IOSR Journal of Humanities And Social Science (IOSR-JHSS)
Volume 25, Issue 9, Series 3 (September. 2020) 17-22
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Teaching-Learning Strategies for the improvement of Science Education in Government Schools in India

Dr. Md Jamal Uddin[1*] and Prof. P.C. Agarwal[2]
[1]*Assistant Professor & Head (Officiating), Department of Education, Aliah University, West Bengal, India*
[2]*Principal, Regional Institute of Education, Bhubaneswar, Odisha, India*

ABSTRACT*: For sustainable development of education and more particularly the science education our 1st step will be to start with our own resources. Then we have to take stock of our resources, our deficiencies and challenges ahead, and plan how we can overcome them gradually. Constructivism in learning and ICT has brought about revolutionary changes in education and our country should fall in line with it. But more important question is how we should tune ourselves with vast change of techniques and approaches in education in the 21st century. The present author has discussed the sustainability in science education in Indian schools in seven steps: Our aims of science education, our classrooms, the curriculum we want, the facilities we have, the challenges we face, how can we overcome them & some unavoidable consequences.*

KEY WORDS*: Constructivism, ICT, Hands on Science, Appreciation, Specialists' curriculum, Global Classroom*

Date of Submission: 25-08-2020 Date of Acceptance: 09-09-2020

I. INTRODUCTION

The subject matter of science takes a central place in school education. The most widely acclaimed views of teaching science in schools is that it can inculcate in children certain values and attitudes –scientific temper, rationality, reasoning, problem solving, methods of science and so on. – that are essential for an enlightened citizenship; also teaching science in schools can fasten progress and development of a nation by creating scientific and technological manpower essential for continued economic growth[1,2]. A wide range of influences went into the shaping and formulation of science education of Indian school classrooms – the historical and colonial influence, the Nehruvian project of creating a modern independent India, the neo-liberal economic mandate of creation of scientific and technological manpower and production of skilled labours, the way in which larger society and parents wish to shape the lives of younger children and so on. The objectives that figured most prominently and persistently in several of Indian science curriculum and policy documents is the role of science education in eradicating poverty, and emancipating masses from social ills of superstitions and illiteracy, and training and creating a cadre of scientists who will contribute to the nation building[3].

1. Aims of Teaching Science in India

- Teaching the general mass the functional knowledge of Science and to dispel superstitions
- Creating specialists in Science
- Applying science to meet the needs of the people
- Competing with other countries for the economic advancement with science
- Science and technology to fight against problems of 3Ps, depletion of natural resources, illiteracy etc.

2. Some Concepts of Modern Classrooms

- Constructivist approach in teaching & learning science
- Problem Solving Approach
- Global classroom
- Teaching learning with ICT
- Teacher as a facilitator of learning
- Team teaching and peer tutoring

3.0 What type of Science Teaching Learning Conditions do we want?

3.1 Participation

More participation of students including boys and girls in science learning

3.2 Types of curriculum

- Science for ***all*** and science for ***specialization*** are to be given due emphasis
- Different branches of science are to be correlated
- Science is to be correlated with other branches of social science
- Science curriculum in the lower classes is to be integrated with Technology
- Knowledge of contemporary science should be included in science syllabus

3.3 Teaching Techniques

- *Concept mapping* should be used for better understanding of science concepts
- Science teaching should be based on the conceptual structure of science
- More stress should be placed on :
  -process of learning science
  - project based work, cooperative learning
  -open ended experiment
  -learning science beyond schools
  -improvisation of TLM by teacher and students
  -development of scientific temper among students
  -development of Interest &curiosity
  -history of science, life of scientists
  - more speed in science teaching
  - non formal and informal mode of teaching
  - success stories of persons with science background

3.4 Social milieu

- More association of science teachers, scientists and technologists is needed
- Science and mathematics teachers should work together

3.5 Evaluation: We have to incorporate in evaluation the following:

- Analysis, synthesis & evaluation ability in science and different performing skills
- Diagnostic test and remedial teaching

3.6 Infrastructural facilities

- Scope for individual learning of science with own pace
- Classes should be provided with ICT arrangements
- Well equipped laboratory
- Library equipped with up to date books, journals, CDs etc.

4. 0 What facilities do we have in science teaching learning in Indian schools?

4.1 Policies, objectives, techniques and recommendations pertaining to science education and its development in India can be had from S E P (1958) , NCF(2005) and NCFTE (2009-10), NPE(1968,1986,1992), Indian Education Commission (1964-66)

4.2 NCERT, NCSTC, NCSM & other Govt. Institutes, Eklabya (Hosagabad, MP), Science Teachers' Associations, Physics Teachers' Association and NGOs are taking active role for the development of school education in science

4.3 EDUSAT is used for the development of science teaching particularly in open learning

4.4 We have plethora of science curricula followed by different school boards of which CBSE & ICSE are two boards of national importance.

