

Abstract of the Thesis

Title of the Thesis: Development of an Instructional Design for Bridging the Gap between Shared and Alternative Conceptions of Senior School Students in the Area of Electricity and Magnetism.

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Alternative Conceptions refers to the students' ideas and beliefs that are significantly different from the scientific view while Shared Conceptions refers to the scientifically consistent conceptions presently shared by the community of scientists.

The present study aims to explore the teaching and learning of Physics with specific focus on students' alternative conceptions at tertiary school level. My experience of teaching Physics to senior school students encouraged me to take up a research larger in scope and more in depth and structured around a specific area of Physics. Based on the experience of many teachers and the available literature, it is suggested that, electromagnetism is highly abstract and mathematically intensive, hence difficult to grasp by learners.

The key areas in Electricity and Magnetism were first identified. These were – Static Electricity, Current Electricity, Electric Potential and Electromagnetism. A tool consisting of multiple choice type and free response type items was used to identify different alternative ideas related to the above topics. Simultaneously, a list of corresponding shared conception for each alternative conception was prepared and formalized with help from subject experts. The interventional modules were then administered on a sample of 52 students. Then a post interventional assessment tool which included items parallel to those in the pre-test was prepared. The performance of the students on the pre- and post- interventional assessments was then analyzed and the findings were reported.

The study shows that students even at tertiary level of school education may hold alternative conceptions which may not get manifested in response to standard questions and special probes may be necessary. A few probable causes of the alternative conceptions and development of students' conceptual framework through teaching learning experiences created in the class room were- Confusion between similar concepts, Mathematical language of Physics , Focus on only one parameter while solving a problem and Limited perspective of the concept. So subject studies need to be strengthened in the classroom as this is the last opportunity in the academic lives of students before they engage in a formal study of any of the disciplines. Teaching methodology should focus on the replacement of the alternative conceptions with new concepts through questions, experiments, demonstrations or hypothetical situations with or without the underlying principle. Since all students do not respond to the same instructions in the same fashion, it would be more meaningful to evolve a 'learning design' to replace the 'instructional design' which caters to individual differences.

The present study explores students' ideas in Electricity and Magnetism only. Other areas of Physical Sciences could similarly be investigated and appropriate interventions developed. For this purpose, the use of technology in innovative ways can be explored to create appropriate conditions of learning. Such studies, however, remain ineffective till assessment is understood and structured differently. The present system of evaluation caters little to any variation of learning and its expression. Thus different ways of assessment need to be devised which are in congruence with constructive pedagogy.