USING THE ENVIRONMENT FOR MORE EFFECTIVE PHYSICS TEACHING

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It is suggested that the present physics syllabuses for Std. 9 and 10 can be made more relevant and interesting by linking them more closely to mathematics and by the imaginative use of the local environment.

INTRODUCTION

Physics is not an easy subject to study, but we think that it can be made easier if the pupils' knowledge of mathematics is sharpened by encouraging them to study mathematics at the higher grade (HG) level and by making greater use of the environment as a teaching medium.

The present syllabus requires that "at least mathematics standard grade (SG)" is needed for physics HG pupils. In fact mathematics HG is needed since sections such as vector algebra and 'dot-product', which are useful for solving problems in physics, are left out of the mathematics SG syllabus. Another problem is that the std. 9 physics syllabus contains problems which require knowledge of topics such as vectors and 'dot-product' yet these are only taught in mathematics std. 10 HG. Therefore physics std. 9 HG should correspond with mathematics std. 9 HG or else the problems that need mathematics std. 10 HG should be excluded from the physics std. 9 HG syllabus.

Many aspects of the teaching of physics can also be enhanced by the imaginative use of the school and local environment. Such an approach is particularly pertinent where schools are poorly equipped in terms of laboratories and apparatus. Using the environment by actively involving the pupils may even be a crucial factor in the development and internalising of abstract concepts. We will treat the following topics and their examples found in the physics syllabus i.e. Vectors and the environment e.g. displacement.
Sir Isaac Newton's 2nd and 3rd Laws of Motion and the environment.

VECTORS AND THE ENVIRONMENT (STD. 9 HG)

Displacement
Defined as the distance between two points in a specified direction.
Resources: The teacher and the pupils, two bricks A and B and a measuring tape.
Environment: School grounds or open space.
Procedure: The teacher will act as a supervisor. One pupil (Pat) chosen will place bricks A and B several metres apart then start walking from A to B while the others are observing. The teacher will call another pupil to measure the distance between the two bricks - say 5 metres - and choose a third pupil to describe the direction in which Pat was moving.
Solution: If he moved from A to B then Pat's *displacement* would be 5m towards B. Hence the pupils will be in a position of relating the theory they have learned with the immediate environment so that they cannot forget.

SIR ISAAC NEWTON'S LAWS OF MOTION AND THE ENVIRONMENT

Second Law of Motion
Force exerted on a given mass is directly proportional to the acceleration and indirectly proportional to the mass. That is $F = ma$ where m = mass, a = acceleration and f = force.
Resources: Empty bucket, the pupils and the teacher.
Environment: A well.
Procedure: In a rural area the pupils could be taken to a nearby well. Then the bucket tied up with a string would be put carefully into the well to fetch the water from the bottom. This would be done firstly by the teacher and thereafter by the pupils. A similar experiment could be performed from any high point such as a building if there is no well.
Solution: Knowing the quantity of water in Kilograms the bucket is supposed to contain, then the force can be determined easily, employing the formula $F = mg$ where g in this case is the *gravitational acceleration*. ($g = 9{,}8$ m/sec^2).

Third Law of Motion
To every action there is reaction.
Resources: The teacher and the pupils, a rope.
Environment: The school grounds and the immediate environment.
Procedure: So that the pupils must appreciate the above law a good explanation coupled with a demonstration is needed. The teacher must make the pupils appreciate the fact that the earth is exerting a force on us and on the other hand we are also exerting an equal but opposite force on its surface, since if these two opposite forces were not balanced then we could be falling into the earth.

Another example could be that of a rope tied to the branch of a tree. If one pupil jumps and gets hold of the rope and the rope does not break, then the teacher would be able to require them to explain the nature of the forces coupled with tree, rope and the hands of the participant.

CONCLUSION

These examples illustrate that the environment can be used to simplify some of the problems in physics. Such a practical demonstration will be more likely to lead to internalisation of the concepts than mere book learning.

The teacher must be versatile in the sense that he/she must be in a position of applying the theory taught in the classroom to the outside environment. In this way many problems could be solved by using the local environment.

REFERENCES

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