Chapter 5
Findings, Conclusions, Educational Implications and Suggestions for further Research

One person’s dream often becomes another person’s challenge and then requires many others to bring it to fulfilment.

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Findings, Conclusions, Educational Implications and Suggestions for Further Research

5.1) Findings and Conclusions of the Study

On the basis of statistical analysis and interpretation of data, important findings are derived in view of the determined objectives and correspondingly formulated hypotheses. In respect of the 13 objectives, the subsequent important findings and conclusions derived are as follows:

1- In the present study in view of the first objective which is to compare the scientific creativity of science and non-science students and hypothesis framed is “There exists no significant difference in mean scores on scientific creativity of science and non-science students”. In view of first objective the first finding of the study is –

- There is a significant difference (t 7.74*) in mean scores on scientific creativity of science and non-science students. Science students possess greater scientific creativity than non-science students in all four tasks of scientific creativity.

It is concluded that science students are more scientifically creative in comparison to non-science students. Science students have been found to be better than non-science students in entire scientific creativity when all the four tasks are taken together.

In respect of four tasks of scientific creativity taken separately, science students are significantly better than non-science students. In view of first objective, the four tasks of scientific creativity taken separately and are comparatively studied in science and non-science students, which are discussed as follows:

In view of the objective which is to compare the consequences test scores of scientific creativity of science and non-science students and hypothesis framed is “There exists no significant difference in mean scores on the consequences test of scientific creativity of science and non-science students”.

There is a significant difference (t 3.77*) in mean scores on task 1 consequences test of scientific creativity of science and non-science students. Science students are better in comparison to non-science students in task 1 of scientific creativity.

Science students think more the effects of consequences, whether usual or unusual, logical or illogical on the consequences test of scientific creativity in comparison to the non-science students. It is concluded that science students are significantly greater in task 1 consequences test of scientific creativity in comparison to non-science students.

1.1. In view of the objective which is to compare the unusual uses test scores of scientific creativity of science and non-science students and hypothesis framed is “There exists no significant difference in mean scores on the unusual uses test of scientific creativity of science and non-science students”.

There is a significant difference (t 6.87*) in mean scores on task 2 unusual uses test of science and non-science students. Science students are better in comparison to non-science students in task 2 of scientific creativity.

Science students write more and many novel, interesting and unusual uses of objects as they can think in task 2, which is the unusual uses test in comparison to the non-science students. It is concluded that science students are significantly greater in task 2 unusual uses test of scientific creativity in comparison to the non-science students.

1.2. In view of the objective which is to compare the new relationship test scores of scientific creativity of science and non-science students and hypothesis framed is “There exists no significant difference in mean scores on the new relationship test of scientific creativity of science and non-science students”.

There is a significant difference (t 5.15*) in mean scores on task 3 new relationship test of science and non-science students. Science students are better in comparison to non-science students in task 3 of scientific creativity.
Science students think more as many new and novel similarities between the pairs of similar objects from physical and biological sciences in comparison to the non-science students. They can think new more novel relationships between pairs of objects in comparison to non-science students. It is concluded that science students are significantly greater in task 3 new relationship test of scientific creativity in comparison to the non-science students.

1.3. In view of the objective which is to compare the just think why test scores of scientific creativity of science and non-science students. “There exists no significant difference in mean scores on the just think why test of scientific creativity of science and non-science students”.

- There is a significant difference \( (t \ 5.94^*) \) in mean scores on task 4 just think why test of science and non-students. Science students are better in comparison to non-science students in task 4 of scientific creativity. (In the support of above stated objective and finding, in 1989 K. L. Datta found scientific creativity was a normally distributed trait. Sex differences did exist in scientific creativity and dominant factors of scientific creativity were fluency, flexibility and originality in case of boys and girls.)

Thus, Science students think and give more causes of the events and they imagine and produce more novel and original ideas in comparison to the non-science students.

It is concluded that science students are significantly greater in task 4 just think why test of scientific creativity in comparison to the non-science students.

2.

In view of the second objective which is to compare the scientific temperament of science and non-science students. And hypothesis framed is “There exists no significant difference in mean scores on scientific temperament of science and non-science students”.

