

PROJECT METHOD (PROBLEM SOLVING)

(D) Problem-solving Method

Introduction

Every person has to struggle in life. He has to face one or the other problem in life. He makes effort for problem-solving on the basis of his previous experiences. Such efforts and solutions beget new knowledge and skills, and desired changes in the behaviour can be brought about. This method can be used as an effective teaching method to impart related knowledge and skill of a subject to the students. This method can be successfully used in the subjects of science and mathematics.

Definition

The problem-solving method is that teaching method under which the student attempts to find out solutions to a problem on the basis of his previous knowledge and the specific efforts being made at present. He makes use of the solution of a prior problem in order to solve the similar other problems, and this enhances his experience, that is, his knowledge and skill.

Problem-solving Process

When the students faces such situations under which he feels specific difficulty or problem, and he faces problems in solving it on the basis of his previous knowledge and skill; it becomes necessary under those circumstances to acquire some new experiences, that is knowledge and skills by which he can solve the problems present before him. As a result, the students attempts to acquire the following types of knowledge :

1. What type of problem it is.
2. How can he solve it.
3. He undertakes creative and serious contemplation about it.
4. He attempts to acquire suitable educational experiences.
5. There can be several alternatives for problem-solving before him. He attempts to acquire the most suitable alternative on the basis of acquired experiences (knowledge, skills, etc.).
6. He confirms that the solution that he sought was proper.

The students treads through the above steps or stages, and succeeds in finding a new solution to the specific problem while acquiring new knowledge and skills. The training to a student about acquiring the skill of problem-solving can be extremely helpful to him.

Steps in Problem-solving Method

Using the problem-solving method in the teaching of biological sciences is the use of completely effective scientific method. Under it, the student proceeds towards problem-solving in the following way :

1. He adopts contemplation in a scientific manner.
2. He does not depend upon prejudices or the things only heard in problem-solving, but makes use of his own efforts to arrive at the proper conclusion.
3. He adopts proper and suitable scientific technique in the above working.

The student has to often go through the following steps while using the problem-solving method :

1. Confronting the Problem : The student faces several problematic situations. These problems arise in different ways. Some of the examples are as follows :

- (a) **Spontaneously :** Sometimes a problem is faced of its own natural accord, such as :
 - (i) Out of curiosity to find out more about a thing, as while studying in the library.

- (ii) Arising of any doubt or question in the mind while reading the textbook.
 - (iii) Not being able to find a solution to a problem while doing homework or doing exercises.
 - (iv) While working in the laboratory or in the daily life, there may arise a difficult problem or problematic incident solving which may not be possible on the basis of the acquired knowledge and skill.
- (b) Artificial or Created by the Teacher :** The teacher presents before the students a problem in order to teach the topic or subject by creating a specific situation, the purpose of which may be as follows :
- (i) The student should face a question or challenge.
 - (ii) The student should take the problem and become ready to contribute towards its solution.

It may be remembered though that teaching becomes difficult by taking the problem as the basis. The teacher has to select the problem after due consideration. The problem should have some necessary qualities. Some of the desirable qualities of the problem are as follows :

- (i) The problem should pertain to the content of the specific subject.
- (ii) The problem should be according to the ability, interest, experience and mental level of the students.
- (iii) The problem should be selected with due consideration to circumstances and available means and resources.
- (iv) The students should get maximum opportunities for learning by the problem and its solution.

2. Comprehending the Problem : The second step in the process of problem-solving is to comprehend the problem. The following steps are taken in this regard :

- (a) At first the problem is found about what it is. For it, the problem is defined clearly.
- (b) The limits and extents of the problem are found out at this stage.
- (c) The problem is so analysed that the students come to know of the real nature of the problem.
- (d) It is clarified to the students what knowledge and resources they possess with a view to solve the problem.
- (e) Suitable guidance is provided to them how they can proceed further in solving the problem.

3. Collecting Relevant Information or Data : Under the third step, the students are motivated to gather necessary information or data keeping in view the possible solution to the problem. The students work in the following way for collection of information or data :

- (a) They study in the library.
- (b) The test and experiment in the laboratory.
- (c) They collect information from the learned people.

- (d) They discuss with one another and also collect information on the basis of their prior experience.

At this time, the sole motive of the students is to collect as much information or data as may be possible.

4. Analysing the Collected Information or Data : The following functions are performed at this step :

- (a) All collected information or data are properly learned and analysed for the possible solution to the problem.
- (b) Meaningless, unverified or irrelevant information is left out. Such left out information is that which appears to not help in the problem-solving.
- (c) The remaining information or data are used for possible problem-solving.

5. Formulating Hypotheses or Tentative Solutions : Under this step is done the analysis of the acquired information or data in order to illuminate the path of the task done so far. This is the reason that the students form their hypothesis about all types of methods or solutions as may be relative to the problem presented before them. In fact, such guesses or estimates about the possible solution about the solution is called formulating hypotheses or tentative solution. Here the students are permitted to formulate their hypotheses in their own unique way without any influence.

