

TEACHING BIOLOGICAL SCIENCES IN SCHOOLS - APPLICATION OF THE "PROJECT METHOD"

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Abstract

The 'Project method' of teaching is one of the oldest and most popular educational views of John Dewey-practiced worldwide in various subjects. However, the initial implementation of this method in developing countries like India had not been successful. But today, it is attracting youth and the modern society to adopt a student centered method of education. In India, Jawahar Navodaya schools and Kendriya Vidyalaya Sadans have been implementing the same as a part of their curriculum for years, which is amply documented. The present study has made an attempt to learn the application of project method in teaching biological science concepts viz., chemical stimuli on the

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sensitivity of *Mimosa pudica*. The findings from this experimentation are discussed.

Keywords: Project method; Teaching of Biological concepts,

Introduction

The project method is the outcome of the pragmatic educational philosophy of John Dewey, the well known American Philosopher-cum-Educationist. It was developed and perfected by Dr. William Head Kilpatrick of the University of Columbia. It involves choosing a particular theme or topic and weaving several activities, spanning multiple subject areas, in an effort to integrate and make whole all the information about the chosen topic. (Chaube S.P. *et al.*, ISBN 81)

The following points have been stressed in the above-mentioned definitions of the project:

1. A project is a problematic act.
2. A project is a purposeful activity.
3. A project is a whole-hearted activity.
4. A project is an activity in natural setting.
5. A project is an activity in a social setting.
6. A project is a bit of real life introduced in school.
7. A project is a problem solving of a practical nature.
8. A project is a positive and concrete achievement.
9. A project is an activity through which solution of various problems are found out

Role of a Teacher in Project Method

For the project to be successful, it must be based on a definite procedure. The prime responsibility of the teacher is to provide those situations to the students wherein a spontaneous urge to solve some of their practical problems, must be felt. The teacher must be on the lookout of discovering their interests, tastes, aptitudes

and needs. There are different methods of providing situations. As far as possible, problems or situations which are provided to the students should be social ones. These train them to develop better social and inter personal skills and provides more satisfaction. The teacher may converse with the class on different topics of interest to them. The teacher is to tap all resources to provide worthwhile situations. (Troehler et .al.)

Implementation of Project Method in Schools

In India, Jawahar Navodaya schools and Kendriya Vidyalaya Sadans have been implementing the same, as a part of their curriculum for years. The creativity of the children is tapped and helped in reaching their horizon of possibilities by encouraging them to participate in innumerable activities related to the theme of the project. The children and teacher both throw themselves into the spirit of the project and begin by engaging in serious and extensive research about the topic in all its aspects. For weeks, encyclopedias, magazines, journals, newspapers, parents and friends are consulted in the effort to gather information- inside and outside the classrooms. Art and Craft are used to express ideas generated by the children's research. Once the imagination is let loose, there is a support of creative compositions by all, taking the form of plays, poems, stories, dialogues and formal reports too. Eventually all this material is organized in individual scrapbooks or project files and the plays and poems are performed informally for each other or for parents in a more formal display. There is no formal individual assessment and the lack of it has not hampered or hindered the pursuit of excellence. Unthreatened and free from the fear of judgment, children work at their projects motivated entirely by their curiosity and the joy of discovery. Instead of individual assessment, the projects culminate in a performance and a display of their scrap files and art and craft work. (*The Project Method: Planet Vidya Schools*- <http://www.planetvidya.com/schools>)

Methodology

The biology teacher had selected twenty five students randomly from eighth standard for the experimentation. The teacher had given proper instructions to the students about the project for two periods. Teacher had assigned the topic **"Sensitivity of 'Touch-me-not' plant to chemical stimuli"** to the students. Sufficient time was given to carry out the experimentation. Students had conducted the experiment in the following way;

Illustration of Project Method

Project: Study on the sensitivity of 'Touch-me-not' plant (*Mimosa pudica*) to chemical stimuli

Objectives of the project

1. To enable the students to select the various chemical stimuli in the form of water, sugar solution, saline, vinegar and kerosene.
2. To enable the students to observe and justify the effect of chemical stimuli on the sensitivity of *Mimosa pudica*.
3. To enable the students to systematically classify *Mimosa pudica* and aid in taxonomical study

Mimosa pudica is well known for its rapid plant movement. In the evening the leaflets fold together and the whole leaf droops downward and later re-opens at sunrise. This type of motion has been termed *Nyctinastic movement*. The leaves also close up under various other stimuli such as touch, warmth, wind etc. The stimulus can also be transmitted to neighbouring leaves. These types of movements have been termed *Seismonastic movements*. The movement is caused by a rapid loss of pressure in strategically situated cells that cause the leaves to droop.

This characteristic is quite common within the *Mimosaceae* family.

KINGDOM: Plantae

DIVISION: Magnoliophyta

CLASS: Magnoliopsida

SUBCLASS: Rosidae

ORDER: Fabales

FAMILY: Mimosaceae

GENUS: *Mimosa*

SPECIES: *pudica*

Common names: Shame plant, Common sensitive plant, sensitive grass, sensitive plant, sleeping grass, touch-me-not, shame plant.

Habitat: *Mimosa pudica* is common in rather moist waste ground, in lawns, in open plantations, and weedy thickets. The plant is a native of tropical America, naturalized nearly all through the tropical and sub tropical parts of India.

