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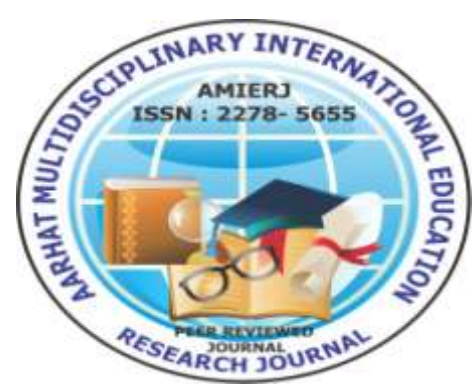
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STRENGTHENING SCIENCE EDUCATION FOR THE 21st CENTURY

Education

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Abstract

Science education at all levels needs to be strengthened at its weakest points which are innumerable. The reason is that we lack a frame of reference for teaching science. In its absence, we need teachers in large numbers who can experiment with student goals; better adaptation of teaching – learning to individual needs; encouragement to students towards acceptance of responsibility for learning; increased opportunity for co-operative work by students for their improvement; more emphasis on question-answering & problem solving; greater satisfaction of learning by the students, a sense of self attainment by the students as active partners in the game; and increased possibilities for experiencing the joys of teaching & learning.

The quality & quantity of learning at schools will go up if the mentioned deficient situation is set right. Teaching will then cease to be confused with ‘telling’ which is appreciated by the parents & the administrators. This is a real danger to guard against because our present day schools must serve as a “mighty instrument of discipline & progress”. A hindrance to this progress is our faith in status consciousness & hierarchy. The contribution of the individual to the national development is lost as such. Moreover, self sensitivity to professional concerns & enthusiasm are no longer the concerns of bye-laws & rules. This is a complex problem facing our educational



system & it is not the objective of this paper to tackle this problem as this paper is mainly addressed to the individual science teacher & the impact nuclei.

Key Words-

Science Education, 21st Century, Science teaching, Science teacher

INTRODUCTION

One problem as the most important target for science & science educators to address in the 21st century, would be to clarify the best and most fundamental aspects of science so as to make science a comfortable and accepted part of the shared common story of all human beings. To solve it, one need to find ways to reduce the perception of science as a specialized and isolated activity of the few, and create the kinds of bridges that will more effectively link science not only to other academic disciplines but to the non-academic world as well. Science education at all levels needs to be strengthened at its weakest points which are innumerable. The reason is that we lack a frame of reference for teaching science. In its absence, we need teachers in large numbers who can experiment with student goals; better adaptation of teaching – learning to individual needs; encouragement to students towards acceptance of responsibility for learning; increased opportunity for co-operative work by students for their improvement; more emphasis on question-answering & problem solving; greater satisfaction of learning by the students, a sense of self attainment by the students as active partners in the game; and increased possibilities for experiencing the joys of teaching & learning. The quality & quantity of learning at schools will go up if the mentioned deficient situation is set right. Teaching will then cease to be confused with ‘telling’ which is appreciated by the parents & the administrators. This is a real danger to guard against because our present day schools must serve as a “mighty instrument of discipline & progress”. A hindrance to this progress is our faith in status consciousness & hierarchy. The contribution of the individual to the national development is lost as such. Moreover, self sensitivity to professional concerns & enthusiasm are no longer the concerns of bye-laws & rules. This is a complex problem facing our educational system & it is not the objective of this paper to tackle this problem as this paper is mainly addressed to the role of



individual science teacher in 21st century & the impact nuclei of strengthening science education in this era.

IMPACT NUCLEI

There are numerous impact nuclei which if effectively developed can make a big impact not only on the tone of the school in general but also on the thinking & actions of a majority of pupils at school in particular. These impact nuclei are as given below-

1. Stress should be laid on **productive thinking & creativity** rather than clerical system of examination
2. Focus should be on **discovery & investigation** rather than purely factual or information packed lessons
3. Consider seriously the **ideas & views of children** in their learning of science
4. **Scientific literacy** is essential for living effectively in modern times
5. Boost the voluntary establishment of **science clubs**
6. **Motivation** for students & teachers is a major problem in the educational system of this country
7. The growth & organization of a well equipped **school library** should not be neglected in schools
8. **Science museum** should be opened at school level
9. **Aquarium** is an excellent device to arouse interest in science learning
10. Use of **community resources in science teaching** requires separate treatment
11. **Instructional illustrative material** go a long way to focus attention, arouse interest, add to information, motivate to action & stimulate physical & mental activity of the pupils in classroom
12. **Home made apparatus** have special advantages of observation, examination & experimentation in contrast with the finished product procured from the market
13. The creation of a school **resource centre for teachers' education in science, mathematics & technology**



14. Science teacher & his professional growth should be reinforced well

15. Microteaching (scaled down teaching encounter) should be well implemented & practiced in classroom

16. Research in science education (action research) should be promoted for individual professional effectiveness & solution of school problems

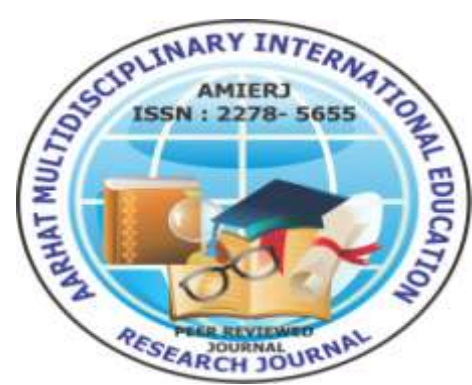
PRODUCTION OF A COMPETENT TEACHER

It's a major problem to increase the personal, academic & professional efficiency of teachers. A teacher is the conscience keeper of a nation. He can not reject his personal/private responsibility. It is necessary to strike a proper balance between his public accountability & his private responsibility. A competent teacher's general liberal education has both breadth & depth. He knows his own areas of teaching well, understands human growth & development & knows how learning takes place. He can appraise & help individuals. He is an expert in group processes.