4.5 We have a number of private and aided schools who are enriched with resources for science education including equipped laboratory, ICT & libraries[4].

5.0 What Challenges do we face?

5.1 Number of students

- Large no. students in a science class poses a difficulty to science teaching
- Neighbourhood schools comprise students of heterogeneous abilities

- Literacy of students in 'science and technology' is not satisfactory
- Training of the science teachers in 'educational technology' is not adequate
- Dogma and superstitions exist among a large number of students and their community members.

5.2. ***Equipment and accessories***
- Inadequate provision for laboratory, library, resource materials including computers, ICT materials and space in majority of schools is matter of grave concern.
- A small portion of students possesses PC

5.3. ***The Number of Qualified Teachers***
- It is difficult to get adequate number of qualified teachers for science teaching.
- Pre service teacher trg. colleges can't always provide :

- Innovation in Science teaching
- Skill of experimentation
- Higher cognitive activities.
- Development of scientific attitude.
-Development of ability of appreciation

- Teachers possessing PC and with experience in computer application are not many.

5.4 Learning about science as an exciting human activity
- Appreciation of history of science, lives of scientists and their discoveries are not properly presented to the students.
- Textbook centered knowledge is given more importance
- The knowledge of scientific facts supplied by textbooks does nothing towards development of need achievements among students

5.5 Hands-on science
- Hands-on science activities seem to be limited in most of the schools
- A section of pupils are efficient in computer applications in science irrespective of their intelligence and achievement in science.
- PPt is sometimes used for demonstration but without sufficient explanation of underlying ideas.
- By computer animation sometimes students perform experiments in science. This does not develop the skill of performance of experiments. The students benefit when they ***do*** science, not just learn ***about*** science.
- Scope for open ended experiments is limited in schools and training colleges.

5.6 Connecting science to other subjects
Correlation among different branches of science, impact of science on life and environment are not adequately covered in: text books, curriculum for school science and 'probably' in teaching also.

5.7 Scope of giving examples and analogies: Some objects or instruments of our daily life like common balance, electric bulb, transistor set, hurricane, torch light, electric regulator, metal ring of wheels, pendulum clock, spring clock, earthen and metal pitchers etc have almost disappeared due to technological advances but once they could be readily referred for understanding some basic concepts & rules of science. Electronic gadgets replacing them are not suitable for teaching basic concepts of science at school level.

5.8 Excessive Craze for more Marks
- Guardians, teachers, education authorities, employers etc desire more marks for the students in exams.
- Cramming, lecture, bookish knowledge etc bring about some unavoidable evils in science education.
- Notebooks & note book like text books pervade the domain of science education to help students get more marks in examination.

5.9 Problems on evaluation:
Evaluation system puts less emphasis on:
-Formative evaluation (classroom questions, home works, project works)
-Skills of Performance
-Creative ability
-Process of learning science
-Co scholastic activities in science

6.0 What we can do to improve our science education?

6.1 Cooperation in Science

- For right kind of science education at school level school, school complex, science clubs, science museums, science teachers, Science Teachers' Associations, interested scientists, NGOs and other stake holders should work together. For this : Social network like **face book,** E-mail, video and teleconferencing may be used (gradually) to develop understanding and exchange among teachers, scientists and students
- Cooperation among science teachers of all levels, scientists and activists of science are to be developed – through national and regional meetings

-- science teachers' associations, science congress

6.2 Right Attitude

Teaching through experiments, demonstrations, examples, reasons and different types of co curricular activities in and outside the classroom can dispel superstitions among children and develop right kind of attitude and scientific temper among them. This attitude is the locus of control of learning science.

6.3 Curriculum: *S*cience curriculum is to be divided into two parts: **Contextual curriculum (**science for all curriculum) for development of Scientific literacy (up to upper primary stage) and **curriculum towards specialization** from secondary stage onward.

- Contextual curriculum should be integrated and should aim at developing good civic life. Such curriculum should be a synthesis of physics, chemistry, life science, earth science, environment and technology.
- Specialists' curriculum should aim at developing career in science. This should be discipline oriented curriculum.
- Children's preparation for common curriculum serves as a spring board for learning specialists' curriculum.
- In science curricula the experiences of both urban and rural areas are to be included.

6.4 Conceptual Teaching

- Unity (commonness) and diversity in different objects and concepts are to be observed and understood by the students
- Different problems of environment are to be observed and investigated in a co operative way by the students

6.5 Hands on activities

- Students should be inspired to pursue scientific **activities outside schools** using simple, easily available and scrap materials.
- Teacher may use simple materials of environment (duster, chalk, paper, scale, pencil etc) for firsthand understanding of different scientific concepts and processes.
- The role of **science museums** and **hands-on** science exhibitions and experiments are to be given importance.
- *Mobile exhibition* may be encouraged.
- *A single material* may be used by the teacher to present *different scientific concepts* (a **tea plate** may be used for demonstrating nonconductors, circle, colour, larger rate of vaporization, china clay, reflector of heat and light, opaque object, plane and curved surfaces etc)
- Even if computer is used in learning science, the scope of demonstrations and *practice with real objects* should not be set aside.
- With the help of computer animation teacher may demonstrate how to use and/ maintain different domestic gadgets, maintain healthy and secure life etc.
- More *project works* should be given to the students depending on the cognitive ability, experience and their ability to work
- *Open ended experiments* may be devised with scrap materials or cheap materials available in science shops.
- Students and teachers may improvise science apparatus and innovate different experiments.