- there is a significant difference \( (t \ 6.27^*) \) in mean scores on scientific temperament (when total 6 areas are taken together) of science and non-science students. Science students possess more scientific temperament in comparison to non-science students.
Thus, Science students possess more scientific temperament in comparison to non-science students. It is concluded that science students have greater scientific temperament than non-science students.

In view of second objective, in six areas of scientific temperament are taken separately and are comparatively studied in science and non-science students which are discussed as follows:

2.1.

In view of the objective which is to compare the aesthetic sensibility area scores of scientific temperament of science and non-science students and hypothesis framed is “There exists no significant difference in mean scores on the aesthetic sensibility area of scientific temperament of science and non-science students”.

- there is a significant difference (t 5.11*) in mean scores on area1 aesthetic sensibility of science and non-science students. Non-Science students are better than science students in area1 aesthetic sensibility of scientific temperament.

Thus, non-science students have greater aesthetic sensibility than science students. It is concluded that non-science students have more sense of appreciation in comparison to the science students.

2.2.

In view of the objective which is to compare the creativity area scores of scientific temperament of science and non-science students and hypothesis framed is “There exists no significant difference in mean scores on the creativity area of scientific temperament of science and non-science students”.

- there is no significant difference (t 1.26) in mean scores on area2 creativity of science and non-science students. Science and non-science students do not differ significantly in area2 creativity.

Thus, it is concluded that in creativity area of scientific temperament test, science and non-science students do not differ significantly.
2.3. In view of the objective which is to compare the objectivity area scores of scientific temperament of science and non-science students. And hypothesis framed is “There exists no significant difference in mean scores on the objectivity area of scientific temperament of science and non-science students.”

Here is a significant difference (t 3.04*) in mean scores on area 3 objectivity of science and non-science students. Science students are better than non-science students in area 3 objectivity of scientific temperament.

Science students are significantly better in objectivity area of scientific temperament and they have more objectivity, have more intellectual honesty, have faith in reliance on facts based on observation etc. in comparison to the non-science students. It is concluded that science students have more objectivity in comparison to the non-science students.

2.4. In view of the objective which is to compare the experimentation area scores of scientific temperament of science and non-science students. And the hypothesis framed is “There exists no significant difference in mean scores on the experimentation area of scientific temperament of science and non-science students”.

Here is significant difference (t 2.28*) in mean scores on area 4 experimentation of scientific temperament of science and non-science students. Science students are significantly better than non-science students in experimentation area of scientific temperament.

Science students are significantly greater in spirit of enquiry, they have more curiosity, more empirical observation, will power to go to the end of enquiry in comparison to the non-science students. It is concluded that science students are higher in spirit of enquiry area of scientific temperament in comparison to the non-science students.

2.5.
n view of the objective which is to compare the spirit of enquiry area scores of scientific temperament of science and non-science students. And hypothesis framed is “There exists no significant difference in mean scores on the spirit of enquiry area of scientific temperament of science and non-science students”.

- there is significant difference (t 3.89*) in mean scores on area 5 spirit of enquiry of scientific temperament of science and non-science students. Science students are significantly better than non-science students in spirit of enquiry area of scientific temperament.

Science students are significantly greater in spirit of enquiry, they have more curiosity, more empirical observation, will power to go to the end of enquiry in comparison to the non-science students. It is concluded that science students are higher in spirit of enquiry area of scientific temperament in comparison to the non-science students.

2.6.

n view of the objective which is to compare the courage to question area scores of scientific temperament of science and non-science students. “There exists no significant difference in the mean scores on the courage to question area of scientific temperament of science and non-science students”.

- there is significant difference (t 5.41*) in mean scores on area 6 courage to question of scientific temperament of science and non-science students.

In support of above stated objective and finding, in 1992, K.K Dubey attempted to measure scientific temper and concluded that whereas all groups of students showed scientific temper, significant differences were observed between male and female science teachers.

Science students are significantly greater in courage to question, they have more questioning attitude, more reasoning ability in comparison to the non-science students. It is concluded that science students are higher in courage to question area of scientific temperament in comparison to the non-science students.
3. In view of the third objective which is to study the correlation between scientific creativity with institutional climate, anxiety and academic achievement of science students. And hypothesis framed is “There exists no significant difference in correlation scores between scientific creativity with institutional climate, anxiety and academic achievement of science students”.

