

## Teaching Mathematics Through ABC Model of Critical thinking

Dr. Indra Kumari Bajracharya\*

### *Abstract*

*Critical thinking is research based instructional methods. It is useful and appropriate to generate ideas for instruction of different discipline. CT program specifies classroom teaching in three phases. These three phases are Anticipation, Building knowledge and Consolidation. There needs different types of strategies for three phase session plan.*

### **Introduction**

Critical thinking means correct thinking in the pursuit of relevant and reliable knowledge about the world. Critical thinking refers to making reason based judgment. It refers to the process of methodology that employs reasons; insight awareness, imagination and sensibility in order to criticize and evaluate a text or what so ever. According to Paul and Elder (2005), it is a process by which a thinker improves the quality of thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them. Critical thinking is essential for effective functioning in the modern world. According to Paul (1989), to think critically is a combination of both affective and cognitive skills. It is the use of those cognitive skills or strategies that increase the probability of a desirable outcome. The most successful classrooms are those that encourage students to think critically.

Critical thinking is a professional development program for educators. It is a research based instructional method to help students think reflectively, take ownership of their personal learning, understand the logic of arguments, listen attentively, debate confidently and become independent life long learner. The most successful classrooms are those that encourage students to think for themselves and engage in critical thinking (Halpern 1996; Kurland 1995; Unarau 1997). So, it is important and useful for students. It develops writing, listing, speaking and thinking skills. If Critical

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\* Associate Professor, Mahendra Ratan campus, Thachal Kathmandu.

thinking strategies are adopted in classroom teaching, it obviously promotes the active inquiry, student initiated learning, problem solving, thinking critically, cooperative learning, writing and reading processes and alternative assessment.

### **A Brief Account of Critical Thinking Program in Nepal**

Critical thinking methodology is a comprehensive and complete package and is well tested in more than 37 countries and classrooms of similar conditions in Nepal (Shingh *et al*; 2010). Aim of the CT program is stimulating innovation, creativity and critical thinking in education for active involvement of citizen in community development. In 2008 December, expert team from the Open Society Institute (OSI) conducted a one-day workshop on critical thinking methodology in Kathmandu Nepal. In this workshop, various groups such as educational planners, decision makers, university professors, non-government organizations, school administrations and teachers were invited to participate. After this workshop, the Alliance for Social Dialogue (ASD) and Social Science Baha (SSB) organized CT training. The period of CT training workshop is 25days. In this CT program 33 teachers from Faculty of Education, Tribhuvan University and Kathmandu University and 34 staffs from NCED and other Non-governmental organizations participated. At this time, four phases of five days training on CT have also been completed with participation of two groups of trainers, pre-service (teacher of faculty of education, Tribhuvan University and Kathmandu University) and in-service (staffs of NCED and Non-government organization) groups. Four more demonstration workshops were conducted by international CT trainers. two more workshops were organized outside of Kathmandu by CT Nepal trainvalley. The series of CT workshops for pre-service and in-service teacher trainers completes in 2010. Again, CT manual is reprinted in Nepal by ASD with the permission from OSI.

### **Strategies of Critical Thinking and Learning**

The scope of critical thinking is broad. It not only includes logical arguments but also the intellectual criteria such as clarity, credibility, accuracy, precision, breadth, fairness and so on. It has structured productive and innovative idea of thinking. So, critical thinking is also called non-destructive methods of creating new ideas. In addition, critical thinking is useful and appropriate to generate ideas for instruction of various disciplines.

For teaching and learning, there are many strategies that have been used in critical thinking. However, we need to select appropriate strategy of instruction according to the subject, content and topic of instruction among different strategies. In fact, the determining factors in selecting the strategies are number of students, their level of knowledge, Individual differences, geography of classroom etc. This approach opines that teaching is more than a set of methods or strategies. It focuses on developing student skills and strategies for learning, at the same time; they learn content of the curriculum. However, it suggests a number of methods and strategies useful to develop critical thinking ability in the students. Some of the strategies are: Think/pair/share (T/P/S), Know/want to know/learn (K-W-L), what/so what/now what, Mix/freeze/pair, Quick-write, Pens in the middle, Value line, Directed Reading Activity (DRA), Jig-saw, One stay/three stray, Walk around/talk around, Reciprocal teaching, Save the last word for me, etc.