6.6 Development of Interest

- Up to upper primary stage different aspects of *science* igniting the *imagination and creativity* are to be identified : e,g. Stories of discoveries, activities of scientists
- At primary level more importance should be given on observation and raising questions by the students
- Students may be inspired to **read** popular books on science, science encyclopaedias, **develop** computer animation, **write** articles on science , **participate** different competitions like science aptitude tests, essay

competitions, extempore lectures, science exhibitions, children's science congress on the issues of **exploring** and **developing** environment etc[5].

6.7 Quality Science Teachers

- Motivated and dedicated teachers to be recruited , recognized and rewarded.
- Quality teachers' training both In Service and Pre Service is to be developed with the help of skilled and experienced teacher educators at national or state level (NCERT, RIE, IASE,SCERT).
- Science teacher should have functional knowledge and skill in Computer Assisted Instruction (CAI) [6,7].

6.8 Evaluation

- *Process of learning science* should be evaluated along with *product* of learning
- Use of computers & co scholastic activities in science should be encouraged and evaluated
- Home Assignment should be evaluated regularly
- In diagnosis and remedial teaching (with branching programs) in science computer may be used with convenience
- For selection of the students for higher *courses* or *career* in science importance should be given on ***skill*** of the students in addition to their examination scores.

6.9 ICT &Computers

- Infra structure is to be developed in every school before making use of ICT mandatory in all school curricula.
- Science teachers should be trained in computer application and CAI.

6.10 Gender bias is to be avoided by designing activities to enhance the participation of girls and women in science education. They are to be inspired and enabled by the schools and authorities to participate in all local, state and national level science activities. Awareness must be developed in girls so that they pursue science in higher studies[9].

7.0 Some consequences

- If classrooms fail to provide layman's science to all students open and distance learning may be arranged with the help of ICT.
- It is desirable that teachers and students be trained in the development of learning package for use in computers.
- Indiscriminate use of computer, internet and teaching packages in science education to get immediate gain in teaching learning of science may *adversely affect* the following both in the case of learners and teachers

- Cognitive &Psychomotor abilities
-Intellectual behaviours (precision, accuracy, observation etc)
-Work habits and self confidence
-Originality and Imagination etc.

II. CONCLUSION

The development of a systematic strategy for bringing in fundamental changes in the teaching and learning of a subject like science requires meaningful curricular visions, innovation in course content, modes of instruction, teacher education, student assessment and situating the learning in child's socio-cultural milieu. What is more important is the support of a state policy, funds and resource allocation. The contributions of education and science education to the development of societies and individuals have been profound. Education is the fundamental right of all children, a means for economic, social and political advancement and for empowerment of marginalized and disadvantaged sections of the society.

REFERENCES

[1]. Colgoni, A and Eyles, C: "A New Approach to Science Education for the 21st Century" EDUCAUSE Review, vol. 45, no. 1 (January/February 2010): 10-11.
[2]. Delors, J. et al: "Learning: the Treasure Within" Report of UNESCO; UNESCO Publishing, 2nd ed (1998).
[3]. De, K.K.: Bhouta Bigyane Sikshak Siksharthi. Shova (Soma Book Agency), Kolkata-9,5th ed.(2009).
[4]. Grobstein, P.A. :Vision of Science(and Science Education) in the 21st Century: Everybody " Getting it less wrong" Together in "Science Technology and Society: Ethical Awareness for Tomorrow's Leaders"

Organized by the Centre at the Illinois Mathematics and Science Academy, Adler Planetarium, Chicago, 3rd April,2003.
[5]. NCERT: NCF 2005, Position Paper, National Focus Group on Teaching of Science, New Delhi.
[6]. Osborne, J "Science Education for the Twenty First Century"* Eurasia Journal of Mathematics, Science & Technology Education, 2007, 3(3), 173-184.
[7]. P. Gluckman (2011) Looking Ahead: Science Education for the Twenty-First Century. A report from the Prime Minister's Chief Science Advisor. ISBN 978-0-477-10337-4.
[8]. Rao, Chintamani N.R. Science Education and Capacity Building in the Twenty-First Century.

Dr. Md Jamal Uddin, et. al. "Teaching-Learning Strategies for the improvement of Science Education in Government Schools in India." *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 25(9), 2020, pp. 17-22.