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Science Creativity In Higher Education, Namakkal District

KEYWORDS: Creativity, Originality, Higher Education, Demographic variables, Prediction

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ABSTRACT *The study aims to find out the Science Creativity in Higher Education, Namakkal District. Thus the study is highly useful to the educational institution to improve the students capability in their education. In the present investigation a sample of 100 students selected randomly were studied. A questionnaire method of survey was used to find out the Science Creativity in Higher Education, Namakkal District. The data were collected by using questionnaire as an instrument. Primary data were collected by conducting direct structured interview using questionnaire. The present research is highly useful to identify the gap related to this area. Research design is purely and simply the framework or plan for a study that guides the collection and analysis of the data. The research design indicates the methods of research i.e the method of gathering information and the method of sampling. Descriptive statistics, t-test, ANOVA and Correlation analysis was applied to test the hypotheses. The findings and observations are the result and outcome of the interpretations made during the study of analysis. The result found that higher level of science creativity in higher education in the study areas.*

Introduction

Good education, proper care and provision of opportunities for creative expression inspire, stimulate and sharpen the great mind. It is in this sphere, the parents, society and teachers need to contribute much. They are required to help children in nourishing and utilizing their creative abilities.

The Almighty, the creator of the universe, is the supreme mind who possesses the finest creative abilities. God has created all of us in this nature. Every one of us is a unique creation, but does not posses the same creative ability. Ramanujam, Sir C.V.Raman, Newton, Shakespeare, Piccasso, Darvin etc., were some of the creative individuals who left their mark in their chosen fields. They were undoubtedly gifted with creative abilities. The role of environment in terms of education, training and opportunities in their development cannot be ignored.

Creativity there is considerable confusion about the nature of creativity and there are at least two major ways in which the term is used. On the one hand, it refers to a special kind of thinking and on the other hand, creativity is used to refer to the generation of products that are perceived to be creative, such as works of arts, architecture or music. In terms of these creativity adopts the stance that it is the capacity to get ideas, especially original, inventive and novel.

The terms 'creativity' and 'creative process' have been defined in many ways. Some of the definitions are as follows: Creativity implies the production of a 'totally or partially' novel identity. It means the product essentially new or novel and previously unknown to the producer. Creative process as any process by which something new is produced - an idea or an object including a new form or arrangement of old elements. The new creation must contribute to the solution of some problems. Creativity as 'the ability to discover new solutions to problems or to produce new ideas, inventions or works of art. It is a special form of thinking, a way of viewing the world and interacting with it in a manner different from that of the general population'. It is further explained 'the ability to see things in a new and unusual light, to see problems that no one else may even realize exist, and then to come up with new, unusual and effective solutions'.

Some of them consider it to be purely a function of the mind, a component of the cognitive behaviour to be an attribute of the person as a whole involving his total behaviour and functioning of his whole personality. Stein uses a cultural frame of reference and being novel, a creative product must be useful from the cultural and social angles while others view it in a personal frame and hold that. A product may be a creative one if it is new or novel to the individual involved, if it is his creation, if it is expressive of himself rather than dictated by someone else. It needs to be neither useful nor unique. By assigning the characteristic of "a unique personal experience" to the creative product, the scope has been so widened as to include any novel idea or thing including the rearrangement or reshaping of already existing and known ones. The definitions given above have considered creativity both as a process and a product, the thought as well as its result, but the central, essential condition of novelty or newness in the creation has not been over looked by any one. By incorporating all these viewpoints, creativity may be described as the capacity or ability of an individual to create, discover, or produce a new or novel idea or object, including the rearrangement or reshaping of what is already known to him which proves to be a unique personal experience.

Review of Literature

Stanic and Kilpatrick (2005) viewed that the science problem solving is deeply tied to the nature of genuine science activity, and it offers considerable promise for developing in students a more creative disposition toward science.

Silver (2006) found that the problem posing, along with problem solving, is central to the discipline of science and the nature of science thinking. This means problem-posing situations can provide opportunities for pupils to demonstrate considerable creativity.

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Erkki Pehkonen (2007) made a study on "The state-of-Art in Science Creativity'. The research has explained that the Creativity is a topic which is often neglected within science teaching. Usually teachers think that it is logic that is needed in science in the first place, and that creativity is not important in learning science. On the other hand, if we consider a mathematician who develops new results in science, we could not over look his/her use of the creative potential. Creative thinking might be defined as a combination of logical thinking and divergent thinking which is based on intuition but has a conscious aim. When one is applying creative thinking in a practical problem solving situation, divergent thinking produces many ideas. Some of these seem to be useful for finding solutions. The balance between logic and creativity is very important, for the creative process. If one places too much emphasis on logical deduction, creativity will be reduced. What one wins in logic will be lost in creativity and vice versa. The level of the problems used should correspond to the pupils' skill since they should experience success in order to be motivated to continue with problem solving.