### **ABC Model of Critical Thinking**

CT specifies classroom teaching in three phases. These phases are abbreviated as termed as A B C: Anticipation, Building knowledge and Consolidation.

#### **Anticipation**

Each lesson begins with a phase of anticipation, in which students are directed to think and ask questions about the topic they are about to study. The anticipation phase serves to call up the knowledge that students already have. It informally assess what they already know including misconceptions, sets purposes of learning, focus attention on the topic, and provides a context for understanding new ideas.

#### **Building Knowledge Phase**

In this phase, teaching leads students to inquire, find out, make sense of the material, answer their prior questions, and find new questions and answer them. This phase serves to compare expectations with what is being learnt, revise expectations or raise new ones, identify the main points, monitor personal thinking, make inferences about the material, make personal connections to the lesson, question the lesson.

#### **Consolidation Phase**

Towards the end of the lesson, once students come to understand the ideas of the lesson, there is still more to be done. Teachers want students to reflect on what they learnt and ask what it means to them, reflects on how it changes what they thought, and ponder how they can use it. This phase of the lesson is called the

consolidation phase. The consolidation phase serves to summarize the main ideas, interpret the ideas, share opinions, make personal responses, test out the ideas, and assess learning ask additional questions.

### **Model Session Plan**

The example of a model session plan, which is developed and implemented by the trainers based on ABC model of CT methodology for the requirement of assessment of the CT program for video record. The session plan is as follows.

#### **A Model of Session Plan 1**

**Name of the school:** Madan Smark Higher Secondary School, Lalitpur

**Subject:** Geometry

**Time:** 45 minutes

**Grade:** VIII

**No of student:** 40

**Period:** 4<sup>th</sup>

**Topic:** Properties of a Parallelogram

**Objective:** To construct a parallelogram and verify that the opposite sides of a parallelogram are equal.

**Session :**

<b>Time</b>	<b>Phase/strategy</b>	<b>Step 1</b>	<b>Step 2</b>	<b>Step 3</b>
10min	<b>A</b> (Anticipation phase)	Draw a quadrilateral and discuss its properties	Quick draw (individually draw a quadrilateral ) and T/P/S will be used	All students will draw quadrilateral and follow think, pair and share and each student from each pair will come forward and write their sharing in note copy.
20 min	<b>B</b> (Building knowledge phase)	Draw three types of Parallelogram with the help of ruler and measure opposite sides and filled in the table.	Group work	Five groups of students will follow drawing of parallelogram and measure it by ruler its properties and fill up table which will be given instruction by the teacher
15 min	<b>C</b> (Consolidation phase)	Conclude the opposite sides of parallelogram are equal.	Presentation and active listing	One student from each group will present their group work.

### A Model of Session Plan 2

**School:** Neric Academy, Baneshwor

**Subject:** Geometry

**Topics:** Circle

**Sub-topic:** Equation of circle

**Date:** 2010-5-31

**Time:** 45 min

**Number of students:** 24

**Grade :** 10

**OBJECTIVES:** On the completion of this lesson the students will able to

- derive the Equation of circle in diameter form
- find the equation of the circle when the two points of a diameter is given.

**Session :**

Time	Phase/strategy	Step 1	Step 2	Step 3
10min	<b>A</b> (Anticipation phase)	Circle and its parts like as radius, diameter, sector, segment and so on. Ordered pair, slope of line	T/P/S Recall the terms, Identify the different parts of the circle	Students are asked to list out the different parts of the circle individually and then in pair and share in group. Collect the one idea from each group.
25 min	<b>B</b> (Building knowledge phase)	Diameter form, slope of the line, relation of slope of two perpendicular lines, use of the equation	Derive the formula with mini lecture DRA and active listening	Teaching with demonstration, Mini lecture and active listening
10 min	<b>C</b> (Consolidation phase)	Do	Do	Do

#### **Conclusion**

Critical thinking is a professional development program for educators. Its methodology is a comprehensive and complete package. It is structured, productive and non-destructive methods of creating new ideas. In addition, critical thinking is useful and appropriate to generate ideas for instruction of different discipline.

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