

Developing Higher Order Thinking Skills At School Level

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Backdrop :

One of the significant developments in the school level education in the context of emerging 21st century world is the shift from passive rote level learning to active inquiry based approaches in learning. This is called paradigm shift from teacher centered to learner centered education. The focus of attention on the learner through the progressive education movement. It has persisted in various forms at all levels of education in general and that of school level education in particular. What are the main concerns and engagements pleaded under the umbrella of this paradigm shift? What are the principles and the processes which get promoted under it and what are the major swings of emphasis manifest in the content and process of education on one hand and the activities which are frequently associated with it on the other? These are the issues which have been examined in this paper in the context of the goal of education being the development of thinking specially the higher order thinking which gets expressed under the rubrics of divergent thought processes.

Thinking as goal of education :

At school level in particular the subjects which are taught share one perennial concern which pertains to making the learner thoughtful, inquisitive and avid. It may be pointed out that avidness is one of the basic indicator of learner's thoughtfulness and readiness to probe new domains and unfamiliar territory. Thus, whether we teach science- physics, chemistry, mathematics, life sciences, social sciences or languages one of the common dominator in postulating the goals of education relates to development of thinking.

Thinking is one of the basic attributes of human beings. It is the hallmark of all human endeavors and related pursuits which try to seek explanations of the complexities and mysteries which face human life and the societal processes. In the schools, the various subjects which we teach are directed unilaterally to one single goal and it is the promotion of thinking and refinement of thinking processes.

Recently three types of thinking have been identified and referred to by the way of representing the levels and forms of human intelligence described as IQ, EQ, and SQ. IQ is intimately associated with serial thinking which expresses itself in

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logical and step by step progressive movements in the nuances of thought patterns. Infact, IQ has been measured by a weightage given to the amount of serial thinking a learner is able to possess. The EQ which is the recently reported component of human intelligence is related to associative thinking. In this type of thinking there is an automatic networking of relational and affective aspects of our thoughts. It directly relates to emotional management and awareness of one's own and other's emotional characteristics through the processes of empathetic appreciation. The SQ which has been now the subject of discussion in the past ten-fifteen years is related to the domain of Unitive thinking. This thinking deals with one's ability to go beyond the immediate concerns and takes a leap far beyond the known and is expressed in one's power of transcendence. Needless to mention that school education provides the necessary background for promoting the three types of abilities that affect the IQ, EQ and SQ by laying stress on the content and process which will not only promote and develop but also nurture and support the processes of serial thinking, associative thinking and unitive thinking as discussed earlier.

Concerns of teaching and learning at school level

Teaching is a systematic plan orchestrating the goals, strategies and instrumentalities to cause learning. All teaching aims at achievement of some kinds of learning goals. These learning goals may be sub-divided into three major domains viz., cognitive, affective and psychomotor. In all the three domains learning is concerned with development of thinking skills. At the school level various subjects are provided and structured to form a curriculum and their object is to promote thinking skills specific to three domains of behavior.

Thus, in the cognitive domain the concern for learning is focused mainly on the following thinking skills:

- Recall and recognition skills which are considered to be the basic skills in the context of facts, principles, processes and systems. The specific thinking skills are related to identifying and configuring information so as to render it to become a knowledge configuration.
- The next higher order thinking skill is that of understanding which implies the ability of seeing relationship between facts and concepts.
- Putting the capabilities of understanding to explain and interpret the situations which are in a novel context is the application level skill and is considered to be pretty high as compared with the preceding two skills.
- The skill of analysis is still higher and recognizes the capability of

differentiating the various distinct elements which form an integral whole. It amounts to finding out how 'a' is different from 'b' and 'b' is different from 'c' and so on which put together form a unit or group.

- Another higher order skill in this conceptualization is of synthesis which means the capability to form a comprehensive whole based on the analysis of individual units. It implies the emergence of new configurations and patterns with a potential to summarize all the distinct elements into a unitive whole.
- The highest type of cognitive ability is called critical thinking or the capability to evaluate the patterns and processes on the basis of internal and external criteria. This capability develops as a result of the effective acquisition of the previous ones and it presupposes the use of a critical acumen which emerges as a sign of insightful learning and having the potential for critical appraisal.

