SUMMARY

Human beings are born with latent urges, abilities, capacities, interests, aptitudes and other personality traits. It is the prime concern of education to stimulate and guide these capabilities to the most desirable channels. To carry out these multidimensional objectives suitable Instructional strategies are essential. This led researchers to explore various models, methods and techniques, to enhance cognitive, affective and psychomotor capabilities of the learners. To meet the above instructional goals, a number of teaching strategies have been developed by educationists and psychologists based on available theories of learning. But there is no single best way that can be employed in all situations of teaching learning process. Present day classroom transaction systems provide little opportunity for the development of creative pursuit. Many models of teaching have been developed to enhance creativity among the learners. Williams’ Frank E. (1993) model of teaching is one such approach specifically meant for enhancing creativity among learners at school level. Making our classrooms more interactive, innovative and interesting, teachers should teach through creative programmes which enables the students to feel the mathematics very practical, easy to learn and close to real life. Therefore, to explore its credibility in enhancing the creative ability, an attempt was made to find out the effect of the Williams’ model of teaching in enhancing the creative abilities among the students and also its effect on achievement in mathematics.

WILLIAMS’ COGNITIVE – AFFECTIVE INTERACTION MODEL

Williams had developed a cognitive-affective interaction teaching model. William’s argument was based on the principle “Thinking processes cannot really operate without feeling processes and almost all cognitive behaviour has an affective component”. For effective human development, the combinations of both cognitive and affective domains are required. The pupils’ demand for knowledge and information is nearly related to his personality dispositions and his internal set of values. Williams discussed the theoretical basis and educational uses of 4 models of cognitive-affective behavior: (a) Piaget's theory of intellectual development, (b) Bloom's taxonomy of the cognitive behavior, (c) Krathwohl's taxonomy of the affective domain, and (d) Guilford's Model of intellect.
A discussion of the theoretical basis and educational uses of above 4 models of cognitive-affective behavior new model, as outgrowth presented which is designed for use by the teacher in enhancing and encouraging creativity among youngsters. It is summarized that this model may narrow the distance between what is already known about the cognitive-affective interaction processes and how it is utilized in educational settings. This model is based upon studies conducted on creative peoples. This model has three dimensions:

**Dimension 1:** Dimension first consists of subjects that comprise the school curriculum. William’s has taken almost all school subjects namely Languages, Mathematics, Social Studies, Physical Education, Science, Music and Art as a content material in his study to implement the model.

**Dimension 2:** In Williams’ model dimension second is behaviour of teacher. The ways of imparting the knowledge about school subjects to the students adopted by the teacher are known as model of teaching or strategies of teaching. These comprise 18 strategies to be used by the teacher to develop thinking ability and creativity among students.

**Dimension 3:** This dimension contains eight student processes that have been shown empirically to be involved in creative thinking of learner. The model has been designed to provide students the opportunity for creative thinking (characterized by fluency, flexibility, originality, and elaboration). The teaching strategies used in dimension 2 also enable the expression of the personality factors of learners like curiosity, imagination, risk-taking and complexity that is important for the expression of creativity.

**STATEMENT OF THE PROBLEM**

The study has been entitled as:

**EFFECT OF WILLIAMS’ COGNITIVE–AFFECTIVE INTERACTION MODEL ON ACHIEVEMENT AND CREATIVITY IN MATHEMATICS IN RELATION TO INTELLIGENCE OF SECONDARY SCHOOL STUDENTS**

**OPERATIONAL DEFINITIONS**

(a) **Creativity in Mathematics:** Mathematical creativity is operationally defined as the ability of pupils to think divergently and to produce a number of original and rational responses to specific situations in mathematics. The score of Mathematical
Creativity Test by Sharma and Sansanwal (2012) has been taken as creativity in Mathematics in the present investigation.

(b) **Achievement in Mathematics:** Achievement is a progress that a learner make in learning often measured by either standardized or teacher made test. Therefore, Achievement is knowledge acquired and skills developed in school subjects generally indicated by marks obtained in test. It is exposition to his/her present level of performance. Achievement in Mathematics here means the score on the achievement test in Mathematics developed by the invigilator. These scores have been taken as achievement in Mathematics for present investigation.

