



## **TEACHING STRATEGIES FOR FOSTERING HIGHER ORDER COGNITIVE SKILLS : THE NEED OF THE GLOBALISED ERA**

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### ***Abstract***

*The fast paced scientific and technological developments has transformed the whole world into a global village. Global warming, ozone depletion, oil spills, nuclear energy etc have forced the thinkers across the world to make a reform in the education at all levels. We come across dilemmatic situation in our everyday life which requires us to make judicious use of knowledge, solve problems, make unbiased decisions. In order to subsist these challenges better we need to prepare the future citizen who can make use of their higher order cognitive skills like problem solving, decision making, critical thinking, rational thinking etc in an implicit way. This requires paradigm shift in teaching- learning technique form presiding algorithmic lower order cognitive skills to higher order cognitive skills in concurrent educational system. This paper attempts to throw light on the role of teachers in the promotion of higher order cognitive skills into the class room. The teaching strategies used for the promotion of higher order cognitive skills are discussed along with the challenges.*

**Key words:** *higher order cognitive skills, lower order cognitive skills, problem solving, teaching strategies*

### **Introduction**

The developments in various spheres of the world is shaping the personal and professional outlook of the individual. The continuously developing world is becoming challenging for the citizens to thrive upon as they are require to effectively cope with the expectations and challenges of the conflicting interest and at the same time make judicious use of their critical thinking ability in order to solve the various problems and make judicious decisions of the

challenges which they come across in the various walk of their life. This changes have forced the countries around the world to focus on the development of higher order cognitive skills of the students in order to empower them with reflective thinking , critical thinking , problem solving, decision making skills.

According to American Association for Advancement of Science AAAS (1994) NRC " A major goal of science education today is fostering students intellectual competencies such as independent learning , problem solving, decision making and critical thinking." To achieve this goal worldwide all the education system should shift their teaching from traditional textbook oriented approach to more constructive approach. The students are no longer expected to sit passively , listen and react in accordance to the instruction which they receives but are required to construct their own learning.

It is unanimously accepted fact that the pupil of the country are enlarged replica of their teacher and also the future of the country rests upon the success and the failure of the teacher. It is a well known saying "*that what a teacher teaches is more important in stimulating student learning than the prescribed curriculum framework*". Such thinking arises out of the conviction that real learning results only when individual construct their own learning and are empowered with the skills to make crucial decisions about the problems and issues confronting them and also taking responsibility of the personal actions as a result of these decisions. The role of teacher in fostering of the higher order cognitive skills becomes evident in this context.

The general purpose of this paper is to discuss the role of teacher and the teaching strategies which helps in the promotion of higher order cognitive skills of the students in the teaching learning process.

### **1.1 Theoretical Framework**

According to Robinson, "Teaching children to become effective thinkers is increasingly recognized as an immediate goal of education. If students are to function successfully in a highly technical society, then they must be equipped with lifelong learning and thinking skills necessary to acquire and process information in an ever-changing world". Educators around

the world have generally agreed that it is in fact possible to increase students' creative and critical thinking capacities through instruction and practice.

The reforms in the educational scenario has motivated almost all the nations of the world to shift their emphasis from teaching lower order cognitive skill to fostering higher order cognitive skills into their education system. However various research in the context of higher order cognitive skills and classroom implementation has pointed out that the changes instigated are still far from reality when comes the question of implementing them in classroom. Class room teaching practices is textbook dominated and teacher oriented. In classroom teachers mainly focuses on delivering the content and students solve the problems algorithmically. Rote learning methods is still the reality of our class room at large.

There is unanimous agreement that in order to foster students higher order level thinking teachers must not only possess in- depth subject matter in the field they are specializing in such as mathematics, physics or biology but also good pedagogical knowledge or how to develop students higher order thinking in the context of the subject matter they are dealing with.(Brickhouse, 1990; Bybee,1993, Fullan....Richardson,1996)

## **1.2 What are higher order cognitive skills?**

Zoller (1993) has defined *Higher order cognitive skills as non-algorithmic, complex multi component conceptual framework of reflective, reasonable and critical and systematic evaluative thinking, focussing on deciding what to believe or do, in confronting a issue to be followed by a responsible action accordingly*

Resnick (1987) has also defined *Higher order cognitive skills as non-algorithmic, complex mode of thinking that often generates multiple solutions. Such thinking involves uncertainty, application of multiple criteria, reflection and self- regulation.*

Higher-order thinking is commonly typified as the three top three levels (Analysing, Evaluating, Creating) of Bloom's Revised Taxonomy (D.Anderson 2001).

Various researchers have suggested that at the higher levels of cognitive process the students are involved in designing, constructing, planning, producing, inventing, checking,

hypothesising, critiquing, experimenting, judging, comparing, organising, deconstructing, interrogating and finding

In *Education and Learning to Think* Lauren Resnick (Resnick 1987) characterised higher-order thinking / cognitive process as complex and non-algorithmic thinking involving:

- multiple solutions;
- nuanced judgement and interpretation;
- the application of multiple criteria;
- uncertainty;
- self-regulation of the thinking process;
- imposing meaning, finding structure in apparent disorder; and
- effort.

