

**Shanti Pise**  
Research scholar,  
Department of Education and Extension,  
Savitribai Phule Pune University

**Dr. Vaibhav Jadhav**  
Assistant Professor,  
Department of Education and Extension,  
Savitribai Phule Pune University

## **NURTURING CREATIVITY THROUGH SCIENCE EDUCATION**

### **INTRODUCTION**

There is a wealth of talent that lies in all of us, only we need to identify it!

‘The effects of rising complexity calls for CEOs and their teams to lead with bold creativity, connect with customers in imaginative ways and design their operations for speed and flexibility to position their organisations for twenty-first century success’ stated by IBM’s 2010 **Global CEO Study**. Thus ‘Creativity is the crucial 21st century skill which we’ll need to solve today’s pressing problems’ claims creativity expert Ken Robinson.

In the fast changing world where new challenges and novel situations arise every day, nurturing creativity at a young age has become imperative. In developing countries like India where both physical survival and survival of national identity are more important than world dominance, creativity is often seen as the key to rapid economic and social development, especially modernization and its hoped-for benefits of improved education, nutrition, health care, tolerance of minorities, democracy and political stability. The challenges we currently face are without precedent. More people live on this planet now than at any other time in history. The world’s population has doubled in the past 30 years. We’re facing an increasing strain on the world’s natural resources. Technology is advancing at a headlong rate of speed. It’s transforming how people work, think, and connect. It’s transforming our cultural values. All these situations are posing strains on our political and financial institutions, on health care, on education and so on. This has led us to understand that we are going to need every ounce of ingenuity, imagination, and creativity to confront these problems. Nobody has a clue what the world’s going to look like in five years, or even next year actually, and yet it’s the job of education to help kids make sense of the world they’re going to live in. Classrooms in India are posed with challenges of rigid curriculum demands, lack of resources, large class sizes and very often low motivation levels among teachers. Add to that poor teacher training

facilities. Given the constraints, the pursuit of encouraging creativity education in the Indian schooling system seems like a tall order. Introduction of Life Skill Education also specifies the importance of Creativity by stating it in the top priority list of thinking skills.

Science teachers are often content to leave creativity to the arts and humanities classes. Fostering creativity in science, if attempted at all, is a challenge often relegated to the gifted classroom.( Meyer, Allison Antink, 2012 ) Creativity has been held to be the source of the best of human inventions. Problem solving, creating hypotheses, designing experiments, and technical innovation require a special type of scientific creativity. The human being is creative in a special field. Creativity in science can be considered to help achieve new and original steps in performing the targets of science.

In the school education, the problem and materials are given to the students, and this prevents improvement of thinking skills. Moreover, scientific knowledge and theories are directly told to the students in their textbooks, and they are not allowed to think for themselves. While the teacher teaches a lesson at the classroom, first he/she tells about the concept, and then makes the students do experiments to understand the concept. This type of education does not exactly represent the scientific exploring process.

Surveys have shown that in theory at least teachers overwhelmingly support creativity as something that should be fostered in the classroom. However in actual classroom practice they often frown upon traits associated with creativity or even actively dislike characteristics such as boldness, desire for novelty or originality. Teachers are not aware that their behaviours in the classroom actually inhibit creativity (Dawson, Andrea, Affinito, & Westby, 1999). It is socially desirable for teachers to claim they value creativity in the classroom even if they do not. (Runco & Johnson, 2002). Teachers' implicit definitions of creativity and creative behavior are uniquely different from the behaviors exhibited by students whom experts would define as creative (Dawson et al., 1999). To understand the discrepancy between the value placed on creativity and its role in classroom environments, teachers' definitions of creativity needed to be gauged.

The creativity has a supplementary role in many scientific processes. It is used especially in introducing problems and hypotheses and designing experiments. That's why science is a process containing the creativity components affecting each step of life, in addition to being a product. Individuals need to think creatively and to be able to use their scientific process skills in order to develop a fundamental scientific understanding. And creative scientists are required to find useful and new solutions for the problems existing in daily life. Creative scientists are much more sensitive regarding problems. Every educated individual may not be

a scientist, but it is important for each person to begin his or her educational life by applying creative thinking. Scientific process skills include skills that every individual could use in each step of his/her daily life by being scientifically literate and increasing the quality and standard of life by comprehending the nature of science. Therefore, these skills affect the personal, social, and global life of individuals.

The best definition of creativity related to the science was done by Torrance; the definition is that, “The creativity is recognizing the gaps in the problem or the information, creating ideas or hypotheses, testing and developing these hypotheses, and transmitting the data” (Torrance, 1995). In this context, it can be accepted that the creativity is an important aspect of scientific skill. Creative thinking is necessary to search for solutions to all kinds of problems that are encountered in daily life and to make new products. According to scientific studies, creativity takes a complementary role in many scientific processes. The individuals who use creativity can make their science education functional, and therefore, the scientific information can be the basis for producing a valuable product instead of just amassing information. Therefore, for students to gain the creative thinking skills that they will need as adults, each stage of their education, beginning in elementary school, must be one of the most important purposes of science education.