Derek Haylock (2007) made a study on 'Recognising Science Creativity in School Children' and described that the examples of tasks designed to recognise creative thinking within science, used with 11-12 year old pupils. The first construct employed in the design of these tasks is the ability to overcome fixation, by restricting their thinking about a problem to an insufficient or in appropriate range of elements. Other times they show algorithmic fixation by continuing to adhere to a routine procedure or stereotype response even when this becomes inefficient or inappropriate. The second construct employed is that of divergent production, indicated by flexibility and originality in science tasks to which a large number of appropriate responses are possible. The relationship to conventional science attainment is discussed science attainment is seen to limit but not to determine science creativity.

Yoshihiko Hashimota (2008) made a study on 'The Methods of fostering creativity through Science Problem Solving' and used the methods to foster science creativity in school situations are the following 1. "Open-ended approach" and "From problem to problem" approach 2. Relation to science creativity 3. Teachers' belief and the science text book. "Open ended approach" means that an incomplete problem is presented at first, and the lesson proceeds by utilizing a multiplicity of correct approaches to solve the given problem in order to provide experience in finding something new in the process through variously combining students' own knowledge, skills, or ways of thinking which have been previously learned. Openness like "Open-ended approach" and "from problem to problem" is one aspect of fostering science creativity. It is important that students can combine different ways of thinking in one problem. We can often see "Creativity" in science appear by combining seemingly different aspects. Classroom teachers who use proper text book as in Japan have to treat "making up a new problem from a given problem". It is a short cut to foster science creativity.

Edward A. Silver (2009) made a study on "Fostering Creativity through Instruction Rich in Science Problem Solving and Problem Posing'. This study revealed that the creativity is often viewed as being associated with the notions of 'genius" or exceptional ability, it can be productive for science educators to view creativity instead as an orientation or disposition toward science activity that can be fostered broadly in the general school population. From this it is clear that inquiry-oriented science instruction which includes problem-solving and problem-posing tasks and activities can assist students to develop more creative approaches to science. Through the use of such tasks and activities, teachers can increase their students' capacity with respect to the core dimensions of creativity; namely, fluency, flexibility and novelty. The instructional techniques discussed successfully with students all over the world, there is little reason to believe that creativity-enriched science instruction cannot be used with a broad range of students in order to increase their representational and strategic fluency and flexibility, and their appreciation for novel problems, solution methods or solutions. The teachers can assist students to develop greater representational and strategic fluency and flexibility and more creative approaches to their science activity.

Teh Pick Ching (2010) conducted a research on 'An Experiment on Discover Science Talent in a Primary School in Kampong Air'. This revealed that many pupils have hidden talent in science. This hidden ability is rarely seen in a normal classroom teaching and learning situation if the focus of the teacher is on thinking with routine exercises. To allow pupils to display their science talent and to break from mental set and fixation in science, they must he given opportunity to think by themselves with minimum cue or guidance. The pupils could be left entirely on their own to show their science creativity even on science topics which have not been exposed to them. Non routine questions were administered and concluded pupils who dare to try different ways of solving science problems have shown the ability to produce original responses to situations which they never encountered before. Such pupils hold great potential if their ability is discovered early and nurtured to attain greater height of development.

Hartwig Meissner (2013) explained that creativity can be described by a long list of isolated items nor that such a list may help to identify or to develop creative ideas. But the flavour of such lists may help teachers and text book writers when they prepare classroom lessons. To develop creativity in science education teachers and students need more than a correct and solid science knowledge.

Research Methodology

The methodology adopted for the study is explained in detail. The sampling technique, size of the sample, variables of the study, description of the tool used and administration of tool are elaborated.

Science is an interesting subject. Calculating, planning, arranging, ordering and mapping are all science activities. In all the disciplines the origination or the processing of many theories of principles depend upon a science base. Therefore the science awareness among the students is very essential. Some students can discover some interesting ways of solving problems in science if they are given the opportunity to think by themselves. Also they have shown the science concept where the question depends on has not been exposed, they will try in some way to interpret the problem according to their own understanding. The students should be left entirely on their own in order to truly display their science creativity and talent.

Objectives of the study

The following are the objectives of the present study.

1. To find out the Science Creativity of higher education Students.

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2. To find out the Science Creativity of higher education Students on the basis demographic variables.

3. Relationship among the Variables of Science Creativity and Achievement

Sample of the study
The sample consists of 100 college students of Namakkal district. They are chosen randomly.

Analysis and Interpretation
Table 1
Science Creativity and Students' Demographic Variables

S. No	Variables	Categories	Mean	SD	Md	t-value	Sig. Level
1	Gender	Boys Girls	29.69 35.09	10.28 12.99	5.40	3.88	.01
2	Locality	Rural Urban	33.41 31.64	12.64 11.50	1.77	1.20	NS
3	Type of management of the college	Private Government	31.88 32.92	11.22 12.86	1.04	3.87	.01

Gender
The computed t-value namely 3.88 of the mean difference between boys and girls students is found to be significant at 0.01 level. Hence rejecting the null hypothesis, it is concluded that the boys and girls differ significantly in their science creativity. The mean difference is in favour of girls.