### **1.3. Why teach higher order cognitive skills?**

Teaching higher order cognitive skills in classrooms proves to be beneficial in longer terms. The information learned through higher order cognitive processes is remembered longer than the information processed through lower order rote memorization. For example if we consider the difference between two students one who simply memorizes a mathematical formula and another one who learns to derive the formula, it is quite obvious that the student who has derived the formula will retain the information for the longer time and will also be able to use the formula also in a different context. The same inference can be recognized in other subjects also whether it is related to mere memorisation of historical facts or deriving inferences from the historical events. This becomes more evident in science classes as the student continuously comes across various situations be it learning to design the electrical circuits or pollution. If the instruction is provided using the higher order cognitive processes the student will retain it for longer and will be able to apply the learning in real life and would come as a efficient decision maker in everyday life. Many educators practising higher order cognitive skills in classrooms believe that that students are more likely to apply a skill to solve new problems when they have a deep conceptual understanding of that skill than when there is a lack of conceptual understanding,

Since education is our only mean of preparing students - our future citizens -for active and responsible life within our modern society(Zoller 1999). Thus schools at every levels should



become the nucleus and teachers should turn into facilitator to foster higher order cognitive skills of the students.

## **2. Role of teacher in fostering the higher order cognitive skills.**

The education system of our country was always examination oriented and in such scenario learning is almost equivalent to parroting of information which is nothing but knowledge acquisition. The teacher is always compelled to cover information even though they know that many of the students may not have fully understood it and may not retain it for longer. Hence the role of teacher is pertinent while providing information as it should be the duty of every teacher to provide instruction using the higher order cognitive strategies to enable the learner to become an efficient thinker, and develop keen problem solving and decision making skills.

The teacher who knows and holds ideals for higher order learning must be accustomed of the facts that before embarking the students on the path of higher order learning the teacher must equip his student the skill of how to think before asking him to think. Not only that the teacher's duty is to help student to learn to value the significant knowledge which he is gaining. The teacher must realize that depth of the knowledge is more important than covering the lesson and hence he should plan his lesson keeping this points in mind.

## **3. Teaching strategies for fostering higher order cognitive skills in class room.**

A classroom is characterized by various factors such as interest of the student in the subject, teachers attitude, content ,etc. Fostering higher order cognitive skills in science class may prove to be a hard row to hoe for the teacher. Hence the teacher needs to be well equipped with teaching strategies aiming to promote higher order cognitive skill in the regular classroom. The following strategies aim to foster the higher order cognitive skills among the students.

i. **Teach the content in the real world context:** Using real world examples motivates the students to think about the problem and its effect on our day to day life. Specially in science class which is full of context from the real life of the students. For example while teaching the cellular respiration the teacher can ask the students to write about the percentage of carbon dioxide left in the atmosphere when there will be no trees in our surroundings .What will

happen if the entire land is occupied with the plastic waste products? The students should be encouraged to think critically about the issues and make responsible decisions and also take responsibility of the decisions made by them.

ii. **Foster inquiry -oriented experiments** : Inquiry oriented experiments foster the critical thinking develop positive attitude and increased achievement specially in science classes. The teacher can take following steps to foster inquiry oriented approach in the class:

- The teacher must start the lesson with an open-ended question or demonstration (as opposed to beginning a lesson with definitions and explanations).
- The next step of the teacher should be to gather responses and put subsequent questions from students with little comment or direction.
- Help the students to collaborate on designing experiments.
- Helps the students to conduct experiments or gather data.
- If time permits encourage the students to re-evaluate question based on new data and re-experiment or collect new data based on revised question.
- Encourage the students to present findings as an oral presentation, a poster presentation or an evaluative write-up.

iii. **Adapt a flexible approach in solving a problem** : Adapting flexible approach to solve problems is another pre requisites for higher order cognitive skills . In addition to an emphasis on one real world application of skills, a teacher should also work to introduce students to a range of real-world contexts in which a particular skill can be used. The more situations in which a student uses some new element of knowledge, the more the student internalizes the deeper conceptual implications and applications of the knowledge. For example, while teaching about vaccinations the students should also be asked to write the pros and cons of it . learning a skill from many different angle the contextual grip that a student mind may have are loosen and the student will be able to link a particular skill with a particular scenario.

iv. **Encourage open ended discussion** : Open ended discussion on the topic under consideration is a very good technique which a teacher can adapt in his teaching strategies as it provides ample scope to the learner to ponder and debate on the topic under discussion. This helps the students to think critically and also develop positive attitude.

**v. The teacher should encourage the students to think about the thinking strategy they are using to solve a problem :** When a student thinks about his own thinking strategy they

involve themselves in a sort of sort of “meta-cognitive” approach as they are believed to

- Think analytically about problem definitions and relate the problem in the real world context (“What are my goals? What are my scopes? What skills I can use solve this problem? What information is relevant to the problem?”)
- Think about planning (“How should I approach this problem? What additional resources or information do I need?”)
- Purposefully allocate time and energy (“How do I prioritize my tasks in order to most efficiently solve this problem?”)