Although in the school level syllabus all the six cognitive thinking skills are assumed to take place and in here the curricular structures. The fact of the matter is that in most of the school subjects the teaching-learning transactions get confined and restricted to memory level operations derived from and centered on rote learning. The concern now is being directed and shifted to explore the effective transactional strategies for school level curriculum so as to make the learner an active participant in the teaching-learning processes rather than a passive entity and a mere recipient of information and knowledge.

In the affective domain the concern gets expressed in the form of three key areas-interest, attitudes and values. The learner at the school level has to evince a high degree of pro-active move to perform various tasks relevant to the school subjects. They have to develop a positive attitude towards the context and content of the curriculum, teaching-learning process, the teacher and the various learning tools such as the textbooks, gadgets, portfolio etc. Needless to mention, that in our schools this part of the development of affective behavior remains sidelined and neglected.

The psychomotor domain is concerned with the thinking skills which get manifest in performing various activities and manipulating the various aspects of the situation in order to achieve certain pre-specified results. The psychomotor domain is directly related to the school and classroom based activities such as dramatization, designing of gadgets and exhibits, social work and social service, items of handicrafts, decoration and other creative portfolio such as puppets, maps, charts etc.

Thinking And Problem Solving Skills At School Level :

In the development of thought processes at school level the importance of acquiring an ability to form and utilize simple and abstract concepts cannot be denied. A concept is a generalized notion of an object, event or idea. It implies a classification and naming of characteristics which help in its subsequent identification. They enable the students to relate present experience with the past or existing schemata and to expand, interpret and communicate these experiences to others.

In the process of conceptual thinking three types of abilities as pointed out by Piaget are assimilation, accommodation and adaptation. Assimilation is basically an incorporation and organization of environmental experiences into existing schemata or previous thought structure. A young child at play say in the act of catching the ball assimilates the ball to his grasping schema. In the classroom the child who follows and understands what the teacher is saying is assimilating or absorbing the incoming information to his current state of schematic development. Thus, assimilation shares much in common with the behaviourist concept of generalization.

Another important aspect of conceptual thinking involves accommodation. This implies modification and combination of existing schemata and formation of new schemata. Accommodating activities consist of various cognitive acts such as discovery, experimentation, imitation, trial and error and moves for new and successful shades of behavior. Adaptation is a third important aspect of the thinking process in this frame of reference. It involves putting to use the newly formed schemata as a result of accommodation to novel situation and their demands in a rather effortless and spontaneous manner. It basically connotes the dynamic balance, a state of equilibrium between assimilation and accommodation. Piaget has identified preconceptual thought during two to four years of age and imitative thoughts from four to seven years. In his research during the concrete operation (8 to 10 years) there is transition evident in the form of genuine reasoning process and beginning of logical thoughts slowly evolves as soon as a child acquires the capability of making an internalized mental action. According to Piaget it is not the final stage in thought development because the child is still restricted to concrete as opposed to abstract thinking. It may be mentioned that in views of Piaget the following systems of concept and conceptual thinking emerge at this stage of development.

- Classification which means formation of classes and sub classes.
- Seriation which implies placing related objects in their correct order or

succession.

- The construction of a number system which necessitates an understanding of both classification and seriation in the sense that nine is placed between four and sixteen in the sequence of squares of whole numbers as opposed to a parrot like learning of 1,2,3 which is purely verbal counting.

In the formal operation stage (over 11 years) propositional thinking begins. The specific example of such thinking may be given by reference to mathematical logic in which variables like p,q, and r are combined with logical consonants to form valid logical formula.

The advanced stage of thinking converges into development of principles of problem solving. The following is a list of general principles which may be found useful in organizing teaching-learning processes at the school level. (Gordon R. Cross, 1966)

- Comprehension of the problem which entails the following safeguards:
 - Avoid jumping to a hasty conclusion.
 - Make certain it is thoroughly understood in every particular and detail.
 - Ask questions about it.
- Possible methods of approach to the problem which requires the following cautions:
 - Recall and select all apparently relevant facts, ideas, rules and principles.
 - Combine and recognize them.
 - Generate ideas; look for unusual usages, novel applications and extensions beyond common or past experiences even if they seem implausible.
 - Specific approach to the problem.
 - Formulate a detailed plan of solutions; if necessary break it down into a sequence of sub-goals.
 - Verify the solution, for example by substitution or confirm it by a re-run with alternative data.

