**Mathematical Creativity**

There is no uniformly in various definitions of creativity. It has been defined differently and it has not any universally accepted definition as such. K. Benett has done research on the meaning of creativity. According to him creativity is multidimensional and its meaning is not same for all people. It does not have a universally accepted definition, though there is similarity in various definitions of it.

There are some properties commonly related to it, such as **Fluency, Flexibility, Divergent Thinking, Originality, Inventiveness, etc.**

*Mathematical creativity can be defined as making new mathematical combinations from existing mathematical concepts, objects and elements.* *Creativity can be also defined as the sum total of scores on fluency (All the relevant responses), Flexibility (Number of Approaches/way adopted to respond) and originality (Peculiar, New and Unique responses).*

Creativity as the unique characteristics of the human mind may be defined as the capacity of an individual to create or produce an entirely new or novel idea or object or by the rearrangement or reshaping of what is already known. According to spearman, “creativity is the power of the human mind to create new contents by transforming relations and thereby generating new correlates”.

Creative classrooms are unlikely to happen at random. In fact there are many social and institutional pressures in most educational jurisdictions which militate against the sorts of features which might characterize our creative settings. Not the least among these is the fact that for very high percentage of the population not excluding many teachers of mathematics, Creativity and Mathematics are terms which are simply incompatible.

Conception 1: *creativity as novelty*

 The teacher attempts to introduce concepts in ways which are different, unusual and innovative. A creative mathematics teacher attempts to bring her students to mathematics that is motivationally strong.

Conception 2: Here the teacher attempts to have *mathematical ideas emerge* from the building of physical objects. A creative mathematics teacher works hard at *hands on approach* to learning and makes extensive use of physical materials and models. This conception fits well with the laboratory approach to teaching, a psychological perspective built on Bruner’s modes of representation-enactive, iconic and symbolic.

Conception 3: *creativity as the construction of artifacts- symbolic*- the teacher attempts to have mathematical ideas emerge from the development of symbol systems. This conception fits well with a problem solving emphasis in mathematics, the use of computer software packages.

Conception 4: *creativity as personalization/ humanization* –here the teacher attempts to structure the learning environment so that students have maximal opportunity to follow their own interpretations of a basic mathematical idea. Here a creative mathematics teacher encourages her students to individualise their approaches to tasks.

In practice, however, creative mathematics teachers are likely to mix aspects of all of these conceptions and many others. This is apt to be particularly true when working with gifted learners.

“Balka has developed the following **criteria for measuring creative ability in Maths**

 (1) The ability to formulate mathematical hypotheses concerning cause and effect in a mathematical situation.

 (2) The ability to determine patterns in mathematical situations.

(3) The ability to break from established mind sets to obtained solutions in a mathematical situation.

 (4) The ability to consider and evaluate unusual mathematical ideas to think through their consequences for a mathematical situation.

(5) The ability to sense what is missing from a given mathematical situation and to ask questions that will enable one to fill in the missing mathematical information.

(6) The ability to split general mathematical problems into specific sub-problems.

**Nature and characteristics of creativity**

-Creativity is the ability to develop something original.

 - Creativity is the ability to create new ideas, theories or objects.

 - Creativity has several dimensions.

 - Creativity is a process as well as a product.

- An Environment and person is also creative.

 - Creativity is the ability to synthesise ideas or objects

- Creativity is the resultant of some interaction

. - Creativity knows no special medium, place, person or time.

- Creativity is the capacity to accept challenge.

- Creativity is the readiness to change self and environment.

- Creativity is the freedom to exercise choice.

**Some specific ways to foster mathematical creativity**

 \* Training the mathematics teacher in different types of skills (Intellectual, Teaching, Evaluation etc.) to present the content creatively. The skill of problem solving may be helpful for creative empression as identified by NCF (2005) “Many general tactics of problem solving can be taught progressively during the different stages of school : abstraction, quantification, analogy, case analysis, reduction to simpler situations, even guess-and-verify exercises, are useful in many problem solving contexts.”

\* Utilisation of different methods of teaching such as Brain Storming, Group Discussion, Buzz Session, Seminar, Symposium, Interview, Panel discussion, Debate, Cooperative Learning besides the traditional methods specially Laboratory, Inductive – Deductive, Analytic – Synthetic, Lecture Demonstration. The major thrust is on group discussions, participatory activities, practicum, assignments and field visits for observation of creative activities.

\* Use of unconscious, Internal, Criterion – Referenced and Continuous & Comprehensive evaluation techniques for practice and analysis of different mathematical problems.

\* Identification of mathematically creative students and forming the teaching group for their development of creative talents in mathematics.

 \* Training the guardians/parents of mathematically creative students in the way they could help them to foster their mathematical creative talents informally and at times non-formaly.

 \* Researching in mathematical creativity specially with respect to the relationship of creativity and other psychological traits.

\* Developing creative style of self study among the mathematics learners.

\* Identification and Measurement of mathematical creativity as early as possible.

 \* Review of Teacher Education programme for the development of some mechanism for developing mathematical creativity.

\* Arrangement of some special programmes for development of mathematical creativity.

 \* Formation of committee for the identification and development of creative talents at National, State, District, Block and Panchayat Level.

\* Development of some Instructional Materials for committee members, teachers and parents.

\* Creation of creative environment in schools for creative expression and its development.

 \* Introducing the topic of Mathematical creativity in the curriculum at secondary and Teachers Training Level.

 \* Special provisions and arrangements for counseling of mathematically creative talents.