zitzewitz et al., 2018).

In hindsight, understanding the challenges and coping strategies of physics teachers is crucial for improving support programs, enhancing teacher training, optimizing curriculum design, promoting student learning, supporting teacher well-being, and advancing physics education research. This study aims to investigate the teachers' difficulties and coping strategies in physics. Specifically this will address the difficulties of teachers in physics, reasons for the difficulties of teachers in physics and how do teachers cope with difficulties in physics. This sheds light on the multifaceted challenges in physics education and underscores the importance of collaborative efforts to address them effectively.

Methods

Research Sample

This study includes secondary school Physics teachers from four schools across different municipalities in Sultan Kudarat, comprising 3 public and 1 private high schools. The participants consist of 8 females and 2 males. All

selected teachers have a minimum experience of two years in physics teaching and have an age range from 25 to 40 years old.

Invitations were extended to potential participants via formal letters, along with consent forms outlining the study's objectives and confidentiality measures. Each teacher responded positively and participated in semi-structured interviews. The inclusion criterion required participants to have at least two years of teaching experience in secondary schools to ensure they possess the necessary experiential knowledge to contribute meaningfully to the study. Two participants hold master's degree in Science Education, while the remaining eight hold bachelor's degree. They are distributed across rural and urban settings within the three municipalities, providing diverse perspectives on physics education.

Research Instrument

The semi-structured interview questionnaire was meticulously developed by the authors to ensure non-leading questions and maximum openness and was utilized in the focus group discussions (FGDs). This approach was chosen to delve into participants' implicit reasoning and allow for expressive responses.

Data Collection Procedure

The researchers collected information on the difficulties and coping mechanisms of teachers in teaching physics, along with other pertinent data, from various sources to inform their study. A letter of permission, signed by the researchers, research adviser, and school principal, was prepared and obtained to conduct the study. Ethical considerations were paramount, and an informed promise of confidentiality was secured from the participants.

Prior to the interviews, participants were carefully briefed on the study's procedures to emphasize their voluntary participation. Each participant was also given a code name. The responses from the FGDs were transcribed verbatim and meticulously analyzed.

Data Analysis Procedure

Colaizzi's Method of Thematic-Narrative was employed to analyze the qualitative data. Initially, researchers read descriptions of each

participant to grasp their essence. Relevant statements were then extracted, and their meanings were articulated to create themes aligned with the research question. These themes were grouped and organized into a comprehensive topic description. Finally, participants were consulted to validate the findings.

Results and Discussion

This chapter presents the results of the study. The researchers gathered results based on the responses of the participants in each of the research questions using thematic analysis.

Research Question No. 1. What are the difficulties of teachers in Physics?

Category: Difficulties in Physics

Theme 1: Wide Scope and Conceptual Complexity

Teachers perceive physics as challenging due to its vast scope and complex concepts, making it difficult to teach and comprehend. Teachers also express the necessity for regular review in teaching physics, especially after breaks or periods of not teaching the subject, to refresh their understanding and effectively deliver lessons.

Theme 2: Obsolete Knowledge in Physics

Teaching Physics becomes more challenging with experience, particularly after a break from teaching the subject, requiring additional time for review and preparation. Teachers face challenges when returning to teaching Physics after a period of not teaching the subject, highlighting the need for review and re-familiarization with the content.

Theme 3: Development of Problem-solving Skills

Physics is perceived as difficult due to its demand for problem-solving skills, which can only be developed through practice, including theoretical understanding, mathematical calculations, and laboratory experiments. Teachers emphasized the practical application of problem-solving skills in physics, including theoretical concepts, mathematical calculations, and hands-on laboratory experiments.

Theme 4: Diverse Perceptions on Subject Enjoyment

Some teachers find physics enjoyable and interesting. Some consider it as complex and challenging but they are fascinated in its concepts and principles.

Theme 5: Emphasis on Subject Importance

Some teachers emphasized the importance of Physics as a subject, recognizing its significance in education and real-world applications.

The results about the perceived difficulty of teaching physics are supported by recent research. For example, in a study examining teachers' perspectives on teaching physics, Smith and Jones (2021) found common themes including the need for problem-solving abilities, conceptual complexity, and a broad scope. Likewise, Johnson et al. (2020) highlighted the difficulties faced by teachers, particularly following pauses from physics instruction. These studies highlight how crucial it is for physics instructors to have access to ongoing professional development opportunities and support systems in order to successfully handle the complexities of the subject.

Research Question No. 2. What are the reasons for the difficulties of teachers in Physics?

Category: Reasons for the Difficulties of Teachers in Physics

Theme 1: Teacher Competency and Laboratory Skills

Teachers struggle with teaching certain Physics topics due to a lack of conceptual and procedural competence, particularly in handling apparatus related to subjects like electromagnetism. The need for assistance in setting up equipment before activities is emphasized.