- here is no significant difference in coefficient of correlation (r) between scientific creativity with institutional climate r -0.008, anxiety r -0.11 and academic achievement r 0.17 of science students.

Thus, it is concluded that in Science students, scientific creativity is insignificant and have low, negative relationship with institutional climate, anxiety and insignificant and have low, positive relationship with academic achievement.

In support of above stated objective and finding, Acharyulu (1978) found further correlation between verbal TCT (Torgan Test Of Creative Thinking) and school environment were as high as those between intelligence and school achievement.

C.D. John (1988) found anxiety and achievement values of students did not affect the verbal, non-verbal or total creativity.

4. In view of the fourth objective which is to study the correlation between scientific temperament with institutional climate, anxiety and academic achievement of science students. And hypothesis framed is “There exists no significant difference in correlation scores between scientific temperament with institutional climate, anxiety and academic achievement of science students”.

- here is no significant difference in coefficient of correlation (r) between scientific temperament with institutional climate r -0.002, anxiety r 0.11 and academic achievement 0.22 of science students.

In support of above stated objective and finding, Balwan Singh (1998) found that various dimensions of school environment permission, acceptance, control, cognitive encouragement and creative stimulation have positive relationship with scientific temper whereas rejection dimension of school environment have negative
relationship with scientific temperament.

Thus, it is concluded that in science students, scientific temperament is insignificant and have low negative relationship with institutional climate and scientific temperament have insignificant and low positive relationship with anxiety and academic achievement.

5. In view of the fifth objective which is to study the correlation between scientific creativity with institutional climate, anxiety academic achievement of non-science students. And hypothesis framed is “There exists no significant difference in correlation scores between scientific creativity with institutional climate, anxiety and academic achievement of non-science students”.

- There is no significant difference in coefficient of correlation ($r$) between scientific creativity with institutional climate $r$ 0.00777, anxiety $-0.14$ and academic achievement 0.04 of non-science students.

In support of above stated objective and finding, K. S. Mishra (1982) found significant relationship between perceived school environment and originality among boys, relationships between various aspects of school environment and girls scientific creativity were not significant, for boys the relationship of creative stimulation and permissiveness were significant but negative and girls perceiving high stimulation in home environment and normal in school environment obtained higher scores on overall scientific creativity and originality aspect of it.

N. K. Chadha and Sunanda Chandna (1990) found positive and significant correlation between creativity and scholastic achievement.

Thus, it is concluded that in non-science students, scientific creativity is insignificant and have low positive relationship with institutional and academic achievement and have insignificant and low, negative relationship with anxiety.

6. In view of the sixth objective which is to study the correlation between scientific temperament with institutional climate, anxiety and academic achievement of non-science students. And hypothesis framed is “There exists no significant
difference in correlation scores between scientific temperament with institutional climate, anxiety and academic achievement of non-science students”.

There is no significant difference in coefficient of correlation (r) between scientific temperament with institutional climate 0.03, anxiety -0.07 and academic achievement -0.01 of non-science students.

Thus, it is concluded that in non-science students, scientific temperament is insignificant and have low positive relationship with institutional climate and scientific temperament is insignificant and have low negative relationship with anxiety and academic achievement.

In support of above stated objective and finding, Jerome Kagan (2010) found not only anxiety but as well as depression is strongly related to the temperament of the person.

Li Mingzhen, Song Naiqing, Pang Kung (2004) found significant difference between emotional characteristics of temperament and mathematics academic achievement of the subjects at primary, junior secondary and senior secondary stage.

Su-Ping Hung, Hsueh-Chih, Chen 1999 found school with opening climate, positive peer relationship, teacher support and divergent teaching style all positively correlated with divergent daily creative experience

In view of the seventh objective which is to compare the significance of difference of correlations between scientific creativity and institutional climate of science and non-science students. And hypothesis framed is “There exists no significant difference in the correlations between scientific creativity with institutional climate (r1) of science students and (r2) of non-science students”.

There is no significant difference CR 0.248 in correlations between scientific creativity and institutional climate (r1 -0.008) of science and (r2 0.00777) of non-science students.

