Problem solving and critical thinking – hdlt

Science

Critical thinkingand Problem Solving HDLT mini paper It is possible to store the mind with a million facts and still be entirely uneducated. Alec Bourne. According to American educational Psychologist – Robert M Gagne – " The central point of anyeducationis to teach people to think, to use their rational powers, to become better problem solvers. " Looking at the current model of our own learning, in HDLT 2 class itself – as students of the second semester in the university; we have been exposed to theories of this subject before. It is now time for adapting, assimilating, applying the past knowledge in real life contexts.

This adaptation is tested through fresh, innovative learning environments and higher expectations. Let us first determine critical thinking and problem solving and see how are these phenomenon interrelated with each other and the role both these skills play in our lives. Critical thinking (CT) is defined as " intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and /or evaluating information gathered from or generated by observations, experiences, reflections, reasoning orcommunicationas a guide to belief and action. Scriven & Paul, 2007, P 1). Thus simply put, CT is metacognition or thinking about thinking. Problem-solving (PS) is a mental process that involves ascertaining, investigating and solving problems. The eventual objective of problem-solving is to overcome hindrances and find a solution that best resolves the issue. These problems could range from simply crossing the road and reaching safely on the other side without getting hurt by the oncoming vehicles or solving a Sudoku puzzle or figure out a estimated expenses of a trip or in case of a child, solving a multiplication sum given in the class.

The term problem solving (P S) in educational settings would involve solving well-structured text book problems which are poles apart from ill structured problems which are encountered in everyday life. Thus we can see that in order to effectively solve a problem, one may require to engage with it and critically think about it to find the best solution. Let us now look at certain important broad themes and specific problem solving processes used by children - Broad themes - 1. Task analysis – details of steps taken to actually solve problems.

For example a child adds 2 multi digit numbers, the actual process - starting with adding the numbers in the right most column, writing ones digit as a part of the answer, carrying over the tens digit (if it is so) ... so on and so forth. Task analysis helps in identifying the exact places where child might be encountering difficulty in solving the problem, the nature of the difficulty. Thus it gives an insight into the manner in which the child solves problems; and thus provides scope for rectification. 2.

Means – End analysis - Using this methodology, one solves a problem by considering the obstacles that stand between the initial problem state and the goal state. The path to reaching the goal can be achieved by accomplishing smaller subgoals. When all of the sub goals have been achieved – when all of the obstacles are out of the way – then the main goal of interest has been achieved. Thus, means-ends analysis can be seen as a search strategy in which the long-range goal is always kept in mind to guide problem solving. 3.

Encoding – this literally means identifying critical information in order to build internal representations. Thus it is very important to train the child to

filter out the relevant data from the all the available information. Many children fail because they are not thought how to encode critical information and utilize it. Important processes of Problem Solving- 1. Planning - this is future directed PS, most often used in difficult and new situations. But most often the novelty of the situation also ensures that children often forget to plan. 2.

Route Planning - this is done in order to select a most efficient route in order to reach a destination. Children as early as one year of age start showing the development of this ability. Example – an adult figuring out his way in order to reach a new destination; after looking at various maps. The route is figured out post route planning. 3. Causal Inference - many a times problem solving is an attempt to understand the cause of a phenomenon. Humans are curious by nature. A two year old will constantly be in the endeavor to know " why things happen"... why do birds fly, whereas animals don't? so on and so forth. 4.

Analogical Reasoning - In problem solving this is predominantly concerned with systemic correspondences, where a solution to a known problem may be applied to solving a structurally similar problem. Analogical reasoning improves with maturation and increase in content knowledge. According to Piaget's stages of development analogical reasoning only starts developing in the pre operational stage (ages 2 -7) and gets occasional limited success in concrete operational stage(7-11) and becomes fully developed by formal operational stage (age 11 through adulthood) Stage I (Preoperational) - egocentric responses using idiosyncratic relations.

IA - children were unable to form lower-order relations IB - some children able to form lower-order relations, but unable to form analogies Stage II (concrete operational) - occasional, limited success IIA trial-and-error success on analogies, inability to resist false counter-suggestions IIB consistent success on analogies, but inconsistent ability to resist false counter-suggestions Stage III (formal operational) - Success on all aspects of the tasks. Criticism of Piaget – Goswami & Brown reasoned that children might fail Piaget's tasks because they lack knowledge of the relations entailed.

