**HOW TO DEVELOP SCIENTIFIC ATTITUDE**

Some experts are of the view that direct teaching does not produce considerable kind of changes in attitudes of the students, while in accordance with some experts, for developing such kind of attitudes, out of school and uncontrolled experiences play an important role. Various studies have shown the facts that direct teaching plays an important role in modifying the attitudes of young students to considerable extent.

In simple terms the measures through which scientific attitudes can be developed among the students include those through which their curiosity gets satisfied, they get rid of their superstitions, they begin to participate in co-curricular activities, they begin to think in a practical way, they play an important role in developing a desirable kind of environment in the classroom, they get inspired to get involved in the habit of studying various scientific literatures and they get opportunities to get involved in practicing or practical works.

An important tendency which is found among all human beings and especially in children is curiosity. Children are found to be more curious to know about various things they observe around themselves in their daily life. Teacher should make such kind of arrangements in the classroom and in school that they can get maximum opportunities to get their curiosity satisfied to considerable extent.

This tendency should be nourished by the teacher by encouraging them to ask questions and teacher should try to provide satisfactory responses to their queries and curiosities. Opportunities for close observations should be provided to the students and they should be provided equal opportunities to get involved in the experimental functions carried out in the school. Thus, through such practice, teacher will find it possible to nourish feature of curiosity found in the students.

Generally it is found that whatever a child or person learns during his childhood, they become permanent qualities of his personality for life long time. Not only this, generally children begin to believe the things or stories they hear from the others.

During this age, probability of developing the habit of relying on the superstitions is found to be maximum. Such kind of thinking prove to be an important blocker in developing the scientific attitudes among the students, for which teacher should stress on the removal of such impressions of these false beliefs and superstitions through the proper and well-arranged study of science.

For this purpose, teacher should provide the task of collecting evidences and beliefs based on their self-observations, experiences and experimentation with the aim to test the validity of such baseless beliefs and superstitions. Proper encouragement should be provided to the students to carry out various test and experimental functions independently. Spirit of self -exploration and investigation should be developed among them. This can only be done with the help of scientific methods.

Teacher should encourage the students in every possible respect to find out the evidences on which they base their beliefs. They should be led to the unknown by making use of their own previous knowledge for finding and exploring the further aspects of relevant field of knowledge.

Some opportunities should be provided to the students by which they can experience complete freedom in their thoughts. Teacher should never indulge in such practice by which students can get ready-made responses. All those facilities should be provided in the schools through practices of free thought and active participation can get developed among the students.

As science is a practical subject, for which, provision of educational trips and tours should be made from time to time. All the students should be encouraged to get participate in such tours. At uniform intervals, provision of science exhibitions should be made in the schools and the responsibility of making all arrangements of such functions should be laid on the shoulders of students. Experts and teachers from other schools or institutions should be invited and science conferences should be organised in the schools by which scientific attitudes can get developed among them easily and quickly.

For developing scientific attitudes among the students, it is necessary that classroom in which science information is imparted, laboratories where various kinds of experiments are being conducted and other places where scientific activities are being conducted be equipped with a sense and spirit of scientific environment.

Students should be provided with complete freedom to carry out their own devised experiments in the well-equipped laboratory. In permitting the extent of freedom, teacher must make use of his discrimination, as in absence of this; chances of occurrence of various kinds of accidents will get increased.

Various reference books are published by prominent authors in addition to the text books. Teachers should make use of such books in the classroom and he should encourage the students to make use of such books to maximum possible extent. In the school libraries, there should be provision of extra science books; as such literature will help in prompting scientific attitude among the students.

No science teacher can play effective role in developing scientific attitudes among the students unless and until he does not possess such kind of attitudes. It is therefore one of an important duties of science teacher to adopt scientific attitude in himself and to make use of various scientific methods for imparting information of various scientific facts and concepts. In such kind of situation, children will try to become like their own teacher and they will try to follow the path which their teacher will show them.

As said that development of scientific attitudes among the students or learners is one of the main objective of science teaching, because of which various experts have put forwarded their views regarding the methods by which this objective can be fulfilled.

**Majority of experts consider that this objective can be fulfilled by making use of following things or keeping following points in the mind:**

**a. Analysis of Wrong Beliefs**

As known that even till now, a large number of people in our nation have not freed themselves from the clutches of superstitions and wrong beliefs. In this kind of situation, children are more bound to get infected by such beliefs as they have very tender kind of mind.