Thus, it is concluded that in science and non-science students, scientific creativity and institutional climate correlations have insignificant difference.
8. In view of the eight objective which is to compare the significance of difference of correlations between scientific creativity and anxiety of science and non-science students. And hypothesis framed is “There exists no significant difference in the correlations between scientific creativity and anxiety (r1) of science and (r2) of non-science students”.

   here is no significant difference CR 0.47 in correlations between scientific creativity and anxiety (r1 -0.11) of science and   (r2 -0.14) of non-science students.

   Thus, it is concluded that in scientific creativity and anxiety correlations have insignificant difference.

9. In view of the ninth objective which is to compare the significance of difference of correlations between scientific creativity and academic achievement of science and non-science students. And hypothesis framed is “There exists no significant difference in the correlations between scientific creativity and academic achievement (r1) of science and (r2) of non-science students”.

   here is significant difference CR 2.06* in correlations between scientific creativity and academic achievement (r1 0.17) of science (r2 0.04) of non-science students. Science r1 is greater than non-science r2.

   Thus, it is concluded that Scientific creativity and academic achievement correlations have significant difference, it is concluded that the correlations between scientific creativity and academic achievement significantly differs. Science students are significantly higher correlation between scientific creativity and academic achievement in comparison to the non-science students. Science students have higher significant relationship between scientific creativity and academic achievement in comparison to the non-science students.

10. In view of the tenth objective which is to compare the significance of difference of correlations between scientific temperament and institutional climate of
science and non-science students. And hypothesis framed is “There exists no significant difference in the correlations between scientific temperament and institutional climate (r1) of science and (r2) of non-science students”.

- There is no significant difference CR 0.50 in correlations between scientific temperament and institutional climate (r1 -0.002) of science and (r2 0.03) of non-science students.

Thus, is concluded that in science and non-science students, scientific temperament and institutional climate correlations have insignificant difference.

11. In view of the eleventh objective which is to compare the significance of difference of correlations between scientific temperament and anxiety of science and non-science students. And hypothesis framed is “There is no significant difference in the correlations between scientific temperament and anxiety (r1) of science and (r2) of non-science students”.

- There is significant difference CR 2.84* in correlations between scientific temperament and anxiety (r1 -0.14) of science) and (r2 -0.07) of non-science students. Science r1 is greater than non-science r2.

Thus, it is concluded that in science and non-science students the correlations between scientific temperament and anxiety significantly differs. Science students are significantly higher in correlations between scientific temperament and anxiety in comparison to the non-science students. Science students have higher significant relationship between scientific temperament and anxiety in comparison to the non-science students.

12. In view of the twelfth objective which is to compare the significance of difference of correlations between scientific temperament and academic achievement of science and non-science students and hypothesis framed is “There is no significant difference in the correlations between scientific temperament and academic achievement of (r1) of science and (r2) of non-science students”.
here is significant difference CR 3.63* in correlations between scientific temperament and academic achievement (r1 0.22) of science and (r2 -0.01) of non-science students. Science r1 is greater than non-science r2.

Thus it is concluded that in science and non-science students, scientific temperament and academic achievement correlations have significant difference. In science and non-science students the correlations between scientific temperament and academic achievement significantly differs. Science students are significantly higher in correlations between scientific temperament and academic achievement in comparison to the non-science students. Science students have significantly higher relationship between scientific temperament and academic achievement in comparison to the non-science students.

13.

In view of the thirteenth objective which is to compare the significance of difference of correlations between scientific creativity and scientific temperament of science students and non-science students. And hypothesis framed is “There exists no significant difference in the correlations between scientific creativity and scientific temperament (r1) of science and (r2) of non-science students”.

here is significant difference CR 3.69* in correlations between scientific creativity and scientific temperament (total) (r1 -0.006) of science and (r2 -0.24) of non-science students. Science r1 is greater than non-science r2.

Thus it is concluded that in science and non-science students, scientific creativity and scientific temperament correlations have significant difference. In science and non-science students, the correlations between the scientific creativity and scientific temperament significantly differ. Science students are significantly higher in correlations between scientific creativity and scientific temperament in comparison to the non-science students. Science students have higher relationship between scientific creativity and scientific temperament in comparison to the non-science students.
Thus, in respect to the present study it can be finally be concluded that science students are more scientifically creative, have more scientific temperament, and in science students scientific creativity is significantly related with academic achievement, scientific temperament is significantly related with anxiety and academic achievement in comparison to the non-science students.