Science educators recognized the importance of creativity in science education, and started to work on methods and techniques which can improve creativity. However there are not many studies presenting creativity improvement and supporting methods for science students. If during this study some evidence related to improving scientific creativity could be identified, and then science teachers could consider scientific creativity as an educable skill rather than as a comprehension endowment or an extra-ordinary skill. The results of the study can help teachers to understand the factors affecting the scientific creativity of the students. Therefore, teachers can use a model for training creativity to increase the scientific creativity of the students.

When asked to the science teachers about creativity they said “I am already teaching creativity to my students by showing charts, pictures and of course in the lab where they perform experiments”.

But is this the actual definition of creativity? This question needs to be answered and what do science teachers know about nurturing creativity among students needs to be checked.

For all these reasons, teacher’s awareness about how to nurture creativity needed to be understood that can help to develop a training model to improve their scientific creativity.

So in the present study the researcher identifies the awareness of the science teachers to nurture creativity among students. The researcher suggest the model for training creativity. The methodology entails checking the awareness with the help of self made creativity awareness scale of science teachers teaching in secondary school. Survey - descriptive research method was used to identify the teacher's awareness about successfully implementing practices which encourage creativity learning among their students. An attempt is made to provide a model for training of creativity through science teaching. The paper therefore, provides an optimistic view of the future of out of the box learning.

#### TITLE

A study of awareness about nurturing creativity through science teaching among secondary school teachers

#### OBJECTIVES

1. To identify the dimensions of creativity training through science teaching
2. To identify the awareness about creativity through science teaching
3. To suggest a model for training of creativity through science teaching

#### METHODOLOGY

For the present study descriptive method- Survey of data collection was used. The secondary school science teachers in Pune City of Maharashtra state was the population of the study and By purposive sampling method 60 science teachers from secondary schools of Pune City were selected for the study.

The self made creativity awareness scale was used to identify the awareness about creativity among science teachers, it was self administered 29 opinion statement using a 4 point Likert Scale (e.g., Strongly Disagree – 1, Disagree-2, Agree-3, and Strongly Agree- 4). The responses to these statements can be categorized into 6 areas Knowledge, intellectual ability, thinking style, motivation, personality, environment.

#### RESULT

Response frequencies to each question were computed using the data collected from Creativity Awareness Scale (CAS). Composite score were created for each of the six areas of CAS. The composite score were computed by finding the mean of all the 4 points in the rating scale responses in each of the six areas measured.

Regarding the areas of creativity to be nurtured, over 85% of the teachers believes that knowledge – scientific is crucial element to nurture creativity, about 80% of teachers agrees with the area of personality- scientific attitude determines the creativity. Further 73% teachers were of view that creativity can be nurtured through thinking styles-divergent

thinking , 65 % teachers viewed that motivation can play an important role in nurturing creativity and around 55% teachers believes that creativity can be nurtured through areas like intellectual abilities and environment.

## DISCUSSION

The purpose of the present study was to investigate the awareness in teachers about nurturing creativity among students. Some of the great teachers we know are the most creative teachers because they find a way of connecting what they're teaching to student interests. Teaching science to nurture creativity, where the pedagogy is designed to encourage other people to think creatively. Teacher encourage kids to experiment, to innovate, not giving them all the answers but giving them the tools they need to find out what the answers might be or to explore new avenues.

The six areas can be explored for training of creativity while teaching science in the following manner,

1. Knowledge: science is a systematic body of knowledge. There are facts, figures, concepts, theories, assumptions, hypothesis. Concerning knowledge, one the one hand needs to know enough about science as a stream of knowledge. Thus, the teacher needs to decide to use previous knowledge of science for the students but also decide not to let the knowledge become a hindrance rather than a help. Science teachers need to understand what the true meaning of creativity is. Creativity is not just reinvention. They should believe that creativity can be nurtured through science teaching. The sound knowledge of scientific terminology is pre-requisite for enhancement of creativity. Brainstorming sessions could develop creativity amongst the students.
2. Intellectual abilities: are generally acknowledged to be necessary but not sufficient for creativity. Synthetic, analytical & practical ability is required for systematic building of creative expression. The teachers have to give op opportunities to the students to generate new ideas, analyse these ideas & sell the ideas to others. Teachers need to develop insight amongst the students to develop new ideas. Ample opportunities should be provided to apply innovative ideas. Teacher has to take the role of critic while discussing about the new ideas.
3. Motivation: Intrinsic task focused motivation is very important for creativity. Students need to love science & focus on the work rather than the potential rewards. The biggest challenge science teacher has is to motivate the students to become creative. Science lessons which are enriched with creativity are enjoyed by the students. Field trips,

laboratory work, games & visit to museums can act as great motivators for the students to think creatively.