But it is not possible for any teacher to develop scientific attitudes among the students without eradicating such beliefs and notions from the minds of students. However, it is not as simple as it seems. It should be understood by the teacher that just by talking about superstitions and unfounded beliefs in the classroom and calling them bad and out of date will not bring any kind of change in the impressionable minds of the children.

Any effective change in this direction will take place only when science teacher will encourage the students to investigate some common superstitions and beliefs practically. All the students should be engaged in works which are intended to find out the bases on which such myths or wrong beliefs are based.

For instance it is believed in various parts of the nation that one can get blind by viewing solar eclipse with naked eyes as the sun rays are produced by some evil spirit. But the students should be taught by the teacher that although by viewing sun rays in solar eclipse one can become blind, but the main reason is that such rays consist of more harmful rays as a result of which such incidences can take place.

However, if one make use of black goggles or x-ray films, then chances of occurrence of such incidences can be reduced to minimum. Another instance of this fact is that it is believed by majority of people in our nation that one should not sleep under trees at night as souls of dead persons exist on them, however, the fact is that during night, trees absorb oxygen and exhale carbon dioxide because of which human beings will find an unhealthy environment.

For this, students should be asked to analyse the condition of any animal spending night beneath the tree at their houses. Thus, it is only through practical functions or works that the students can be freed from the clutches of superstitions, otherwise, teacher will find it very difficult to install or to get developed scientific attitudes among the students, especially in rural areas.

**b. Using Personal Examples**

As said that students consider teacher as their role model and try to imitate him in every possible respect. Teacher should make use of scientific methods for imparting information regarding scientific facts and concepts. Not only this, he should make use of his personal experiences during the teaching process.

Majority of the experts are of the view that tendency to copy elders is found among the children because of which teacher will generate his own type of students. As known4hat scientific attitudes can get developed in a person who is free from all kinds of biases and prejudices and who possess the ability to take decisions on the basis of various valid and true proofs.

Therefore, it is necessary that science teacher himself must be free from biases and prejudices of all kinds while dealing with the students. He should not give more importance and consideration to any student or group of students. All the students should be provided with equal opportunities by him and he should not make his judgements on the basis of other's views and beliefs.

He should have an open-mind and before making any kind of decision, should invite all the students or parties involved to put forward their views. He should respect other's opinions and should not perform any act based on partiality. To solve out various problems getting arise during teaching process, he should make use of scientific methods and should not take decision in hurry or hastily.

Thus, it can be said that his approach to everyday life's problems should be truthful and simple. He should not be believe on accepting those things for which there are no evidences found. He should be of such mind-set that everything or incidence happen with a specific cause and he should get indulged in trying to find out the cause of every happening. It is only after finding out the cause, that efforts should be made by him to find out the solution of the problem.

**c. Planning Exercises**

Today, one can found number of magazines or literary works which are devoted to science and provide the exercises through which certain kinds of attitudes can be developed among the students. Teacher should have thorough knowledge of such magazines or books and during teaching process, should make use of such sources at frequent intervals. For this purpose, any information provided in any book, journal and even in newspaper can be used.

Generally such kinds of information are being provided in the form of pictures in the journals. Teacher should remain actively engaged in gathering such kind of pictures and information and should display them on the bulletin board of the school. For direct teaching purpose, such materials should be used again and again by the teacher.

As said earlier that reference books can be found in large number, which can be used by teachers in addition to the text books. Teacher should make use of those books in which exercise questions are provided at the end of each chapter. Such kind of exercises plays an important role in fulfilling the aim of developing scientific attitudes among the students.

For aim of developing scientific attitudes among the students, teacher himself can play an important role. He can make questionnaires in which some objective type questions can be asked through the students. Before switching to the next or new chapter, students should be provided with such questionnaire and they should be asked to answer the questions mentioned in the paper.

Through such kind of planned exercise, teacher can judge out the level of knowledge of the students. Not only this, he can also develop the quality of finding out the basis of one's belief among the students by asking them about the reason for which they consider one statement to be true while considering other statement to be false. Thus, by making use of planned exercises, students can play an important role in developing scientific attitudes among the students to considerable extent.

**d. Inclusion of Co-Curricular Activities in Science Programme**

For developing the level of science knowledge among the students and to encourage them to function independently in various functions, it is necessary for the science teacher to organise seminars and discussions in the school from time to time.

In such seminars, experts should be called from the other institutions and they should provide information to the students regarding latest developments taking place in the area of science and technology. Not only this, provision of arranging science exhibition should be made by the science teacher and the responsibility to arrange such exhibitions should be laid on the shoulders of students. Through such co-curricular activities, science teacher not only can play an effective role in developing the level of science knowledge among the students but also can get their level of confidence developed to considerable extent.