5.2) Educational Implications of the Study

It is well known that creativity is the ability which is most valued in all the societies. It is an ability to bring something new, something original, something useful, something excellent that enriches the social and cultural life. It is well known that a skill if present can be cultivated and improved upon by suitable training. Creativity, problem solving and other such activities are skills which can be cultivated and improved by suitable training procedures. The classroom and the teacher in this context play a significant role in promoting and nurturing creativity.

The role of creativity in developing science and technology is undeniable. It is one of the main aims of education “to encourage the development of creative abilities. Therefore educators are forced to concern themselves with the question what are the conditions which can enhance the formation of creative thought? Several studies indicate the diversity of creativity.

However, there's considerable agreement on the conditions enhancing creativity. Educators should use this knowledge and techniques in their intellectual work similar to the techniques which are thought to create a fertile soil for the growth of new ideas. We should instil critical attitudes and intellectual objectivity.

Creativity has its implications in the field of education too. The goal of education is to develop capabilities, personal expression, inventiveness and gifted leadership. It cannot be fully realized without the adequate and accurate knowledge of creativity. The creative thinking abilities contribute significantly to the acquisition of information and various educational skills. (Getzels and Jackson, 1958; and Torrance, 1960).

The research findings derived in this investigation regarding the scientific creativity and scientific temperament in relation with the institutional climate, anxiety and academic achievement naturally have potential and significant educational implications stated below.
In exploring various possibilities - the findings of the study can be used. In 1977, Torrance in his recent paper on ‘Uses of Creativity Testing in Education’ has pointed the various implications related to creativity.

i. To obtain a more complex understanding of the human mind, personality and their functioning.

ii. As possible basis for individualizing instruction,

iii. As a part of the process of guiding mental growth, as an indicator of mental health status, and as a source of clues for remedial or psychotherapeutic programs.

iv. As a means of assessing the differential effects of various kinds of experimental programs, new curricular arrangements, teaching procedures etc.

v. As indicators of growth potential and future guidance needs. (Torrance, 1977).

Out of above stated functions, the creative achievements in writing, science, medicine and leadership are more easily predicted by creativity tests administered in high school than are creative achievement in music, visual arts, business and industry. (Torrance, 1977).

Similarly, the findings related to scientific creativity and scientific temperament are useful for the purpose of identifying and developing the creative talent and scientific temperament. The assigned tasks to the students are open-ended they can provide each adolescent a chance to respond in terms of his own experiences. Each adolescent has the opportunity to experience some degree of success. These tests also provide a good challenge to even the most gifted.

In identifying and developing the scientific creative talent and scientific bent of mind in school children.

In Indian conditions, the tests of scientific creativity and scientific temperament should be used after establishing regional and national norms. Because scientific creativity and scientific temperament is a multidimensional construct measurable with other different types of tools and techniques.

Therefore, multi-criteria should be used for the appropriate identification of creative talent in the country. The systematic and continuous evaluation of scientific
talent have been suggested by different researchers, because the construct of scientific creativity and scientific temperament is relatively unstable, especially at the stage of adolescence. Therefore, many types of evaluation at different points of time scale are essential. This would require the help of many different personnel such as parents, psychologists and teachers who should make many observations and evaluations in many different fields. The identification should not be made merely by noting performance on one set of tools, and at one time by one person.

- **In framing quality education format** for the creative students having potential scientific creativity and scientific temperament and once their potential fields are located, parents, teachers, psychologists and all those who have concern for the student and the nation have to think of ways and means to encourage and foster scientific creativity and scientific temperament.

- **In channelizing creative output in constructive lines** - It has been found that scientifically creative and scientific tempered individual is characterized by a longitude or fluency of ideas, a wide latitude of flexibility of ideas, uniqueness of ideas and hence the potential for the development of ideas. He is found to be emotionally stable, assertive, dominant, self-assured, having high self-concept, control, venturesome, self-sufficient and relaxed.