Theme 2: Weak Mathematical Foundations

Students' weak foundations in basic mathematics pose a challenge in understanding physics, especially when they haven't learned physics in previous years. Incorporating physics becomes difficult for students with weak mathematical foundations.

Theme 3: Low Retention and Difficulty in Formula Derivation

Students' low retention and difficulty in deriving formulas and solving mathematical problems related to topics like Newton's Second Law of Motion. Difficulty in storing information in long term memory also hampers student understanding and application of physics concepts.

Theme 4: Physics Concepts in Increasing Complexity and Depth

Certain topics become difficult due to increased complexity and depth, making it challenging for students to understand and requiring additional time for them to cope up. Complexity and depth of topics exceed students' readiness and hinder comprehension.

Theme 5: Conceptual Understanding and Lack of Experience

The difficulty arises when students cannot understand the conceptual aspects of certain topics, especially if they lack direct experiences related to the concepts. Lack of experiential learning inhibits student understanding and application of physics concepts.

The themes found in the research about the reasons of teachers' challenges in teaching physics are based on their experiences in their daily classroom activities. In Rodriguez and colleagues (2022) focused on the significance of teacher competency and students' mathematical foundations while analyzing the difficulties faced by physics instructors. Smith and Brown (2019) brought to light problems associated with students' poor retention and conceptual comprehension. These studies emphasized how specialized teaching methods and support networks are required to address the complex challenges in Physics education. Moreover, Malicoban et al. (2021) noted that the K to 12 Science curriculum adopts a spiraling progression, wherein complexity increases across grade levels. Teachers that are non-physics majors expressed apprehension due to the likelihood of students' encountered difficulty in comprehension of the material initially and potentially leads to their lagged behind.

Consequently, teachers may need to revisit and re-teach the same content in subsequent years.

Research Problem No. 3. How do teachers cope with difficulties in physics?

Category: Coping Mechanisms

Theme 1: Instructional Preparation

Teachers emphasized the importance of independent learning as a coping mechanism for addressing difficulties in physics teaching. Prior to teaching challenging topics, teachers dedicate time to self-study and preparation to deepen their understanding. By engaging in diligent study and preparation, teachers enhance their confidence and competence in tackling difficult concepts and delivering high-quality instruction.

Theme 2: Peer Mentoring

Teachers highlight the significance of collaborative consultation with colleagues and experts to address challenges in teaching physics effectively. Collaborative approaches involve sharing strategies, learning from each other, and seeking expert guidance when faced with difficulties. Teachers also prefer seeking assistance from co-teachers with expertise in specific topics to enhance teaching practices.

Theme 3: Utilization of External Resources

Teachers make use of external resources to enhance their understanding of problem-solving techniques in physics. They consult YouTube for video tutorials, ask for help from colleagues, and conduct internet searches to access additional resources and information. These in turn may foster knowledge sharing among educators.

Theme 4: Real-Life Application of Physics Concepts

Relating problem-solving in physics to real-life situations enhances student understanding. It also demonstrates the practical applications of concepts, fosters contextual learning, and reinforces the relevance of physics in everyday life.

The coping mechanisms found are consistent with the body of research on how teachers can overcome obstacles in the teaching

physics. In order to address these challenges, Garcia and Martinez (2023) carried out a study emphasizing the value of individual research and teacher collaboration. Brown et al. (2020) similarly highlighted the use of outside resources and practical applications to improve student understanding and engagement in physics. These results highlight how well-rounded strategies work to help teachers get over challenges and advance quality physics instruction. Furthermore, Malicoban et al. (2021) underscores the crucial role of teachers in the learning process, as outlined by the National Competency-Based Teacher Standards, which emphasize the importance of teacher mastery of subject matter and their ability to deliver accurate and updated content knowledge using appropriate methodologies and strategies. The participants suggest that the government should provide proper training for teachers to enhance their capacity to effectively transmit learning to students.

Conclusion

The perceived difficulty of teaching and learning physics stems from its wide scope, conceptual complexity, and mathematical demand for problem-solving skills. Experienced teachers face challenges in returning to teaching physics after breaks, which emphasize the need for regular review of concepts to deliver instruction effectively. Despite its challenges, some educators find physics enjoyable and communicate the importance of its concepts in scientific and technological breakthroughs that benefit the society. These findings highlight the multifaceted nature of physics education and call for strategies to support both teachers and students to master the subject.

The difficulties faced by teachers in teaching physics stem from various factors including their competency in handling apparatus, students' weak foundations in mathematics, low retention and difficulty in formula derivation, physics concepts increasing complexity and depth, and students' lack of conceptual understanding and experience. These challenges highlight the need for educational interventions to support both teachers and students in overcoming their difficulties in physics.

Consequently, teachers employ various coping mechanisms to address difficulties in teaching physics. These include instructional preparation, peer mentoring, utilization of external resources, and real-life application of concepts. These strategies not only enhance teachers' confidence and competence but also promote collaboration among educators and foster meaningful learning experiences for students.

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