Thinking Skills in Constructivism Paradigm :

Towards the end of the last century constructivism became a popular approach to learning and thinking. Its chief proponents were Piaget, Dewey, Montessori and

Vygotsky. In 1978 Driver and Esley took a stand that interventions provided in the classrooms can help learner to construct their own concepts. They believed that learners construct knowledge on the basis of their prior knowledge and personal experience. The advocacy was therefore, to promote thinking habits among children. In the following years, Novak and others (1993) pleaded for providing interventions to help children to construct their own concepts. Taking cue from the constructivist paradigm a teacher has to investigate and explore thinking based instructional strategies which are effective in facilitating conceptual changes.

It is to be noted that according to the contemporary constructivist approaches teaching and learning must promote thinking ability which will lead to adaptive processes in which learner's conceptual scheme will be reconstructed progressively. Novak proposed a model of learning and thinking known as human constructivism. This view asserts that cognitive processes resulting in creative or research work is basically the same as that of a new learner in constructing new knowledge. In this framework individuals construct meanings by forming connections between new concepts and those that are part of an existing framework of prior knowledge. It may be therefore rightly stated that learning and for that matter thinking is a meaning making mechanism embodied in a complex set of language symbol systems.

Constructivists have accordingly laid stress on metacognition and thinking skills. According to this perspective metacognition is the capacity for self-awareness regarding one's own action or mental power. It is particularly important at secondary level of school education when learning becomes more and more teacher directed. At this stage thinking is challenged to become more disciplined and deliberate task or set; problems posed and instructions given thus, render the criteria for success and failure become more overt. Result of this is to be seen in a new degree of self control required. In order to achieve this self control new forms of reflective thinking and self awareness become essential and an imperative.

The constructivist approach has been particularly popular in teaching science and mathematics at the primary stage. Several programs such as cognitive acceleration through science education (CASE) has been reported by Adey and Shayer (1994) which have shown positive results in developing higher order thinking abilities. In such projects the emphasis in educational process is on promoting self-regulation and disciplined thinking. Following types of basic thinking skills may be specially mentioned in this connection:

- Information processing skills related to thinking and reasoning.
- Thinking skills needed for inquiry training.
- Thinking skills to encourage creativity and evaluation.

The constructivists have suggested specific teaching strategies to develop thinking skills in this regard. They consist of investigative projects, creative writing, field surveys, experiential learning which lay stress on the importance of critical and reflective thinking in the processes of teaching and learning. Kolb (1981) and Peter Jarvis (1987, 1995) developed a cyclic model of experiential learning involving four steps, namely concrete experience, observation and reflection, formation of new concepts/ ideas and validating new ideas.

Skill Development Programmes for Schools and Colleges :

In the matrix of the foregoing constructivist stance, it will be now in fitness of things to give a brief outline of the justification for development of skills at the level of schools and colleges. This will imply working out a comprehensive plan for development of skills in relation to various subjects and disciplines including practicum. In such a skill development project both cognitive and psychomotor skills should be given adequate coverage. In the cognitive skills the following may be incorporated especially in the context of the language and social science teaching:

- Development of skills for quick recall and recognition of relevant facts and principles.
- Development of skills of analysis and logical relationship among facts.
- Skills of arguing, inferring and interpreting.
- Skills of deduction and induction based on observed facts.
- Skill for problem solving.
- Skills for integration and attaining synthesis.
- Skills of evaluation and critical thinking.
- Skills of convergent and divergent thinking.

It may be observed that an effective skill development program for the various skills mentioned above assumes and presupposes the following of an empirical rather than axiomatic approach. The plan in respect of skill development may comprise three components such as the focus, the context in which the skill is to be developed and the evaluation of the extent to which the skill actually has been acquired. It hardly needs stressing that the experiential learning format as

advocated by the constructivists will play a crucial role in making such programs cost effective and efficient.

Summing up :

To conclude, it may be stated in passing that skills are the most important aspects of any educational and training program. Without emphasis on skill development knowledge acquisition is bound to remain a very perfunctory and superfluous accomplishment. The component of skills not only inhere an effective system of education but also calls for the utilization of a system's approach to make it easy to develop. In this approach the variables related to input, process and output stages have to be carefully identified and harnessed. At all the levels of education including teacher education programs a due emphasis has to be given to this component so that the quality concerns are properly addressed and assured.

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