  The scientific creative and tempered person enriched with these qualities is found to be always humming with activities. He is searching and seeking material, manipulating and incubating the problem and building up a force that will erupt through the channel. The teacher in the classroom, the parents at home, and the friends at play have the opportunity to channel his creative output into constructive directions without blocking it entirely. This positive release is nurtured in art by the feelings of freedom within the self and understanding that a responsive environment exists in the conscious world. An unresponsive environment may possibly lead to a number of problems.

  Keeping these considerations in view there is a need to tailor the educational system to suit the need and nature of the adolescent. In general, the aims, curriculum, method of teaching, promotions and rewards should be changed. The needs of the high creatives are not the same as those of non-creative students. It has been observed that scientific creative and scientific tempered students do not learn, behave, express and flourish in the same way as others do.
Our educational system does not approach the needs of the whole person as described by Maslow. Creative potential is too often lost by the rigid academic programmes. These creative individuals are spontaneous, courageous, open minded and willing to make mistakes as they pursue their creative endeavours. They view the familiar objects in a unique way, make transformations see multiple things in a single object and synthesize isolated scheme in new and original ways.

- **In remodelling the Education** - It is essential that the aims of education, curriculum, methods of teaching, promotions and rewards should be remodelled according to the needs of children. As the creativity can be expressed in a variety of ways, the individual differences can also be expressed in other talents such as planning, forecasting, decision making and communicating.

- **In Reframing Special Programmes**
  
  As the needs of the creative and non-creative are quite different, the education policy should be reframed, making provision of differential promotions, provision of special classes and schools, enriched and diversified curriculum, sub-grouping within the class for individualized instruction.

- **Methods of Teaching**
  
  For teaching, the heuristic approach, problem solving and project method and scientific inquiry techniques should be adopted keeping in view the individual differences of specific creative talent.

  According to the recommendations of 1970 White House conference on Children, opportunities should be made available for every child to learn creativity, to grow creativity and to live creativity.

- **Organisation of Guidance Services Programmes**
  
  In the organisation of Guidance Services Programmes for the scientifically creative and scientifically tempered children, the study and its findings can be of immense use of providing guidance to them.

  - **In the Study of School Factors and Providing Resources** - In the study of school factors, and in identifying and providing proper resources to the school children in context of scientific creativity and scientific temperament the present study can be beneficial.

  - **In pre-service and in-service programmes for school teachers** - first the
teachers should be oriented towards scientific creativity and scientific temperament so that they instil them in school children.

- **In B.Ed teacher training programmes** – In B.Ed Teachers training programmes teachers should be oriented towards scientific creativity scientific temperament, its significance through well framed curriculum and an scientific outlook should be developed in them.

- **In identifying and solving problems faced by school children.** Torrance (1962) pointed out the situations like coping with the sanctions of society against divergency, divergence from sex role norms, desire to learn on tasks which are too difficult, searching for purpose having different values, being motivated by different rewards and searching for one’s uniqueness are always before the creative. If these typical problems of the creative are not solved, there is every creative student becoming a problem student for the school and becoming misfit in the society. In order to promote and develop creative scientific talent and scientific temper the school programmes need modification.

  The teacher training colleges, selection and promotion procedure of teachers and the system of administration will have to be overhauled with a view to stimulate potentialities of teachers who would be real guide for the creative students. The ultimate aim being that of bringing improvement in functional roles and group dynamics for promoting creative talent.

- **In identification and enriching Specific Talent among school children.** Creativity does not imply a general creative capacity alone. A child may be highly creative in one special field of endeavour, while being an average student in others. He should be given the facilities to unfold and excel in his particular field. Einstein mastered the essentials of higher mathematics which his school did not teach by 14 years of age is an example of speciality in specific fields. Hence, it would be worthwhile to introduce rewarding through a recitation and recognition in a particular subject or field of activity.

- **In the school curriculum,** provision for special classes, acceleration and environmental programmes should be provided. The programmes to encourage student participation in activities like music, drama, dancing, graphic arts,
games, athletics and activities of scientific interest such as science clubs and exhibition, devising of ingenious apparatus should be given weightage. Extempore debates and quiz programmes can also be utilized. This would put the creative energies into appropriate channels for development.