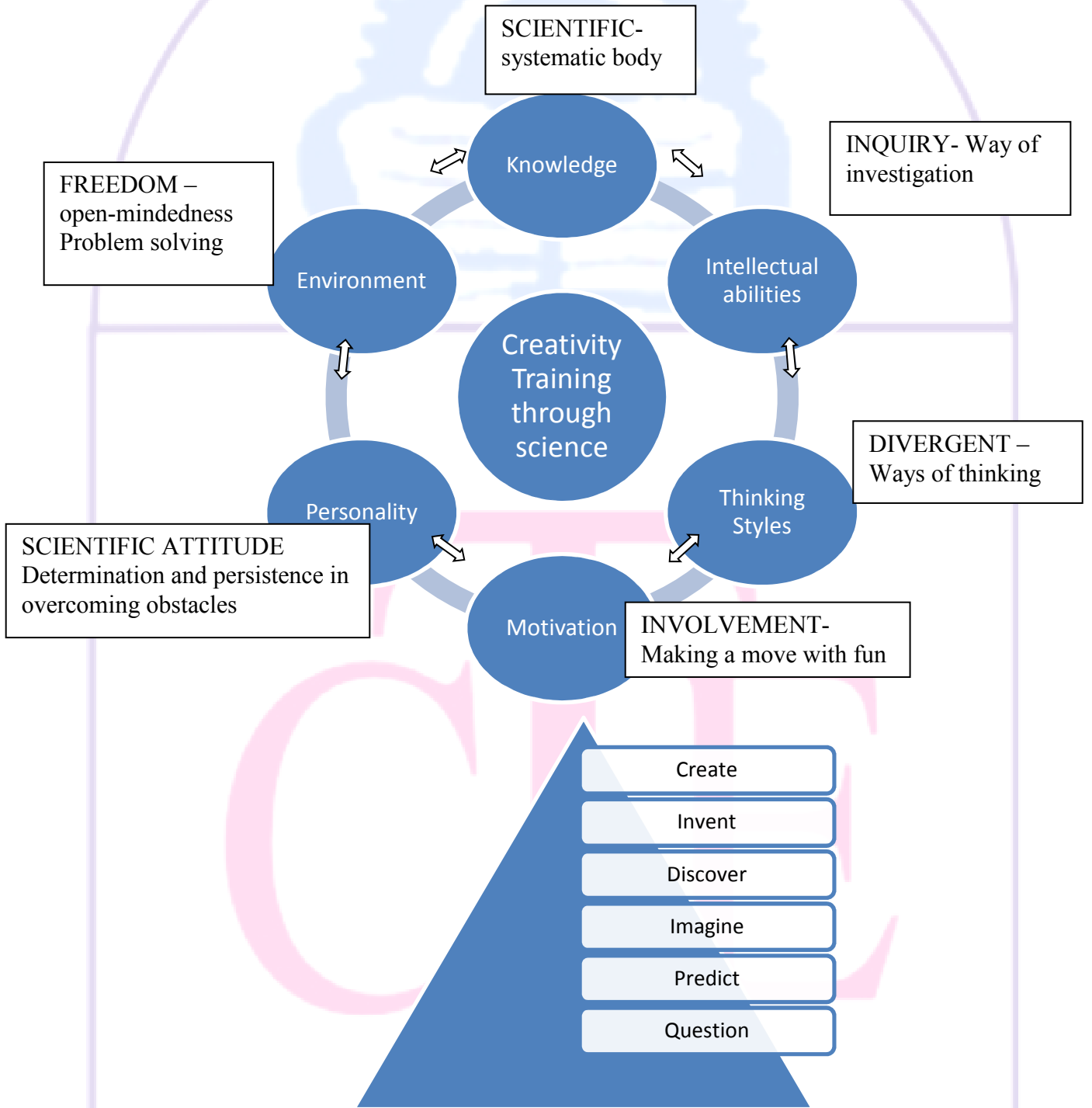
4. Thinking styles: Divergent thinking can be developed by posing various scientific questions. Students need to think globally as well as locally, distinguishing the forest from the trees & thereby understanding the importance of various types of questions. Teachers can use various models of teaching to develop creativity like inquiry training model would prove beneficial for nurturing creativity. Fluency, originality & flexibility are the key elements of creative thinking. All the students have potential for thinking in a novel way by their own, only their thoughts have to be channelized properly.
5. Personality attributes are important for creative functioning. Attributes like willingness to overcome obstacles, to take sensible risk, tolerate ambiguity self & self efficacy. Science teacher needs to develop their own personality for creative expression & develop the personality of the students to think & act in creative base. Creative teachers can nurture creative persons which will act as the future of the creative world. The personality of the students can be moulded by science teachers in a novel way. Devotion & commitment in performing science experiments can nurture creativity amongst students. It is the responsibility of the teacher to sensitize the students topic related to science.
6. Environment: Finally the students need an environment that is supportive & rewarding of creative ideas. Unless & until the environment is conducive the creativity of the person within him or her might never be displayed. Freedom to the students in classroom teaching is essential to develop creativity. Creative task as assignments help students to develop creative expressions.

