TEACHING THE EFFECTS OF FORCE AT GRADE LEVEL VI : TEXTUAL ACTIVITIES VERSUS HANDS-ON ACTIVITIES

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The effects of force should be related to daily life situations and in technology. The students should be encouraged to identify the situations in the school environment wherein effects of force are visualised and to make a list thereof. This will enhance observation power of students.

Introduction

The effects of force form an important concept at the middle school level. In the NCERT syllabus for Class VI, the concept comes under the topic of "Motion, Force and Machines" (Lahiry et. al. 1987). After the idea of force has been introduced to the students, it is quite worthwhile to introduce the effects of force through some activities to give students the first-hand feel of the same.

Though the NCERT book Science: A Textbook for Class VI has given some activities to introduce the concept but common experience of teachers indicates that the activities described in the textbook are not dramatic and challenging and children find them common place and dull. Therefore it was thought that some alternate activities in which more dramatisation, along with some hands-on aspect, connected with assembly and construction of the activities are there, should be developed.

Objectives

Before the topic is dealt within the classroom, the previous knowledge of students on the concept of force and kinds of forces should be tested and reinforced. The teaching of the topic "Effects of Force" should lead to attainment of the following instructional objectives:

1. To provide hands-on experiences for learning effects of force.
2. To apply the concept to daily life situations.
3. To explain some simple events on the basis of effects of force.
4. To use the effects of force to design some simple (low-level) technological devices.

Textual Activities

The activities as described in the NCERT textbook are shown in Table 1.

Table 1

Name of the activities	Short description	Major conceptual experience
Change in speed	a. Opening an umbrella against the wind. b. Hitting glass marble gently and then strongly.	Pushing back by the wind and decrease in speed. Observing the difference in speed.
Change in direction	Dropping of a cardboard piece and striking it with hand in air.	Due to striking the cardboard changes direction in the mid-air.
Change in shape	i. Pressing dough ii. Pressing sponge iii. Pressing tomato iv. Hammering a strip of iron v. Extending a spring	The shape of all the objects changes on applying force.

Summary of NCERT Textbook Activities on the Concept of "Effects of Force"

Short Critique

Even a cursory look at these activities would indicate that these cannot be effectively used as demonstrations or hands-on experiences for children as they are more of daily life applications which children keep on experiencing quite frequently. Such classroom activities which are mostly discussed orally do not excite the children.

The activities mentioned in Table 1 do not provide the opportunities for children to design the activities themselves through assembly and construction which are essential components to sustain interest and make learning of science a joyful experience for children.

Alternative Method

As an alternative to the above-mentioned activities, some new activities were envisaged and implemented to provide children with some experience in construction and assembly before extracting the concepts from the activities which children found quite absorbing.

Before a sample activity is given in some detail followed by other activities in brief, it would be worthwhile to mention that mainly the rubber bands were used for imparting the concepts related to "effects of force". The concepts were

further simplified into sub-concepts to provide a variety of experiences. The conceptual schemes of

S. No.	Name of activity and major concept	Sub-concepts	Short description of assembly*	Remarks
1.	Change of shape	(i) Elongation (ii) Twisting (iii) Compression	Rubber band tied to a thread which passes over an improvised pointer-pulley arrangement A rubber band tied to a cycle spoke with free end bent into the shape of '8'.	Extension investigative activities by increasing force in steps. Making a rubber band newton-meter.
2.	Imparting motion	(i) Setting a body into motion for rest (ii) Distance travelled increases with the increase in force.	Rubber-band* projectile	Investigative activity: Force vs. distance moved.
3.	Destroying motion	Resistive force	Making a wheel** roulette and stopping with lever brakes	
4.	Increasing speed	Pulling a match box trolley and again pulling it with a newton-meter.	Trolley is made with match box and plastic buttons***	Investigation: force vs. speed
5.	Change of direction	Curvilinear motion	Rotation of two objects—one heavier than the other—tied by a string and passing through a straw piece which is rotated	Qualitative investigation is possible.

the alternate activities are summarised in Table 2.

Table 2

*Kenneway (1980) ** Gupta (1989) *** Gupta (1990)

Exemplary Activity

The activities were prepared in the form of activity sheets. An example of such a sheet is given below.

Tools: Hammer or big stone or brick piece, scissors.

What is to be done:

1. Take the wooden piece and drive in a nail or an alpin near its one end.
2. Now take another nail or alpin and fix it 5 cm away from the first nail.
3. Take a refill piece and pass it over the 2nd alpin or nail.
4. Fix the hook near the other end of the wooden piece.
5. Take the rubber band and tie it to one end of

the twine thread.

6. Pass the twine thread over the refill piece giving it one turn around the refill piece.
7. Pass the twine thread through the hook and tie it to the U-clip or jam clip.
8. Take the thick paper piece. Trim its corner on one end to make a pointer out of it.
9. Near the other end of the pointer put a small cut and pass it over the refill piece so that it remains fixed.

Activity: Put the twine thread from the U-clip

a. What do you observe?

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_____

b. What do you conclude from this activity?

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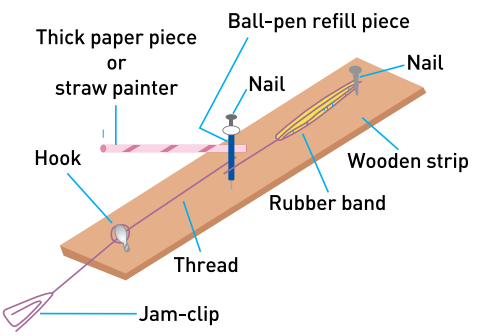
Extension activity could be the study of relationship between load and extension of the rubber band.

Effects of Force

Sub-Activity 1

Sl. No.	Material	Specifications	Quantity	Remarks
1.	Wooden piece (Piece of a broken wooden scale)	10 cm × 3 cm	1	
2.	Ball-pen refill piece	2 cm	1	
3.	Pin or thin nail	Alpin	2	
4.	Thread	Twine, 15 cm	1	



5. Thick paper piece 1	Chart paper 5 cm × 0.3 cm	
6. Hook 1	Picture frame hook or curtain hook	
7. Clip jam clip 1		U-clip or
8.	Rubber band	About 2

to 4 cm long 1

In Conclusion

A simple action research in which the textbook described activity and learning through activity sheet as described above was given to students and their reactions were elicited in a non-threatening climate showed that children over-whelmingly favoured the latter (N=55, p=0.01)

Thus, in order to make the learning of the concepts related to the topic "Effects of Force" effective, it should be kept in mind to provide hand-on constructive and manipulative experiences to children. It would be still better if children are able to do some investigations in the conceptual areas under consideration. This will provide children a feel for the processes of science.

Furthermore, the effects of force should be related to daily life situations and in technology. The students should be encouraged to identify the situations in the school environment wherein effects of force are visualized and to make a list thereof. This will enhance the observation power of student.

References

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