**vi. Encourage brainstorming sessions :** Instead of discussing ideas from the textbooks the teacher must allow the students to brainstorm the ideas have a debate on the topic under discussion before arriving at the conclusion.

**vii. Encourage question asking :** The recent educational reforms demands that the students to become self-directed learners, to ask questions and to be curious about the world around them. One way to achieve this is to promote their question asking abilities. Millar (1989) presents strategies to help students ask questions at all levels of thinking. In addition, he shows how students can be taught to generate criteria which they can then use to assess their own levels of questioning.

- Levels of questioning include:
  - gathering information: who, what, where, when, why, how?
  - organizing information: why?
  - extending information: what next, what if?

**viii. Action Flow Plan .** This plan is suggested by Haramin, (1994). This plan is divided into three stages. The teacher can initiates learning by asking students to write a response to a thought-provoking question based on the reading assignment for that class (Stage 1). As soon as two or three students have finished, the teacher need to ask the rest of the students to finish the thoughts on which they are currently working. Using probing questions (e.g., Would someone like to share a response? Do you agree with the first response. . .if not, why? Can

you clarify that response? What else could be added? In what situation might that apply?), facilitate a discussion of the information without providing additional information

(Stage 2). In the next stage the teacher asks students to form pairs and ask each pair to discuss the information and construct notes which provide an answer to the question. This process actually becomes the essence of the students' notes for the topic. The students should be given only a few minutes to complete this activity (Stage 3). Finally, to close the activities, the teacher can add a few comments and thoughts about aspects of the topic which have not yet been addressed and which serve to amplify, apply, analyze, synthesize, or evaluate the information that has already been discussed

**ix. Case Studies.** In this method the teacher can stimulate thinking in the students by furnishing them with real or created situations and ask them to identify the facts, define the problem, generate and evaluate possible solutions, and create a workable plan of action

**x. Action Mazes.** This method is suggested by Broadwell, (1989). In this method the teacher provide students with a problem with three possible solutions: one is right and is time-efficient in its solution; one is okay but is not time efficient in its solution; and one sounds right but is wrong and is not time-efficient in identifying inaccuracies.

**xi. Classroom Humour.** The teacher can ask students to collect editorial cartoons, comic strips, etc related to the concept taught in the class. The teacher forms group in the class and provide copies to the groups and ask them to identify the situation in the cartoon and the information which pertains to it. Have them discuss how knowing more about this information contributes to their understanding and appreciation of the cartoon.

**xii. What's Wrong with This Picture?** The teacher can create paragraphs or essays which contain both correct and incorrect information about a major topic. Divide the class into groups and have the group rewrite the text, correcting faulty information.

**Challenges of using higher order cognitive skills in classrooms:** The results of using higher order cognitive processes are very rewarding in long terms as it empowers the students to develop positive attitude ,being able to make informed choice, make rational judgement an



efficient problem solver and so forth. But bringing this task to reality is not an easy task as there are many challenges to be won over such as

- **Pupil teacher ratio:** Promoting higher order cognitive skills require the teacher to pay individual attention to the students in the class. However the reality in the Indian classroom is slightly different as the pupil teacher ratio is high since the classes are crowded as a result the teacher is unable to pay equal attention to the individual students.
- **Lack of proper skill and time by the teacher :** Teaching the concept with the objective of developing higher order thinking skills require the teachers to use certain kind of skills like arrangement of debate, role play , preparation of action plan , charts work sheets etc. Which the teacher may not be able to do so because of lack of time or proper skill.
- **Examination oriented atmosphere:** Our educational system is examination oriented the teacher are always in pressure to complete the syllabus within a stipulated time as a result there is hardly any room for experimentation and adaption of innovative approach which is one of the pre requisites for the promotion of higher order cognitive skills.
- **Lack of co-operation from school and home:** In our country adaption of new techniques and strategies have always paved way for criticism hence a teacher most of the time do not get proper support from the school as well as from the parents hence the teacher is forced to follow the path of traditional teaching and learning.
- **In efficient pre service curriculum :** The pre service curriculum for the teacher is still to be reformed and has to provide space for the teaching -learning strategies for the higher order cognitive skills.

## **Conclusion**

The modern educational reform around the globe demands a shift from traditional algorithmic teacher oriented learning to non- algorithmic student centred constructive approach. The future citizens of the globalized world are supposed to endow with the skills of problem solving , rational thinking, critical thinking ,and judicious decision making. In order to empower the students with this skills the role of teacher is very important in this context. The teacher need to adapt constructive approach in his teaching learning strategies to

promote the higher order cognitive skills among the students. The teaching strategies that fosters the development of the higher order cognitive skills of the students are discussed along with the challenges. If a teacher adapts few of the innovative ideas in his classroom she will be able to make a change in the students by making him a lifelong learner flexible in his approach and able to make decision when confronted with dilemmatic situations.

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