On this view, children ought to be able to solve classical analogy problems provided the analogies are based on familiar relations. Practice in analogical reasoning improved young children’s spontaneous formation of analogies. 5. Scientific reasoning: Children question everything as a basic premise, they want to know the why , how of everything; but they are also hugely influenced by the beliefs that they see are carried around them. Whenever they actually do something on their own, they do develop an understanding and rationality regarding the same phenomenon.

For example a child understands that sugar takes less time to dissolve in hot milk rather than cold milk. Thus, when they indulge in activities, experiment they develop scientific and logical reasoning. 6. Logical reasoning - It is when a child can apply logical rules in order to solve problems. Logical reasoning requires the child to link each alternative to the main problem by strong reasoning. They may also require using logical structure " If... , Then .... " for example if a child has to climb up two floors, he could either use the lift or the stairs.

If the escalator lift for some reason is not working, then either the child could wait till the lifet starts working or take the stairs. The choices have to be logically reasoned out. Both analogical and logical reasoning develop gradually over early and middlechildhoodwhereas scientific reasoning does take more time to develop and take shape as it is much enhanced by experience. Along with certain important processes used in PS some of the others are – Symbolic representation as tools Rule based problem solving etc. Above we have also looked at Piagetian perspective on PS.

Let us also look at the Vyogotsky's perspective on the same. Lev Vygotsky gave some novel ideas regarding childrens learning and their problem solving abilities. 1. Zone of Proximal development (ZPD) - This is the zone where learning takes place. This zone represents the difference the between what the child can achieve on its own and what it can achieve with the help of others. In order, for learning to occur, the elder or peer must provide a challenge that is beyond the child's own capabilities and yet be assisted. Thus assisted learning or peer learning is an important aspect of children developing the PS abilities.

If children have done a task with an adult or under the guidance of an adult (ZPD) they tend to show improvement whilst performing as opposed to those who were attempting it for the first time (Piaget's discovery learning). Vyogotsky also pointed towards the importance of private speech in children, whenever confronted with a novel problem. This speech could be their method of engaging with the problem. As children grow up and get better at symbolic interpretation, this private speech diminishes. Now let us look at how a constructivist classroom helps children in enhancing their PS abilities.

Constructivist approaches to learning attempt to generate environments where learners are actively engaged in their surroundings and environments that help them to construct and develop their own understanding, reasoning and knowledge, rather than theteacherinterpreting their world for them. The learners interaction with theenvironmentand with the subject matter at hand results them in having their own view about the subject. Thus we can see that collaborative learning is the hallmark of a constructivist classroom. For example – group of students in a chemistry class are learning about properties of organic salts.

Instead of directly stating the properties, the teacher will devise questions which will engage the students in challenging their previous knowledge, link it to the other phenomenon that they have already been studying and generate a new level of understanding regarding the topic. During the discussions and promptings, when one student comes with the relevant concept, the teacher would cash on it and hint to the group to further explore this concept. Late, she would sum up ay concluding what the class has learnt, what helped and what did not help them in constructing new knowledge.

Question – The biggest question for me is the teaching methodology. In most of the schools, that me and my colleagues have visited during our practicum, we inevitably noticed that instead of focusing on teaching the students how to think, rationalize, develop an understanding. The focus is on what they should think? Conclusion - By providing them everything like “ ready to eat meals”, we seal them from developing their own understanding. In a class

room setting children, still encounter structured problems, in real life settings children will be coming across many ill structured problems.

The aim of education must be to prepare them for encountering the challenges that they would face everyday. They have to be trained to adequately use their problem solving abilities within the classroom as well as outside it. References – Taylor, L, (2005). Introducing cognitive development. Taylor and Francis: PsychologyPress. (Chapter: Thinking and reasoning). Siegler & Alibali (2005). Chapter 10: Problem-Solving (pp 341-380). Synder L. & Synder J. - Teaching critical thinking and Problem solving skills, The Delta Pi Epsilon Journal, Volume L, No. 2, Spring/Summer, 2008