Teacher’s And Student’s Perceptions Of Problem Solving Difficulties In Physics
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Abstract

In recent days, science education researchers have identified a lot of instruments for evaluating conceptual understanding as well as student’s attitudes and beliefs about physics. However, there are no broad based evaluation instruments in the field of problem solving in physics. One obvious way by means of which we can evaluate student’s problem solving skills is to find out how teachers and students perceive problem solving difficulties in physics. A sample of 130 secondary school physics students and 20 physics teachers in Puducherry region was taken for the study. The result of the analysis show that lack of students understanding of the problem and their poor mathematical skills constitute the major obstacles that students experience in solving physics problems. Apart from these the investigator put forward a model on Problem solving ability.

Keywords: Teacher Student Perception, Problem solving ability

Introduction

Science has been and will continue to be a tremendous importance to humanity for its ability to explain many of the everyday occurrences in life, as well as playing a very significant role in the technological development of both developing and developed nations of the world. In performing these roles, science apparently depends on the language of mathematics as a means of communicating its Quantitative and Qualitative aspects.

Physics the most fundamental science during its reputation as a difficult subject primarily from its dominant problem solving nature. Further more as a subject that deals with Physical Quantity and mathematical exactitudes virtually all branches of physics are concerned with problem solving.

A number of authors have offered various definitions of problem solving. Ausubel (1971) defined problem solving as a form of discovering learning, bridging the gap between the learning existing knowledge and the solution of the problem. Gagne (1970) viewed problem solving as the result of assembling rules already known to create a new superior rule which is learned and allows solution of the problem.

Problem solving has become one of the most important valued areas of investigation in science education, particularly physics and chemistry. Unfortunately research studying has found that many students perform algorithmic or mathematical manipulation by rote memorization of formulae without having a basic understanding of specific concepts. The reasons why students find problem solving difficult have been identified by many researchers as students failure to construct meanings from the problem statement, not being able to link the meaning of the problem to their knowledge structures or simply lacking the appropriate knowledge structure for that specific content area.
The basics for a great deal of research in solving problems can be found in the works of Polyá (1957) who identified a four stage model for problem solving. These are recall, planning, implementation and evaluation. Schoenfeld (1992) followed up the research work of Polyá when he distinguished between five cylindrical episodes of solving problems such as survey the problem, activate knowledge, make a plan, carry out the plan, check the answer.

**OBJECTIVES**

To investigate physics students and teachers perceptions on students inability to solve problem

**METHODOLOGY**

A likert type 5 point scale attitude questionnaire was constructed. The content of the Questionnaire was drawn out from an analysis of preliminary interview with 45 secondary school physics students in which every student was asked to state his difficulties. The questionnaire was validated by experts in physics subjects. Its internal validity was established by using the split half technique. The corrected co-efficient value was 0.92. The questionnaire was later administered to 130 secondary school physics students and 20 physics teachers in Puducherry region. The need to involve students lies in the fact that one should be able to get to the root of where the problem lies.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Statement</th>
<th>SA/A %</th>
<th>UN %</th>
<th>DA/SD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Insufficient laboratory practical work in the topic area.</td>
<td>80</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td>2.</td>
<td>Inability to remember the necessary equation to solve the problem.</td>
<td>73</td>
<td>59</td>
<td>18</td>
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<tr>
<td>3.</td>
<td>Lack of understanding of the problem.</td>
<td>107</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>4.</td>
<td>Not having enough practice in problem solving in class.</td>
<td>91</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td>5.</td>
<td>Students’ poor understanding of the necessary mathematical skills.</td>
<td>94</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>6.</td>
<td>Poor understanding of physics definition, principles, and rules.</td>
<td>88</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>7.</td>
<td>Poor teaching and lack of motivation from the teacher.</td>
<td>85</td>
<td>39</td>
<td>26</td>
</tr>
<tr>
<td>8.</td>
<td>Insufficient home assignments or exercise on physics problems.</td>
<td>69</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>9.</td>
<td>Confusion arising from units and their conversions.</td>
<td>61</td>
<td>42</td>
<td>46</td>
</tr>
<tr>
<td>10.</td>
<td>Lack of good text books or course materials on physics problems.</td>
<td>58</td>
<td>50</td>
<td>42</td>
</tr>
</tbody>
</table>

Analysis of table 1, suggest most of the respondents (107%) agreed that lack of understanding is a problem and only 58% of the respondents agreed lack of good text books or course material on physics is a problem.

After having gone through the various steps and strategies suggested by various researchers incorporating the essential characteristics of the model, the investigator put forward the following Step model on Problem solving Strategies.
**Problem solving Strategies:**

1. Identification of the problem
2. Diagrammatic scheme of a problem or Mind Mapping/ Graphic organizer
3. Statement of the problem
4. Dissection
5. Exploration
6. Analyze
7. Organize
8. Generating solution
9. Verification/ Revision
Fig. 1 STEP MODEL ON PROBLEM SOLVING STRATEGIES

Fig. 2 JOHNSON’S MODEL ON PROBLEM SOLVING ABILITY

CONTINUOUS AND SYSTEMATIC INTERACTIONS OF THESE SKILLS

INPUT

Problem solving Strategy
- Identify
- State
- Dissect
- Explore
- Analyze
- Organize
- Generating Solution
- Test
- Apply
- Learn
- Reflect

Self Regulation Problem solving strategy
- Self regulation Orientation
- Metacognitive Knowledge
- Reflection in action
- Meta Comprehension
- Meta memory
- Critical thinking
- Self Monitoring
- Self Regulation
- Self Evaluation
- Reflection on action

PROCESS

- Awareness of one’s cognitive process
- Knowledge of one’s own learning process
- Awareness of one’s thinking
- Developing plan of action
- Developing logical thinking
- Comprehending problem
- Acquisition of new knowledge
- Developing logical reasoning
- Knowing one’s memory system
- Selection of appropriate strategies
- Knowing the progress
- Perceiving difficulty
- Meta cognition
- Regulation of cognition
- Motivation
- Developing strategic competency
- Tackling similar situation
- Interest in problem solving

OUTPUT

PROBLEM SOLVING ABILITY
After identifying the components of problem solving strategy, they are organized to meet the demand of any problem solving situation in science. To make this problem solving strategy more effective, self-regulatory orientation is given for all the components of problem solving strategy by means of it’s identified components that are organized in such a way to enhance problem solving ability. It is believed that all kind of problems in Science are prepared to be taught effectively by this model. The following model explains the detailed function of Self-regulatory orientation in which set of skills could be developed in students on enhancing problem solving ability.

**CONCLUSION**

This study sought physics students and their teachers’ opinion on difficulties encountered in solving physics problems. It is therefore recommended that students should be given the opportunity of having regular problem solving sessions during the process of learning physics, curriculum developers and science educators might also need to incorporate mathematical concepts that are useful and necessary to the understanding of physics in new physics curriculum and text books. The above mentioned model will help the teachers and students to enhance their problem solving ability in this Knowledge era of the 21st century.

**References**


Polya, G. (1957) How to solve it, New York: Double Day and co., Inc.