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Problems Faced By Physical Science Teachers at Secondary Schools

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Abstract:
Physical science teachers at the secondary school level face numerous challenges that hinder effective teaching and learning. One of the major issues is the lack of adequate laboratory facilities, which restricts the ability to conduct practical experiments essential for understanding scientific concepts. Teachers often have to manage large class sizes, making it difficult to provide individual attention and maintain discipline during practical sessions. Limited access to updated teaching resources and technology further hampers the delivery of engaging and effective lessons. Many physical science teachers also report a lack of continuous professional development opportunities, leaving them ill-equipped to handle changes in curriculum or adopt innovative teaching strategies.

Additionally, students often view physical science as a difficult and abstract subject, which reduces their motivation and participation. This perception is compounded by the pressure to cover a wide syllabus within a limited time frame, forcing teachers to focus on rote learning rather than conceptual understanding. Inadequate support from school administration and policymakers adds to the frustration, as teachers struggle with unrealistic expectations and insufficient resources. Addressing these problems requires systemic changes, including better infrastructure, ongoing teacher training, curriculum reforms, and increased support from educational authorities to create a more conducive environment for physical science education.

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I. Introduction

Science that explains the physics and chemistry universe is known as physical science. In addition, science is a field of study that primarily relies on the following skills, ethics forits instruction: imagination, creativity, intuition, examination, disputing evidence, observation, experience, event, occurrence, narration andinterpretation of the testimony, evidence.

Determining the issues in an individual's surroundings through observation, hypothesis-building, experimentation, inference, analysis, generalization, and the application of acquired knowledge and necessary skills is the primary goal of science education. Therefore, science is both a product and a development that affects all facets of life and incorporates elements of creativity (Saxena, 1994).

More than other scientific fields, physics plays a significant part in physical science and reflects our daily lives. Our gait, voice, and movement all conform to the established physical laws. Physics is the study of nature, the causes and effects of natural phenomena, and the mathematical formulation of these concepts. Here, the goal is to guide nature's development for human advantage. All natural sciences and engineering specialties that rely on physical science as their foundation originate from physics. Physical science is involved in so many of the circumstances that we encounter and witness in our daily lives. Students' lives are so entwined with physical science that, no matter where you go in the universe, living things, the ground, sky, air, and waterlight and gravity always constitute inseparable parts of the environment of the students (Aycan & Yumusak, 2003).

In a similar vein, scientific practical activity is recognized and widely considered as a crucial part of teaching and acquiring scientific concepts. One of the main tenets of teaching physical science is learning by doing. It is not possible to teach physical science as a theory subject. Scientific theory is built upon the investigation and testing procedure. Without hands-on experience, physical science education is insufficient. Doing practical work is a crucial part of studying science. Science's conclusions are tested in lab settings. The only way to learn by doing is to conduct experiments. Thus, it may be concluded that the design of practical work in a scientific laboratory is an efficient instructional strategy for teaching science and that practical work is absolutely necessary.

"Learning science entails doing science.There isn't another approach to science education." — Dr. D.S. Kothari

"The greatest joy in my life would be to accomplish original scientific work in my laboratory, if I had to live a life again." Andre Dumas, J.B.

"The guiding principle of science education consists in combining theory and practice," states the UNESCO mission report on science education.