## CONCLUSION

Creativity can act as a mediator for building the strong relation of past with present and connect it with future. Teaching science to nurture the creativity can transform the student's life. The purpose of science education is to enable individuals to use scientific process skills; in other words, to be able to define the problems around them, to observe, to analyze, to hypothesize, to experiment, to conclude, to generalize, and to apply the information they have with the necessary skills. All these can be possible only if the students are sensitive to the world around them and adapt to the changing situations creatively. The research on creativity in education has firmly established that for learners to be creative, teachers need to consciously provide a context for learners to be creative, which is commonly defined as imaginatively combining objects or ideas to create a novel new one which is of value in the immediate context or to wider society. So many people have degrees now that an individual degree isn't worth a fraction of what it used to be worth. So being creative is essential to us;

it's essential for our economy. All these things demand high levels of innovation, creativity, and ingenuity. At the moment, instead of promoting creativity, I think we're systematically educating it out of our kids. So science teachers can also shoulder the responsibility to nurture creativity among students. The model can provide guidance for helping the teacher to include the creative element in their teaching.

**MODEL: NURTURE CREATIVITY THROUGH SCIENCE TEACHING**



TRAINING MODEL FOR NURTURING CREATIVITY IN SCIENCE

## REFERENCES

- Dawson, VLD., Andrea, T., Affinito, R., & Westby, E.L. (1999). Predicting creative behavior: A reexamination of the divergence between traditional and teacher-defined concepts of creativity. *Creativity Research Journal*, 25, 225-244.
- Hilal, A. & Ömer, E. (2008). The effect of scientific process skills education on students' scientific creativity, science attitudes and academic achievements. *Asia-Pacific Forum on Science Learning and Teaching*, Volume 9, Issue 1, Article 4
- Kaufman, J. C. & Sternberg, (Eds.), (1999). *The international handbook of creativity*. New York: Cambridge University Press.
- Kerr, B. (Eds.). (2009). *Encyclopedia of Giftedness, Creativity and Talent*. California: Sage.
- Kuan, C. T. (2012). The value of teaching creativity in Adult Education. *International journal of higher education*. California : Sciedu Press
- Meyer, A. A. (2012) Teaching for Creativity. *Science Teacher, National Science Teachers Association*. 79, 54-56
- Mohan, R. (2010). *Innovative science teaching : for physical science teachers*. New Delhi: Phi Learning Private Ltd
- R. A. Beghetto, & J. C. Kaufman. (2010). *Nurturing creativity in the classroom*. New York: Cambridge University Press.
- Runco, M.A., & Johnson, DJ. (2002). *Parents' and teachers' implicit theories of children's creativity: A cross-cultural perspective*. *Creativity Research Journal*, 14, 427-438
- Torrance, E. (1995) *Why fly – A Philosophy of Creativity*. New York: Greenwood Publishing Group

## Webliography

1. <http://www.ascd.org/publications/educational-leadership/sept09/vol67/num01/Why-Creativity-Now%C2%A2-A-Conversation-with-Sir-Ken-Robinson.aspx>
2. <http://www.ibm.com/ceostudy>
3. <http://www.open.ac.uk/blogs/ed-futures/?p=143>
4. <https://student.societyforscience.org/article/how-creativity-powers-science>
5. <http://esciencecommons.blogspot.in/2011/12/creativity-science-educations-missing.html>
6. [http://www.ied.edu.hk/apfslt/v9\\_issue1/aktamis/aktamis2.htm](http://www.ied.edu.hk/apfslt/v9_issue1/aktamis/aktamis2.htm)



7. <http://www.inter-disciplinary.net/wp-content/uploads/2011/06/madancpaper.pdf>
8. [www.sciedu.ca/ijhe](http://www.sciedu.ca/ijhe)
9. Web site: <http://www.nsta.org>

Paper Received : 07<sup>th</sup> April, 2016

Paper Reviewed : 12<sup>th</sup> May, 2015

Paper Published : 1<sup>st</sup> June, 2016



CTE