(c) **Intelligence:** Intelligence is individuals’ abilities to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by careful thought. The score of the Verbal Intelligence Test (VIT) by Ojha and Roychoudhary (2001) has been taken as intelligence in the present investigation.

**OBJECTIVES OF THE STUDY**

The study was designed to attain the following objectives:

1. To develop the teaching modules in the selected topics of mathematics based on Williams’ Cognitive-Affective Interaction model from the IX class curriculum.
2. To develop achievement test based on the selected topics of mathematics for IX class students.
3. To find out the mean difference in achievement in mathematics of the groups taught through Williams’ model and Traditional method of teaching.
4. To investigate the difference in achievement in mathematics of the groups having high and low Intelligence.
5. To investigate the difference in creativity in mathematics of the groups taught through Williams’ model and conventional teaching.
6. To investigate the significant difference in creativity in mathematics of the groups having high and low Intelligence.
7. To know the nature of interaction between teaching strategies and intelligence on achievement in mathematics.
8. To investigate the type of interaction between teaching strategies and intelligence on creativity in mathematics.
HYPOTHESES OF THE STUDY

The following hypotheses were formulated to achieve the objectives of the study.

H-1. There will be no significant difference in the achievement in mathematics between the groups taught through traditional method of teaching and through Williams’ model.

H-2. There will be no significant difference in the achievement in mathematics of the groups having high and low Intelligence.

H-3. There will be no significant interaction between teaching strategies and intelligence on the achievement in mathematics.

H-4. There will be no significant difference in the creativity in mathematics of the groups taught through traditional method of teaching and through Williams’ model.

H-5. There will be no significant difference in the creativity in mathematics of the groups having high and low Intelligence.

H-6. There will be no significant interaction between teaching strategies and intelligence on the creativity in mathematics.

STATISTICAL TECHNIQUES EMPLOYED

SPSS software was applied on the data in order to analyze the descriptive and inferential statistics

RESULT AND CONCLUSIONS

The following conclusions were drawn from the present study:

• The Achievement in Mathematics of group taught through Williams’ cognitive-affective interaction model is significantly higher as compared to group taught through traditional method. Thus Williams’ cognitive-affective interaction model proved to be a better method over traditional method in increasing achievement in mathematics.

• Students with high Intelligence score significantly better in Mathematics than the students with low Intelligence which means that the students having high Intelligence score and low Intelligence score differ in their achievement in mathematics i.e. intelligence is an important factor in achievement.
• The creativity in Mathematics of group taught through Williams’ cognitive-affective interaction model is significantly higher as compared to group taught through traditional method. Thus Williams’ cognitive-affective interaction model proved to be a better method over traditional method for enhancing creativity in mathematics among school going students.

• Students having low as well as high intelligence does not differ significantly in their creativity in Mathematics i.e. Students with high Intelligence score and students with low Intelligence score nurtured with same level of Creativity while teaching with Williams’ cognitive-affective interaction model and traditional method.

• Interaction between intelligence and methods of teaching does not affect achievement in mathematics whereas students with low intelligence of experimental group are significantly better in achievement in mathematics than students with low intelligence of controlled group and students with high intelligence of experimental group are significantly better in achievement in mathematics than students with high intelligence of controlled group leading to significant interaction between intelligence and method of teaching.

• Interaction between intelligence and methods of teaching does not affect creativity in mathematics whereas students with low intelligence of experimental group are significantly better in creativity in mathematics than students with low intelligence of controlled group and students with high intelligence of experimental group are significantly better in creativity in mathematics than students with high intelligence of controlled group leading to significant interaction between intelligence and method of teaching.

• Above findings is in general agreement with the trends in research in teaching of mathematics. Williams’ cognitive-affective interaction model proved to be effective in improving the achievement of students in mathematics and also enhancing the creativity in mathematics. The purpose of implementation of Williams’ model was to improve the four cognitive and four affective behaviors. It is concluded that it has positive effect on students’ achievement in mathematics.