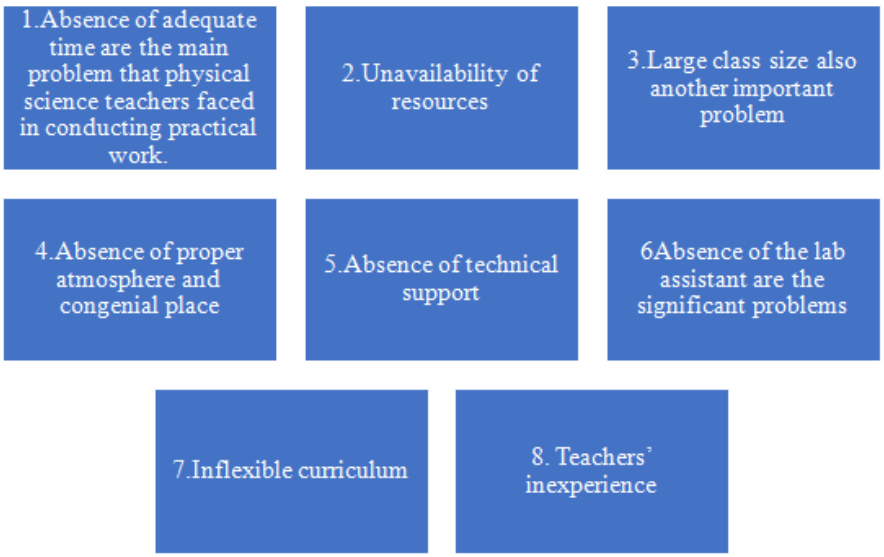
Physical Science should be taught individually in classes XI and XII and integrated up to class X, according to the National Policy on Education (1986). They introduced a novel method for instructing and studying physical science. Through experiments, demonstrations, and student-led projects, it incorporates active student participation. The NCERT working groups tried to keep the lab experiments, theory, and demonstrations closely related to each other.

According to Anderson (2003), there are three main components that make up good scientific practice: sense-making techniques, scientific habits of mind, and science knowledge and practice.

1. Scientific Practice and Knowledge. Experiences, patterns, and models are the three main categories of knowledge assertions that make up science knowledge. Differentiating between these kinds of information is crucial. Observations made by encounters with the things, processes, and events of the physical world are referred to as experiences. Experiences that have been documented and meet repeatability and accuracy standards are considered scientific data. Experience-based patterns include data visualizations like graphs and charts, as well as linguistic and mathematical representations of these patterns, such as scientific laws and generalizations. Systematic explanations of patterns in experience or data that hold true for all data within a domain and can be validated against fresh data are referred to as theories and models.
The two components of scientific practices are application and inquiry. Application refers to the use of scientific models in the construction of systems or techniques for manipulating materials, systems, and phenomena as well as in the description, explanation, and prediction of experiences within their field. To uncover patterns in experience and develop explanatory models, one must engage in inquiry by using arguments based on facts.
2. Techniques for creating sense. We employ a variety of sense-making techniques in our quest to comprehend the scientific universe. The ability to produce accurate responses by applying learned methods is known as procedural display. Achieving practical solutions through action-oriented, person- and context-bound, tacit, integrated, and belief-based reasoning is known as practical reasoning, or craft knowledge. Making sense of the world through interconnected, linear sequences of events is known as narrative reasoning. This tactic is applied to narrative justifications of physical systems and occurrences. Creating and using explicit models or theories that explain phenomena within a scope of application is known as "model-based reasoning," and it is a method used to make sense of the world of science.
3. Curiosity and rigor are the habits of mind of scientists. When a scientist engages in scientific activity, they must be rigorous in their thinking to make sense of the material world and curious about their natural surroundings.

II. Conceptual Framework

The dimensions of problems of Physical Science teachers are



Unquestionably, though, secondary school pupils cannot be effectively taught the concepts, laws, knowledge, skills, and abilities of physical science if teachers are unaware of the struggles they face in imparting knowledge of physical science to their students.

Nonetheless, the current study conceptualizes competent of physical science curriculum at the secondary level in light of the challenges experienced by physical science teachers.

III. Review Of Related Literature

Sandra K.Abell,et.al.(2005)-have studied on "The Challenges of Teaching Physics to Preservice Elementary Teachers: Orientations of the Professor, Teaching Assistant, and Students". The primary conclusions were we understand that launching an investigation can be challenging for instructors, teaching assistants, and students based on our experiences in this course. But if inquiry-based learning is to become the norm in today's classrooms, we think science courses at universities need to model inquiry so preservice teachers may experience it. It is certainly worth the effort to begin inquiry practice in order to break out from the cycle of teacher-centred didactic scientific instruction.

Pedro Sáenz-López1,et.al.(2011)-performed a research Titled 'Describing Problems Experienced by Spanish Novice Physical Education Teachers'The primary insights orthe study's findings demonstrate the need for more emphasis to be placed on social skills and communication, classroom management and organization, the creation and implementation of alternative physical education resources, etc., during the university training of physical education instructors.Incorporating instructors into a school requires the establishment of continuing education programs, especially for those who are in their initial years of teaching.