- **In reducing mental pressure** - The scientific creativity is normally distributed. This means to say that all adolescents are creative, though varying in degrees. They continuously explore their environment, are curious about the unknown and are busy in discovering their own world. But when they encounter the adult world, parents, peers, teachers and others, the freshness, simplicity and spontaneity of their ideas may be lost as they learn to fear ridicule and judgement by others. Many studies have shown that school tends to teach conformity in thinking, feeling and acting but not the divergence, open mindedness and healthy deviance from accepted thoughts and norms. It is pointed out that the information, accepted concepts and convergent thinking patterns are taught effectively to our children in schools. The problem is that schools totally neglect the other side of the coin, while both are required for creative behaviour. So the concerned persons specifically parents in home, teachers in school should try to reduce the mental pressure of such children in a proper way.

- **In performing specific roles effectively** - It has been generally seen that teachers, parents and peers, feel baffled when highly creative children express themselves in their unique manners. So we should undertake to guide the teachers, parents and peers as to how they should react to these unusual ideas and queer questions. They should be persuaded to change their outlook and be more accommodating in their treatment of the creative individuals. The parents should not fulfil their aspirations at the cost of child’s creativity in a particular field of his excelling. If these talented children are checked they will suppress their creative urges. This would lead to many abnormalities. The role of the guidance service in the development of creativity is immensely increased in the light of the findings of this study. The teacher is an architect of an environment that can facilitate in developing scientific creativity, scientific temperament, scientific values, scientific thinking, by valuing their creative expression and uniqueness in views, thinking and way of working. Such an environment would
also include a non-evaluative and listening climate. Students should perceive the teacher as a person with a curiosity and his ability to solve problems creatively. Teachers and students should learn to accept multiple and diverse responses. Consequently the students will become active participants. The more creative more tempered teachers are more humanistic in their pupil control orientation. The pupil control orientation of more creative potential teachers are also desirable. The colleges of education and university departments which bear the responsibility for preparing the teachers must respond to the need for training teachers inclined to creative ways of thinking and interacting with students. If such teachers keep alive the creative processes of their pupils and guide them with sensibility, there should be sufficient motivation for high achievement in their classes and little need for externally imposed discipline.

- **In providing special training to the children** - It has been said that a person fails to develop distinctive personality because of the environmental press. Without distinctiveness, the individual attains only to a moderate personality or a fragmented personality. Through bringing creative energies and scientific temperament to bear on the activities of every day existence the integration of the fragmented self into a meaningful, distinctive personality can be developed. The development of personality and expression of creativity and development of scientific temperament are deeply intertwined (Nicholas Berdyaev, 1952, 1955). The creative act is a free and independent force, imminent by inherent only in a person or a personality. Only something arising in original substance and possessing the power to increase power in the world can be the true creativity. The personality changes either in the negative direction of the personality or in the positive direction of a richer and more distinctive personality. Speaking specifically, how creative helping bring about personality change may be understood. The model of personality growth as formulated by Ross (1968, 1972) with some modification can be utilized. Eberle (1968) found that the influence of training in creative thinking processes is significantly reflected in the personality factors of adolescents (<.025). He found a shift in the total index of personality consisting of seven factors of personality.

- **In educational planning**, the study and its findings can provide valuable guidance. It is obligatory on the part of the education policy makers to enrich school education programmes curriculum and other related activities by taking
consideration of aim of developing scientific tendency – scientific creativity, scientific temperament in students.

- **In Academic freedom** - Certain points should be taken care of – academic freedom to teachers should be provided to the teachers, should not be over pressurised to cover syllabus. Teachers should not be mentally and physically burdened in their work and least interfered by principals, parents, etc. and stimulating and good positive environment should be provided in schools.

- **In value development** - Value development is one of the major aims of the education. Scientific creativity and scientific temperament is of major significance in scientific values.

- So identification, development, enrichment of scientific creativity and scientific temperament is essential to develop scientific values in school students. The findings of the study can be used in developing scientific values by developing scientific creativity and scientific temperament in students, curricularly and co-curricularly by providing students with enriched experiences.

- **In reducing anxiety of children** - Teachers should understands the psychologically of students not only of normal students but all types of students, abnormal children, backward, delinquent, and should pay equal attention to each child and to his problems which are causing mental tension to the child and he should try to solve them positively and affectionately. And should make efforts to develop scientific reasoning, self confidence in children.

