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# Effectiveness of Activity-Based Strategy in Teaching Physics at Class 11 Level in Enhancing Academic Achievement in the Context of Science, Technology, Innovation, and Indigenous Knowledge

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Abstract

*Physics is a fundamental science subject that requires a deep understanding of abstract concepts and practical applications. The present study investigates the effectiveness of activity-based teaching strategies in improving the academic achievement of Class 11 students in Physics. In the modern era of science, technology, and innovation, traditional teaching methods often fail to develop conceptual understanding and critical thinking. This study integrates activity-based learning with the context of Digital India and indigenous knowledge practices to make learning more meaningful. A quasi-experimental design was adopted with experimental and control groups of 11th-grade students. Findings indicate that students taught through activity-based strategies perform significantly better than those taught through traditional methods, highlighting the importance of integrating modern technological approaches and traditional knowledge systems.*

***Keywords:*** *Activity-Based Strategy, Physics Education, Academic Achievement, Innovation, Digital India, Indigenous Knowledge.*

## *Introduction*

Education is a continuous and dynamic process that shapes an individual's knowledge, skills, and values. It plays a crucial role in developing responsible citizens and fostering social progress. Among various disciplines, science education holds a central place as it promotes inquiry, reasoning, and problem-solving abilities.

Physics, as a branch of science, deals with the fundamental laws of nature and the transformation of energy and matter. It is essential for understanding technological advancements and everyday life processes. However, many students perceive Physics as a difficult subject due to its abstract concepts and traditional lecture-based teaching methods. Traditional teaching often emphasizes rote memorization rather than conceptual understanding, creating a gap between knowledge acquisition and meaningful learning. To overcome this, innovative strategies like activity-based learning are required.

***Need and Significance of the Study***

In the present era of science, technology, and innovation, education systems are shifting toward student-cantered approaches. The Digital India initiative has further emphasized the use of technology in teaching-learning processes. However, many classrooms still rely on traditional methods, which limit students' participation. There is a need to:

Promote interactive and experiential learning.

Integrate technology and innovation in education.

Utilize indigenous knowledge systems to make learning context-based.

***Review of Related Literature***

Research studies indicate that activity-based teaching significantly enhances understanding and retention.

**Conceptual Clarity:** Researchers found that activity-based teaching improves conceptual understanding compared to traditional methods.

**Engagement:** Studies revealed that traditional teaching leads to passive learning, whereas active learning enhances student engagement.

**Innovation:** Research shows that integrating technology and innovative practices improves student outcomes in science subjects.

**Indigenous Knowledge:** Linking scientific concepts with traditional practices helps in connecting knowledge with real-life experiences.



***Objectives of the Study***

1. To compare the academic achievement of students taught through activity-based strategies and traditional teaching.
2. To examine students' responses toward activity-based learning.
3. To analyze the role of science, technology, and indigenous knowledge in enhancing learning.

***Hypothesis of the Study***

$H_0$: There is no significant difference in the academic achievement of Class 11 students taught through activity-based teaching and traditional teaching.

***Methodology***

***Research Design***

A quasi-experimental design (Pre-test Post-test Control Group) was adopted for this study.

***Sample***

The study was conducted on a sample of 60 students of 11th grade.

| Group | Number of Students |
|---|---|
| Experimental (Activity-Based) | 30 |

| | |
|---|---|
| Control (Traditional Teaching) | 30 |

***Tools Used***

| Tool | Purpose |
|---|---|
| Activity Modules | Instructional Strategy |
| Achievement Test | Measure Performance |
| Reaction Scale | Measure Student Feedback |

***Integration with Science, Technology, and Indigenous Knowledge***

The study emphasizes a multi-dimensional approach:
Science & Technology: Use of experiments, digital tools, and simulations under the Digital India framework.
Innovation: Incorporating project-based learning and inquiry-based teaching.
Indigenous Knowledge: Linking Physics concepts with local traditional practices and real-life applications to promote contextual learning.

***Analysis and Discussion***

The findings indicate that students taught through activity-based strategies performed better academically than those taught through traditional methods. Activity-based learning improved conceptual clarity, retention, and engagement. Students showed positive reactions, indicating increased interest and motivation when science was linked to modern technology and indigenous contexts.



***Conclusion***

Activity-based teaching is an effective strategy that enhances academic achievement and student engagement in Physics. By bridging modern innovation and indigenous knowledge, it promotes meaningful learning. The study suggests that integrating these strategies into classroom teaching can improve the quality of education and make learning more student-centred.

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