Materials required:

Mimosa pudica herb; water; 10 % sugar solution (table sugar); 10 % saline (common salt solution); 10% acetic acid solution (vinegar); kerosene; dropper

The three independent variables taken into consideration for carrying out the study were the various chemical stimuli like:

- a) Water
- b) 10 % Sugar solution
- c) 10 % saline
- d) vinegar
- e) kerosene

The two dependent variables taken into consideration for the study were:

- a) Time taken for closure of leaflets (Initial Reading- t_1 seconds)
- b) Time taken for leaflets to reopen (Final Reading – t_2 seconds)

The difference in the above two readings would yield the Recovery Time ($\Delta t = t_2 - t_1$) seconds.

Each independent variable was subjected to experimentation on the test plants and the corresponding values with respect to the dependent variables were noted. Periodic observations of the sensitivity of *Mimosa pudica* to the above mentioned chemical stimuli were recorded and the time taken for recovery was noted. Water was used as the control.

Methodology of Experimentation

An appropriate *Mimosa pudica* herb was selected. This plant (P_1) was subjected to a definite stimulus like water. The time taken for the leaflets to close and reopen was noted and hence the recovery time was calculated. The experiment was conducted in triplicates to ensure uniformity.

The above test was followed in a similar manner using the various chemical stimuli (sugar, saline, vinegar, kerosene etc.) on the same three plants as used above. In each case, the recovery time was noted and the corresponding means and standard

deviations were calculated. This data was used for t-test analysis and the comparison of the validity of the stimuli was observed.

Control v/s Treatments	t- test results	Level of significance
Water v/s sugar solution	6.627	0.001
Water v/s saline	1.738	—
Water v/s vinegar	10.127	0.001
Water v/s kerosene	8.629	0.001

The significant difference of *Mimosa pudica*'s sensitivity to **water and sugar solution** with degrees of freedom (n=4) was found to be 6.627. This was significant at 0.001 level.

The significant difference of *Mimosa pudica*'s sensitivity to **water and saline** with degrees of freedom (n=4) was found to be 1.738. This was not found to be significant at any level.

The significant difference of *Mimosa pudica*'s sensitivity to **water and vinegar** with degrees of freedom (n=4) was found to be 10.127. This was significant at 0.001 level.

The significant difference of *Mimosa pudica*'s sensitivity to **water and kerosene** with degrees of freedom (n=4) was found to be 8.629. This was significant at 0.001 level.

Results and Discussion

In the present experimental study- sensitivity of *Mimosa pudica* to chemical stimuli- has shown consistent results. The t-test proved significant for all trials of control with sugar solution, vinegar and kerosene. This can be attributed to it having a long range of significance at 0.001 which minimizes the chances of errors.

The test with saline proved to be meager and did not correspond to the t-test results. Hence, this could be discarded as being insignificant for the trial. Other parameters which could affect the sensitivity of the plant along with the chemical stimuli include velocity of wind; concentration of solutions- table sugar and common salt and temperature of noon hours during which the trials were conducted.

The significance of the sensitivity of the herb to water and sugar solution ascertains the fact that these can be regarded as important parameters in assessing the enigma that still revolves around this wondrous plant. A long range for the sensitivity and behavior of the plant to these stimuli concludes that the experimentation holds reliable and valid- on the long run.

Conclusion

In the present study, students were actively involved in the project, as their educative work. The commitment and dedication was evident in them from day one of its inception till the completion of the project. The students were inquisitive and curious to learn through scientific observations and investigations viz., paying attention to the biology teacher while guiding them, collecting relevant materials within the allotted time, co-operation within the team-mates cum classmates, usage of operating/manipulatory skills in accordance with the procedure outlined by the teacher, documenting the periodical observations on the sensitivity of *Mimosa pudica*, interpreting the obtained data and drawing conclusions with group discussions. These abilities acquainted the students with a scientific way of studying biology. This attitude of scientific temper would probably, propel them to learn in their higher studies. It would thus, not be surprising if they did venture into the arena of scientific research and excel in the same.

The success of the project method implemented above depends on the nature of the study. The methodology adopted for this purpose was experiment based which enables students to test the effect of chemicals on the chosen plant. This would prove beneficial in learning topics in taxonomy since the sensitivity of the chosen plant- to stimuli- is a characteristic feature of the members of the family *Mimoseacea*. Carrying out the same tests on other members of the same family would verify if the tests would prove reliable on other species or not.

The most valuable outcome of this method is that it succeeds in helping students understand and grasp the wholeness of knowledge. As students explore the various aspects of the herb *Mimosa pudica*, the divisions of areas of sciences begin to dissolve naturally and will enable them to picture a bird's eye view of the subject of science. Projects generate an intense involvement and enthusiasm along with encouraging a healthy spirit of co-operation and collaboration in the students, as they work in teams. A free and creative exploratory spirit and scientific temper is developed in the students which becomes a habit of the mind, spilling over to other areas of learning as well. Students learn to create and recreate the subject matter for themselves making it relevant to their own purposes and thereby rendering it meaningful for themselves. By the end of the project, students would have truly made this knowledge their own in a permanent sense, not to be easily lost.

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