**e. Effective Use of Laboratory Period**

There should be provision of well-equipped laboratory in the schools, where students can get indulged in various kinds of experimentation works. As known that in school, students are provided information of various subjects, because of which science teacher gets a specific time period for imparting information to the students.

Teacher should make use of obtained time in such a way that students can get opportunities to get involved in various experimentation processes conducted in the laboratory of the school. Science teacher should understand the fact that as science is a practical subject, thus, laboratory period can offer various opportunities for the students to learn certain elements of scientific attitude in them.

Science teacher should ensure that all the students are getting such opportunities equally. Not only has this, the function to ensure that all the students are utilising available opportunities to fuller extent, also rested on the shoulders of science teacher.

To get the students indulged in the experimentation processes is not a very simple task. Before letting the students to begin their function, teacher should make it ensure that problem of the experiment is clearly stated to all the students and they have understood it properly.

Teacher will also make it sure that hypothesis on basis of which students are expected to base their conclusions are also presented in beyond them clearly and proper methods of testing are being used by the students. Students should be informed about the time period for which they can carry out their experiment work.

After cessation of this period, students should be asked about the conclusions they have drawn from their experiment. This function should be first performed individually, i.e., results obtained by all the students should be analysed by teacher individually, but later, this function should be done collectively, i.e., results obtained by all the students should be discussed in the form of group discussion.

Students should be asked about the kind of conclusion they have drawn and the teacher should ask the reason or the basis on which they have based their conclusion. Other students should be asked to judge out whether the bases on which that student have based his or her conclusion are valid or not. Through this, students will become able to accept or to suspend judgment of their own and judgments of others if sufficient evidences are not found.

**e. Making Use of Scientific Literature**

As said earlier that it has been found that students who remain engaged in reading scientific literature and other books get scientific attitudes in themselves developed more easily and quickly in comparison to those who do not engage themselves in such activities.

Thus, teacher should encourage the students to read supplementary and reference books written on the science. This can only be done in case there is a separate Science Library in the school. As said earlier that students imitate their teacher to greater extent.

Thus, science teacher should have love for reading such kinds of books, then only he can transfer in the students this love for reading and inculcate the ability to use and to understand the information provided through such sources.

Such teacher should be appointed to impart science education in the schools who keeps on growing professionally, reads new titles and does not come to the end of his subject but likes to share his joy of reading new book and information with his students and reference certain suitable books to them by which they can get more information of the present developments taking place in the subject.

**f. Developing Appropriate Classroom Atmosphere**

The thinking pattern of the students can be diverted towards the inculcation of certain attitudes if internal setting of the class is properly arranged and the room is decorated in such a manner which helps in contributing to development of proper atmosphere in which information regarding scientific facts and concepts can be imparted.

In developing a desirable and appropriate kind of atmosphere in the classroom, science teacher plays a very important and significant role. Teacher should encourage spirit of friendly criticism of procedures, hypotheses and results among the students.

While imparting knowledge, he should make sure that all the students are giving due consideration to information provided by him and they are playing an active role in getting more and more information by asking various kinds of intelligent questions.

If teachers will not take any interest in giving response to the questions asked by students, then they will be discouraged to do so. In such a condition, it will be very difficult to create an appropriate kind of atmosphere in the classroom, because of which teachers should understand the fact that by responses or answers to the questions asked by the students, he is not wasting his time in any way, but encouraging the students to take participation in his own function and thus helping him in conducting his function in more effective and desirable way.

Thus, by making use of all the functions discussed above, a science teacher can get scientific attitudes developed among the students. It should be properly understood by the science teacher that his duty does not get finished or completed with imparting information provided in the text books to the students, but he should make all the efforts through which students can get new information or developmental processes taking place in this area.

For this purpose, teacher should get himself engaged with the new sources and should try to expand his level of knowledge, as without it, he will not be able to develop level of student's existing knowledge to considerable extent.

At last it can be said that without developing scientific attitudes among the students, a science teacher's function cannot come to an end and all the efforts made by him will be considered to be wastage of time and money if he cannot get such attitude developed among the students.

Thus, all efforts should be made by him to do so. During teaching process, he should analyse whether he is getting success in developing such kind of attitudes or not. If he finds level of success to be unsatisfactory then he can change his method of teaching and material used by him at proper time, by which his efforts can be saved from becoming wastage.