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CHALLENGES OF STUDENTS IN SOLVING PHYSICS NUMERICAL PROBLEMS

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ABSTRACT

In contemporary educational scientific world students perceive physics to be a difficult and hard subject essentially because they undergo a lot of difficulties in solving physics numerical. Now a day, it is important to determine the causes of these difficulties. Many of the students who understand the physics concept might not do well numerical problems because they are unable to identify the relevant concepts or incapable to recognize the questions posed. Further research should explore whether a framework for students difficulties during problem solving can be constructed. Such a framework is helpful for categorizing students' weakness through that differentiated learning may take place. What is the main cause of these obstacles? Do students use suitable methods and strategies for solving physics tasks? Do students know what methods or strategies should be used? As we authors imply four steps for solving numerical problems.

INTRODUCTION

Tradition education endow with interactive relationship between students and teachers. This interaction promotes better understanding of the contents and provides opportunities to learn with peers. Sciences especially physics playing imperative role in technological development, innovations in medical sciences of developing and developed countries. Physics requires a certain amount of memory work but unlike other subjects, during solving problems students also need to apply the concept what they have learnt. Due to its dominant problem solving nature primarily attain its esteem as an arduous subject. "I understand the concept; I just can't do the problems". Every physics teacher has heard this affirmation from students. Students must learn how to use the concepts of physics; in addition they might learn how to think like a problem solver. During the problem solving students must beconsciousto understand the given question, to relate the question with physics concept, to substitute the values with proper notation, to calculate the numerical values and give the solutions with correct units.

APPROACHING THE NUMERICAL PROBLEMS

Never ever judge a numerical problem by looking at it. A problem may seem to be complicated on first look but students should be confident and collect information from the given problem, then formulate basic equations and calculate what they need. If they are not

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focused, they may end up with messing calculation or they may misinterpret the question. Here we suggest four steps to approach the numerical problems in physics.

UNDERSTANDING THE QUESTION

Physics numerical problems are actually not so complicated to understand. Before understand the question, most of the occasion students try to solve the numerical problems directly. It is perceived as "more difficult" because they haven't approached the subject in the special way that's required for physics. When the numerical problem is not well-understood, the solution of the particular problem will lead to a new problem. In fact there's no guarantee the solution will address the problems at all. So "understanding the question" is the vital role in problem solving. Students must understand the problems intensely and utterly. When they deeply recognize the problems, they must think what is absolutely posed. Once they identify the problem, they realize that the most problems are solvable at all. Here we consider an example.

A particle is having initial velocity 15m/s moves with constant acceleration 10m/s^2 for a time 10s. Find the displacement of the particle in last one second.

Identify the given data from the problem.

Initial velocity $u = 15m/s$

Acceleration $a = 10m/s^2$

Time $t = 10s$

If the students failed to understand the question, adding a few seconds for reading the question again is much better than doing the problem twice.

RELATE THE CONCEPT

Physics usually involves starting with basic ideas and building on them, it is much more hierarchical than other subjects. While approaching the numerical problem the presence of misconceptions and an inappropriate phenomenological primitive is the main challenge of the students. The difficulty of problem solving is due to "calculations related to the concept". Relate the concept before implementing solutions is a pillar of lean thinking. The problem solver has to deal with establishing the link between theoretical idea and the given data. Establishing a connection between concepts and data constitutes one of the most important and most difficult steps of the problem solving. Most of the students are lacking in the appropriate knowledge in specific content area. From the above example problem, after finding the given data students must link this information with the concepts. Having initial velocity, constant acceleration and time, we can relate this problem with the equations of linear motion.

$$s = ut + \frac{1}{2}at^2$$

EXECUTION

Our objective is that to derive a new equation that can be used to describe the motion of an object. The equation of motion is valid only when acceleration is constant and motion is constrained to as straight line. It would be correct to say that no object has ever travelled in a straight line with a constant acceleration anywhere in the universe at any time. In many instances, it is useful to assume that an object did or will travel along a path that is essentially straight with an acceleration that is nearly constant. There is any deviation from the ideal motion can be essentially ignored the problem may be solved if we are very familiar with the concept by divergent thinking. In above case, we can solve this problem by different methods. Here we have to reconstruct an above equation of linear motion. Reconstruct

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the equation without substituting the numerical values stimulates us towards calculating the solution directly.

$$s = ut + \frac{1}{2}at^2$$

$$s' = u(t-1s) + \frac{1}{2}a(t-1s)^2$$

$$s' = ut - u(1s) + \frac{1}{2}at^2 - at(1s) + \frac{a}{2}(1s)^2 \rightarrow (1)$$

$$s_t = s - s'$$

$$s_t = \left[ut + \frac{1}{2}at^2\right] - \left[ut - u(1s) + \frac{1}{2}at^2 - at(1s) + \frac{a}{2}(1s)^2\right]$$

$$s_t = u(1s) + at(1s) - \frac{a(1s)^2}{2}$$

$$s_t = u(1s) + \frac{a}{2}[2t - 1s][1s]$$

CALCULATIONS AND UNITS

Over the years many educators have been trying different ways and methods to help their students avoid making careless mistakes. In recent studies have been found that most of the students perform mathematical calculations, algorithm by rote memorization of formulae without having a basic understanding of specific concepts. Again we noticed the same point that students must understand the concepts better than the memory of formulae. A calculation is an intentional process that alters one or more inputs into one or more results with variables. Substitute the values which we know from the question is an important thing in the calculation. Always substitute the values at the end after deriving a general expression because many of the problems are made that values of given constants cancel each other. A student usually made the mistakes like copies the wrong numbers from the question, carries the wrong values to proceed and transfers an incorrect sign from one step to the other. Always assume that our solution is wrong until we have checked. Meanwhile there are some numerical questions that give us information in different units of measurements. If the student is not careful, they may fall into the trap of ridiculous mistakes. This is especially for questions that involve mass, length and time. Therefore, the students should avoid careless mistakes is to be alert to the units of measurement used. Whenever they read a numerical problem, check that the units given are the same before working with the numbers. Be sure to keep an outlook for whether the units are expressed in g or kg, cm or m, min or s.

$$s_t = u(1s) + \frac{a}{2}[2t - 1s][1s]$$

$$s_t = 15(1s) + \frac{10}{2}(20 - 1)1s$$

$$s_t = 110m$$

CONCLUSION

In fact physics is not too difficult to understand. If you are good at physics, it must mean that you are awfully proficient in some other area like sporting ability, social skills and building relationships. So the students should be aware of that physics is like learning a language. Just because you know all the irregular verbs in French, doesn't mean you can hold a conversation in French. The learners should understand everything in the given question. Sometimes they read the question wrongly and even when they read it again they will do the

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same mistake as their mind in fixed to that wrong question. Students can comprehend the problem easily when they approach numerical questions with basic concepts and proper understanding of physics. They can determine the principles, physical laws and equations involved in the problems. We conclude that students face many difficulties while solving numerical problems in physics especially relating the problem with concept. The more they practice, the more accurate and confident they can get. There are no shortcuts. Practice the problems with proper concepts lead to get solutions. Finally, understand the concept and practice the problems.

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