6. The chief task under this step is to draw inferences as regards the most suitable and meaningful solution among all possible solutions that have been considered. The following process is followed for it :

- (a) Each of the possible solutions are contemplated about and tested one by one.
- (b) The above task can be completed on the basis of self-study, discussion or collective debate or exchange of views or testing in the laboratory, etc.
- (c) The solutions found inappropriate under the above are left out.
- (d) The most meaningful and proper solution is taken as the inference.
- (e) Having evaluated all possible solutions, while accepting the final solution, the following things are kept in view :
 - (i) Factual and reliable solution to the selected problem should be presented.
 - (ii) This solution should be according to the established facts and theories.
 - (iii) While selecting the most appropriate solution, all negative examples and circumstances should also be kept in view due to which the truthfulness of the solution may come into doubt.

7. Applying the Accepted Hypotheses or Conclusion : In order to prove truthfulness and verifiability of the acquired final inference, that inference is applied to different types of other problems. If the inference comes true on such types of problems, then it is considered that it is a suitable inference for the solution of all problems in the above category, else a fresh attempt is made to find out another suitable solution or inference. Under this last step is also done generalization under which circumstances or in the presence of which means or for what types of problems this generalization will work. Effort is also made to not limit the problem

and its solution to the laboratory condition only, but for solution to the everyday life problems. The students be motivated and trained to use the inference so that they can use the problems in the fields of science and related problems in the same manner as they have solved the problem presented before them, or as they should be adequately solved in the practical life.

Evaluation of Problem-solving Method

The problem-solving method is evaluated as follows :

Chief Merits of the Method : The scholars have found the problem-solving method as a suitable teaching method for the teaching of biological sciences. The utility of the method is as follows :

1. Thinking and Solving a New Problem is Scientific : Thinking and solving about the everyday new problems is according to the nature of science. So, the problem-solving method can be a helpful method to understand the biological sciences well.

2. Psychological Method : This is a psychological method. The students can be motivated to learn or do of their own and in a most suitable manner under this method. When they face a problem, they go for its solution as a challenge before them and proceed towards its solution. They make efforts to learn at all times for finding suitable solution to the problem. At last, they feel pleasure and contentment at the solution or knowledge that they acquire as a result of their effort. Thus, the knowledge acquired by this method is permanent and effective.

3. Solution to Two Problems in the Class : Under this method, two problems of the class are solved by themselves :

- (a) Enforcement of discipline in the class.
- (b) Giving homework to the students.

4. Scientific Approach : The use of problem-solving method trains the students in thinking and contemplation in a scientific manner. This helps in rearing the scientific attitude.

5. Amiable Relations : This method provides opportunity for forming amiable relations between teachers and students.

6. Development of Mental Faculties : This method provides suitable opportunity to the students for the development of their mental faculties.

7. Practicable and Useful : This method plays an important role in the study of biological sciences practical and useful. It is because of the fact that the training for solving problems helps the students in the following ways :

- (a) In making use of science in the everyday life.
- (b) In understanding science.
- (c) In taking forward the work of scientific invention and discovery.

Problem-solving Method—Demerits and Limitations

The chief demerits or limitations of the problem-solving method are as follows :

1. Difficult Task : It is a difficult task to select a suitable problem with a view to the educational utility as related to a particular topic or subject. It is not so easy as it has been taken to be.

2. Impracticable : It is not quite possible to teach properly by the use of this method in different branches and topics of biological sciences.

3. Practical Difficulties : If this method is used in the contemporary educational circumstances, then there can be seen many practicable problems in the use of this method, such as :

- (a) Difficulty in obtaining textbooks on time.
- (b) Difficulty in the availability of suitable laboratory and library, etc.
- (c) Presence of excessive number of students in the class.
- (d) Non-availability of teachers of biological sciences.
- (e) Non-availability of teachers of biological sciences who are trained in the use of problem-solving method.
- (f) Evaluation of teachers of biological sciences only on the basis of results.

4. Limited : Only scientific manner is represented in thinking and contemplating by the problem-solving method. All students are not capable of proceeding forward in a scientific manner to take the advantage of its faculties of discovering knowledge.

5. Labour-Oriented : Three tasks under this method are exceedingly difficult:

- (a) Collection of suitable data as related to the problem-solving.
- (b) Analysing them.
- (c) Finding out or pointing out the most suitable solution from amongst a horde of alternative solutions.

6. Other Difficult Problems : It has been seen that at many times the students form such hypotheses and draw useless inferences which only waste energy, time and money without any purpose, while the achievement of all this endeavour remains negligible.

In conclusion, there are different types of merits and demerits in the problem-solving method. No doubt, there are present several practical difficulties and hindrances, yet its utility and meaningfulness cannot be doubted. The way biological sciences should be taught and learnt, this method remains the best to meet this objective. There are two objectives of this method :

1. Training in a scientific manner.
2. Developing of scientific attitude.

The achievement of these two objectives proves the success and usefulness of this method. This method is helpful in both learning and using the acquired knowledge.

1. First, it is related to the inductive form of learning.
2. Second, it guides to the deductive form in using the acquired knowledge.

Thus, it becomes clear that in the form of inductive-deductive method of teaching-learning, this method is most reliable and useful for the theories of biological sciences.