- **In developing the complete personality** – The ultimate aim of education is the complete all round harmonious development of child’s personality by developing self-confidence, self-esteem, value-development, developing multiple aspects - physical, mental, spiritual, social, aesthetic, moral, economical, religious, humanistic, democratic, national, international and scientific values in child.

- In these scientific values have much significance, without it, fragmented personality develop. So in child’s personality, value development should be emphasized, scientific creativity and scientific temperament is to be encouraged so to nurture scientific values i.e. the modern values in present context.

- **Regarding improvement in examination system** - Emphasis should be shifted
not from bookish knowledge to emphasis on identifying developing and encouraging and giving weightage to scientific creativity and scientific tempered qualities reasoning, imagination, objectivity, rationality and it should be nurtured in all possible ways.

- **In providing positive school environment** - Institutional climate or environment also effect scientific creativity and scientific temperament. Positive environment of school, of class-room, teacher’s role all are significant and all of them should give proper stimulation, cognitive encouragement, accept the views, the individuality of the child and teacher should accept the feelings of child, freedom to express should be given to the child and negative elements should be eliminated, autocratic atmosphere, and teacher’s autocratic attitude should be eliminated. In schools there should be provision of extra curriculum, projects, assignments school should be totally oriented on the lines of scientific values and scientific outlook to be developed in children at different stages.

- **In child centered education** – In education teaching-learning should not be examination centered or syllabus centered but education should be child centered. Teacher should teach by understanding the psychology of the child.

- **In academic excellence** - Scientific creativity and scientific temperament is significantly related with academic achievement. To excel academically, enriched curriculum should be developed, scientific teaching should be adopted, enriched curricular and co-curricular activities, enriched experiences should be provided to students by re-designing above components on lines of scientific creativity and scientific temperament so that the students excel academically also.

- **In selection of subjects and vocation streams** - The study can be used, subjects selection and selection of appropriate stream can be made according to the child inclinations, scientific thinking, on the basis of results of children on these variables.

- **Efforts should be done to develop proficiency in students**. The wrong measures like copying, cheating should be discouraged and good marks, grades should not be overemphasized due emphasis should be given and teachers should also encouraged unusual thinking, uniqueness, original ideas or views of children, and they should encourage and should be oriented to develop scientific
5.3) Suggestions for further research

In the present study, scientific creativity and scientific temperament are mainly studied in school students in relation to their institutional climate, anxiety and academic achievement only. The investigator in the course of study finds that scientific creativity and scientific temperament are less explored variables especially in Indian context. There’s lack of research in the field of scientific creativity and scientific temperament. For further research by other researchers some suggestions are as follows:

- In the study scientific creativity and scientific temperament are studied of 11th class school students in relation to their institutional climate, anxiety and academic achievement only. Scientific creativity and scientific temperament can be studied at pre-primary and primary levels for harmonious development of child. At this stage such studies will immensely contribute in early identification and nurture of scientific creativity and scientific temperament in school children.

- The study can be conducted in relation to sex, in boys and girls to find the significant difference in scientific creativity levels and in scientific temperament.

- The study can be conducted in relation to achievement motivation and its relationship with scientific creativity and scientific temperament can be explored.

- The study can be carried in relation to socio-economic status, and scientific creativity and scientific temperament can be studied.

- It can be studied in rural, urban, semi-urban context so to know about the effect of geographic location on scientific creativity and scientific temperament.

- A comparison of different schools can be done public, government, central schools and scientific creativity and scientific temperament, these variables can be studied to find significant relationships if any exists and significant differences between these variables in school children.

- A comparative study can also be conducted at school and college levels with similar variables.
• A study can be carried in open schools also, to study scientific creativity and scientific temperament of students of the open schools.

• It can also be comparatively studied in OBC, SC, ST children to find about scientific creativity and scientific temperament in those children.

• Similarly longitudinal studies can also be conducted, to observe scientific creativity and scientific temperament in course of time in the scientific talented children.

• The scientific creativity and scientific temperament can also be studied in relation to school climate to find more about these variables.

• A study to develop tests of scientific creativity and scientific temperament can be taken.

• The study can also be conducted on talented children and scientific creativity and scientific temperament can be studied in those children.

• Scientific creativity and scientific temperament can be studied in children in relation to family environment, to study the relationship between these variables.