Umesh Ramnarain David Fortus (February 2013)- made a study Titled 'South African physical sciences teachers' perceptions of new content in a revised curriculum' n found out conclusions that It is advised that more research be done on teachers' practices to examine the relationship between their content knowledge of new subjects and their methods for organizing and reconstructing that knowledge—one of the main characteristics of effective PCK—in order to chart the course for the future. A professional development program that is specifically designed to meet the needs of instructors is necessary, as indicated by the perception of a content knowledge gap among the teachers in this study.

Micheal Naliyana,et.al.(2014)- performed a study Titled 'The challenges of teaching physical education: Juxtaposing the experiences of physical education teachers in Kenya and Victoria (Australia)' The biggest outcomes were Although the educational systems of Kenya and Victoria are somewhat similar, there are also important distinctions that affect how physical education is seen in these two nations. Victorian PE teachers work in a more encouraging environment, according to Kenyan PE teachers.

Cihat Demir Burhan,et.al.(December2015)-'Analysing the challenges of science teachers that they confront when teaching physics education' The main conclusions were that students participated in activities that focused on experiential learning and that setting up a lab atmosphere is essential to teach science. When it comes to physics-related subjects, students may experience learning at any point in their lives that has led to the predicted behavioural shift that comes along with using apps in labs. Thus, laboratories play a crucial part in the teaching of physics.

Arsaythamby Veloo1*,et.al.(2016)- analysed Titled 'Physical Education Teachers Challenges in Implementing School Based Assessment'The study's key findings highlight the kind of assistance that relevant authorities, such as curriculum developers, should pick up from those who actually execute physical education curricula. It is therefore important to emphasize that in order for SBA to be successful, everyone involved must understand that change is a continuous process. Regarding the future, secondary school pupils should be taught the value of engaging in physical activity on a regular basis, whether it be within or outside of the classroom. They ought to be pushed to reach and sustain a level of physical fitness that improves health.

Dr. S. Malathi,et.al.(January 2017)-in her research 'Problems Faced by the Physical Science Teachers in Doing Practical Work in Higher Secondary Schools at Aranthangi Educational District' inKaraikudi found outin order for teachers to engage both themselves and their students in practical work, more time needs to be allotted for the teaching of physical science in higher secondary schools. Instructors must establish support groups in order to improve their ability to undertake hands-on work. Within Service Teachers with experience teaching physical science and subject advisers should provide courses on how to perform productive practical work.

Chako Kasiyoa,et.al.(2017)-carried a study Titled 'An Investigation and Intervention on Challenges Faced by Natural Science Teachers When Conducting Practical Work in Three Selected School of Zambezi Region in Namibia'The key findings were that subject advisers and seasoned science teachers should provide in-service workshops on successful peer review (PW) as part of ongoing professional development (CPD) updates. It is necessary to allot time for practical work with enhanced minutes on the school schedule so that instructors can work at their own pace and potentially get more effectively involved in PW. In order to guarantee that successful learning occurs in each of their schools, the administration of the schools must make sure that the budget for science is drafted with the essential resources and equipment included. To guarantee a solid

foundation in science, the researcher further suggests that science laboratories be constructed in all Zambezi region elementary schools.

James Chacha,et.al.(2022)-in his research Titled 'Challenges Faced by Teachers in Implementing Competence-Based Chemistry Curriculum in Public Secondary Schools in Nyamagana District, Mwanza, Tanzania.'Vital results related to the research objective showed that the implementation of competence-based chemistry curriculum is expected to be positively influenced by teachers' qualifications, particularly by highly qualified and experienced chemistry teachers. Nonetheless, the study found that pedagogy and content-area credentials were necessary for teachers to use a competency-based program. Teachers were not able to carry out the curriculum in an efficient manner due to their inadequate training, pedagogical background, and content expertise.

Sakyiwaa Boateng*,et.al.(June 2023)- made a research Titled-'Voices from the Field: Pre-Service Teachers' First Time Experiences of Teaching Physical Sciences during School-Based Experience' inSouth Africa.A comprehensive analysis of the literature demonstrates that basic schools must have the necessary resources to carry out their new duties of assisting physical science teacher (PST)s in pursuing professional careers. Teachers in the field are also required to serve as mentors and play a significant role in teacher education. Thus, the study found that school-based experienceSBE is essential to the preparation of aspiring professional physical science instructors.