Locality
The mean difference of students of rural and urban areas in their science creativity is 1.77. The corresponding t-value namely 1.20 is not significant at 0.05 level. Hence accepting the null hypothesis it is concluded that the students from rural and urban area do not differ in their science creativity.

Type of Management
The calculated t-value namely 3.87 of the mean difference between the students of private and government colleges is found to be significant at 0.01 level. Therefore rejecting the respective null hypothesis the investigator has concluded that the students of private and government colleges differ in their science creativity. It is interesting to note that the mean difference is in favour of the students of government colleges.

Table 2
Science Creativity and Age and Community

S. No	Variables	Source of Variation	df	Sum of squares	Mean squares	F – value	Sig. Level
1	Age	Between groups	3w	672.51	336.25	2.36	NS
		Within groups	97	39962.57	142.22		
		Total	100	40635.08			
2	Community	Between groups	3	646.75	215.58	1.51	NS
		Within groups	97	39988.33	142.81		
		Total	100	40635.08			

Age of Students
The F-value of the mean differences of the students in their science creativity based on the three age groups is calculated to be 2.36 which is found not to be significant at 0.05 level. Hence accepting the null hypothesis it is concluded that the students do not differ in the science creativity due to the differences in their age.

Students' Community
The F-value of the mean differences of students among the four community groups is computed as 1.51 which is found not to be significant at 0.05 level. Hence it is concluded that the students do not differ in their science creativity due to the differences in their community.

Table 3
Age & Community and High Science Creativity Group

S. No	Variables	Source of Variation	df	Sum of squares	Mean squares	F – value	Sig. Level
1	Age	Between groups	2	10.08	5.04	0.15	NS
		Within groups	98	1517.92	33.00		
		Total	100	1528.00			
2	Community	Between groups	3	89.35	29.78	0.93	NS
		Within groups	97	1438.66	31.97		
		Total	100	1528.00			

Age and High Science Creativity Group
The F-value of the mean differences of the students of the High science creativity group based on their three age levels is calculated to be 0.15. It is found not to be significant at 0.05 level. Hence accepting the null hypothesis it is concluded that the student of high science creativity group do not differ in the science creativity due to the differences in their age.

Community and High Science Creativity Group
The F-value of the mean differences of the students of the High science creativity group based on the four community groups is calculated to be 0.93 which is found not to be significant at 0.05 level. Hence accepting the null hypothesis it is concluded that the students do not differ in the high science creativity group basted on their community.

Correlational Analysis
The obtained correlation co–efficients of originality, flexibility, creativity, achievement in science and total achievement are found to be positive and significant with science creativity at 0.01 level. This indicates that there exists a direct relationship among these variables with science creativity. Further originality and flexibility also positive and

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significantly correlated with students' achievement in science and total achievement. Therefore it is concluded that, there is a direct and significant relationship with science creativity and other variables viz., originality, flexibility, creativity, achievement in science and total achievement. For science creativity the over all achievement is also found to contribute and which is evident from the correlation coefficient 0.37.

Table 4
Relationship among the Variables of Science Creativity and Achievement

Variables	Originality	Flexibility	Science Creativity	Achievement in Science	Total Achievement
Originality	1.000	0.54**	0.90**	0.35**	0.35**
Flexibility	0.54**	1.000	0.84**	0.27**	0.29**
Science Creativity	0.90**	0.84**	1.000	0.35**	0.37**
Achievement in Science	0.35**	0.27**	0.35**	1.000	0.85**
Total Achievement	0.35**	0.29**	0.37**	0.85**	1.000

** Significant at .01 level.

CONCLUSION

The conclusions of the present investigation suggest the following measures for improving science creativity. The students must be allowed to think originally. Out of the thirteen background variables, only three viz., gender and parental income are found to be influence students' science creativity.

The influence of these three variables are absent in the case of both high and low creativity group. Factors for the variations in science creativity among the average ability students may be identified. Accordingly girls and boys and students of different income levels may be oriented differently in divergent thinking pertaining to science problem solving. Achievement in science and overall or general achievement between the basis for science creativity. This implies teaching methods should aim at developing science creativity. They should not aim for mere achievement but help for developing science thinking among the students as applied to real life situations.

Boys found to be less creative compared to girls. Boys should be made to be fully aware of the need to be creative. Since the development of any nation depends mainly on the creative skills of its people, the expectation from the students in the modern world are very high.

Students of the government college have secured greater mean score in science creativity. It is encouraging to find that the students of the government college have faced better than those of other colleges in test of creativity. Government should come forward to appoint creative and resourceful teachers with aptitude for creative teaching should be appointed in relation to the strength of students.

Teaching for creativity should be one of the major aims of teaching in colleges. Techniques like 'Brain Storming' and 'Open ended approach' may be used to bring in novelty in teaching and also to foster creativity. Teachers who have an aptitude for teaching for creativity should be identified and encouraged. Ability grouping of college student can be also be tried so as to develop the creative abilities of student. Steps should be taken to make teaching lead to creative thinking on the part of the pupils.

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