He possesses skill in methods of teaching, stimulating, thinking, in preserving & extending creativity of his students' skills, in making them aware of the values they exhibit, & in helping them re-examine those values from time to time. The efforts so far made to improve teaching personnel are laudable ones & are also in the right direction. They look grand on paper but vaporize in the course of implementation.

In support of this observation, one can find a wide gulf between the practice (I do it) & the theoretical report (I can do it) drafted by a group of participants at any workshop. A good report is always available at the end of the workshop on any educational problem, regardless of convictions, which is not taken seriously even by most of the participants as well as the educational administrators.

The reason for this is the lack of realistic & systematic study of the personal & professional problems of science teachers including their effectiveness in general. These science teachers, who are shaping the scientific & technological revolution in country, are working under most adverse circumstances & no one can solve all the difficulties of a teacher.



At the same time, a teacher in isolation can not solve all his problems. Therefore, it is highly desirable to take concrete steps with a view to solve the problems which are beyond the teachers control otherwise he is likely to lose his professional inside and get frustrated. It is a very serious malady which will surely keep the level of science teaching at its lowest ebb.

It is high time to undertake even a major surgery to set the whole situation right so as to release the energies of science teachers, draw them out of their ruts and through proper guidance familiarize them with varied approaches to science teaching, and realizing the mental development, achievement & ambitions of children along with the realization of goal & purposes of science education which are so essential to live a full life in the coming post industrial science based society. It can be done by-

- ✦ Organizing discussion meetings among science teachers on problem of common interest.
- ✦ Exposing science teachers to higher and higher standards of work.
- ✦ Strengthening the extension service department & state institute of science education.
- ✦ Strengthening extension and research at the regional institutes of education (NCERT) for organizing and coordinating the follow up work and encourage research in the region.

CONCLUSION

It is a problem to maintain a psychological climate & reflective atmosphere for cognitive growth in classroom. Often answers are allowed to accept as if they were right without looking into the appropriateness of the questions posed. John Holt in his book, "How Children Fail", says that a school is a place where children learn to be stupid because the natural atmosphere of learning is absent & the emphasis is laid on examination rather than education, on information rather than formation and the facts rather than concepts.



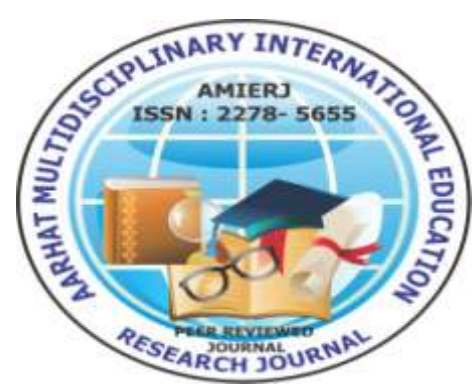
Moreover, stereotyped questions are asked by the teachers & answers are given mechanically by the pupils. This sorry state of affairs needs to be tackled by teachers who should manipulate the learning in such a way as to enlist the active cooperation of the pupils in the development of the lesson. This is the only way to make the teaching-learning process a bit sensible. A teacher who permits his/her students to face difficulties & gives them a chance to solve those difficulties is really providing an opportunity for reflective thinking.

Problems in themselves can not promote thinking & that's why the teacher has an important role to play. He must train the pupils to face their academic & personal problems on their steam as far as possible. Opportunities are provided to pupils to observe, plan & conduct experiment on their own behalf. Bright students can be involved in advanced work through investigative questions, problems & projects.

They all develop confidence in their observations, learn to how respect for facts & they willingly subject their findings to their scrutiny of others. The pupils simply acquire the verbal knowledge of concept taught or demonstrated by science teacher. They will master the concept only when they discover it through self activity. In this context, the well known principle of 'learning by doing' needs to be modified to 'learning by doing & critical thinking about what are doing'.

Jean Piaget is also of the opinion that children assimilate concept only when they discover them for themselves. Moreover, the root of evaluation should be more in educational psychology rather than educational statistics; yet there is no psychological dimension in science teaching & education anywhere. Shaping of a strong scientific & technological country in classrooms is only possible by a band of dedicated teachers who prepare & will prepare efficiently their wards for solving the complex national tasks.

If true, there is no substitute for educational imagination, adventures in education, hard work, hypothesis setting & testing, & finally, trying to reach the top in the comity of nations. Until then it is time to dream, time to visualize, time to act, time to know, time to accept & reject, time to remember and time to react to the infinite by developing the scientific and



technical capabilities of children. Entirely, there is a new race to be run, if any country is survive in the next century.

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