Research Gap

From the above reviews it was found that the various problems faced by secondary school physical science teachers has been studied in South Africa, Tanzania, Namibia, Kenya, Victoria, Spain, Karaikudi, and no research has been done on the problems faced by physical science teachers in India, especially in Odisha.

Another gap of the study was that it didn't considered the problem faced by physical science teachers at higher secondary level and that it only focused on physical science teachers at government schools and not in private aided secondary schools.

Hence, the research is required for tracing out the problems faced by the physical science teachers at secondary schools.

Significance Of The Study

This study has a great importance on physical science teachers for effective understanding of the school-based science subjects since it will encircle out the problems faced by physical science teachers at secondary level. Secondly laboratories related problems at secondary education are given emphasis. Among educators and teachers of physical science, using laboratories to teach the subject has become standard practice. They usually complain the lack of materials and equipment to carryout practical work.It is not convenient for science teachers to place laboratory needs to complete practical tasks. However, it's likely that some of these supplies and tools are hidden from teachers' knowledge in the school laboratory store.

Urban schools are seeing an increase in class sizes, which typically discourages teachers from using the laboratory to teach physical science. Furthermore, the majority of laboratory classrooms lack work tables with enough sinks, water sources, natural gas supplies, and electrical outlets to conduct a physical science lab. Funds are not allocated sufficiently to support such laboratories. Guidelines for the safe use, upkeep, storage, and disposal of laboratory equipment are not officially established. In this aspect, the study has its own importance and the present study assumes significance.

Statement Of The Problem

The purpose of the study is to find out the barriers that science teachers encounter across when instructing physical science in classroom environment as well as the problems faced when conducting practical works related to physical science. Hence, the problem is stated as "**Problems Faced By Physical Science Teachers At Secondary Schools**"

Operational Definition Of The Key Terms

(i) **Problems:**

Here problems refer to the challenges,troubles faced by the secondary school teachers while teaching physical science.

(ii)**Physical Science:**

It refers to Physical Science subjects of secondary schools prepared by school and mass education department, govt. of Odisha.

(iii)**Physical Science Teachers:**
It refers to the persons teaching physical science at secondary schools.

Research Question
(a) What are theresources available and their usage by physical science in secondary schools?
(b) What are the problems and issues that secondary school physical science teachers face when conducting theory and practical classes?
(c) What are the measures to reduce the problems faced by physical science teachers in relation to gender, and types of schools?

Objectives Of The Study
- To explore the availability and usage of the resources by physical science teachers in secondary schools.
- To ascertain the problems and issues thatsecondary school physical science teachers encounter when conducting theory and practical classes.
- To suggests measures to reduce the problems faced by physical science teachers in relation togender, and types of schools.

Methodology
- **Research Design**: - This study is Mixed research consisting of descriptive survey method.
- **Population**: - The population of the study contains secondary level physical science teachers of Khordha District
- **Sampling**: -Purposivesampling technique will be used in this study.
- **Sample**: - The researcher will select 10secondary schools and 10 physical science teachers from Govt. secondary schools of Khordha District
- **Tools And Techniques of Data Collection**: -The tools used for data collection are

(a) Semi structured interview
(b) Questionnaire,
(c) Checklist

- **Data Analysis Procedure**: -The investigator used content analysis and statistical technique such as percentage and frequency analysis to analyse the data collected for this study.

Research Framework

Objectives	**Tools**	**Respondents**	**DataAnalysisProcedure**
1. To explore the availability and usage of the resources by physical science teachers in secondary schools.	Checklist	Teachers	Percentage analysis
2. To ascertain the problems and issues thatsecondary school physical science teachers encounter when conducting theory and practical classes.	Questionnaire	Teachers	Frequency and percentage analysis
3. To suggests measures to reduce the problems faced by physical science teachers in relation to gender, and types of schools.	Questionnaire	Teachers	Thematic analysis

Educational Implication
This part of the research will be confirmed after full completion of the research study.

Scope Of Study
The study will be limited to 10 secondary schools and 10 physical science teachers from Govt. secondary schools of Khordha District.

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