India got independence in late 40's after a long period of slavery of British empire. Today, it is a developing country and is on the road of scientific progress. Science, technology and computerization, in the present time have provided for us miraculous comforts. It has aroused the expectations of a better way of life, given promise of material satisfactions, revolutionized our whole ideas and hold forth greater responsibilities for the development of human potentialities. But in spite of all these, still India has to develop a lot to keep in pace with the advanced countries. The need of today is not only to develop civic sense, but also a right type of scientific attitude and scientific creativity among the students, because the students of today are the builders of India tomorrow.

Moreover, ignorance of science is ignorance of our environment and indifference shown to it, by the students is suicidal. For them, without a general understanding of science, civilized life will become impossible in near future. For this our teachers and our educational system are expected to take this job in order to develop the positive attitude and creativity in scientific areas among the students right from the school stage, because creativity constitute a subtle but absolutely key element in the building of a
scientific infrastructure. Teachers also help the students to contribute to the scientific advancement with their ability and creative talents.

So, encouraged by this idea, the investigator was motivated to take the present study and to identify certain factors which go with the scientific creativity among the students.

OBJECTIVES:

The present study entitled, "SCIENTIFIC CREATIVITY IN RELATION TO INTELLIGENCE PERSONALITY COGNITIVE STYLES AND SELECTED ENVIRONMENTAL CATALYSTS", was undertaken with the following objectives:

(1) To construct and standardize the Scientific Creativity Test.

(2) To construct and standardize Environmental Catalysts Scale.

(3) To study and compare the relationship of intelligence, personality, cognitive styles and selected environmental catalysts with scientific creativity of the urban and rural students.

(4) To examine and compare factorial structure underlying the variables of intelligence, personality, cognitive styles, selected environmental catalysts and scientific creativity of the urban rural students.
(5a) To study and compare the predictive efficiency of the variables of intelligence, personality, cognitive styles and selected environmental catalysts in predicting the criterion variable of scientific creativity.

(5b) To examine the conjoint effect of intelligence, personality, cognitive styles and selected environmental catalysts in predicting the criterion variable of scientific creativity of urban and rural students.

(6) To study the differences in scientific creativity in relation to different levels of intelligence, cognitive styles, sex and environmental catalysts for both the samples as well as their area-wise differences.

HYPOTHESES:

Consequent upon the research trend and based on above objectives, the following hypotheses were formulated for the conduct of the present study:

1(a) Intelligence of urban and rural students correlates differentially with their scientific creativity Part A.

(b) Intelligence of urban and rural students correlates differentially with their scientific creativity Part B.

2(a) Personality traits of urban and rural students correlate differentially with their scientific creativity Part A.

(b) Personality traits of urban and rural students correlate differentially with their scientific creativity Part B.
3(a) Cognitive styles of urban and rural students correlate differentially with their scientific creativity Part A.

(b) Cognitive styles of urban and rural students correlate differentially with their scientific creativity Part B.

4(a) Environmental catalysts, such as - home environment, school environment, personal attributes, socio-economic status and psychological environment of the urban and rural students correlate differentially with their scientific creativity Part A.

(b) Environmental catalysts, such as - home environment, school environment, personal attributes, socio-economic status and psychological environment of the urban and rural students correlate differentially with their scientific creativity Part B.

5(a) Variables of intelligence, personality, cognitive styles and selected environmental catalysts cluster together in group factors with scientific creativity of the urban students.

(b) Variables of intelligence, personality, cognitive styles and selected environmental catalysts cluster together in group factors with scientific creativity of the rural students.

6(a) Variable of intelligence is a significant predictor of scientific creativity Part A and Part B of the urban students.
6(a') Variable of intelligence is a significant predictor of scientific creativity Part A and Part B of the rural students.

(b ) Variable of personality is a significant predictor of scientific creativity Part A and Part B of the urban students.

(b') Variable of personality is a significant predictor of scientific creativity Part A and Part B of the rural students.

(c ) Variable of cognitive style is a significant predictor of scientific creativity Part A and Part B of the urban students.

(c') Variable of cognitive style is a significant predictor of scientific creativity Part A and Part B of the rural students.

(d ) Variable of environmental catalysts is a significant predictor of scientific creativity Part A and Part B of the urban students.

(d') Variables of environmental catalysts is a significant predictor of scientific creativity Part A and Part B of the rural students.

(e ) Variables of intelligence, personality, cognitive styles and selected environmental catalysts conjointly contribute greater variance towards the scientific creativity Part A and Part B of the urban students.
as compared to their individual contribution.

Variables of intelligence, personality, cognitive styles and selected environmental catalysts conjointly contribute greater variance towards the scientific creativity Part A and Part B of the rural students as compared to their individual contribution.

7(a) Urban students differ significantly in their scientific creativity Part A and Part B on different levels of intelligence.

(a') Rural students differ significantly in their scientific creativity Part A and Part B on different levels of intelligence.

(b) Urban students differ significantly in their scientific creativity Part A and Part B on the basis of different types of cognitive styles.

(b') Rural students differ significantly in their scientific creativity Part A and Part B on the basis of different types of cognitive styles.

(c) Urban students differ significantly in their scientific creativity Part A and Part B on the basis of sex differences.

(c') Rural students differ significantly in their scientific creativity Part A and Part B on the basis of sex differences.
Urban students differ significantly in their scientific creativity Part A and Part B on the different levels of environmental catalysts.

Rural students differ significantly in their scientific creativity Part A and Part B on the different levels of environmental catalysts.

Urban and rural students differ significantly in their scientific creativity Part A and Part B.

NEED AND SIGNIFICANCE OF THE STUDY:

Science is nothing but creative thinking and creative doing. But our educational system provides no direction to creative domain of the child and so many creative talents are left in seedling form. It is well remarked by Flescher (1963) that, the cultivation of creative potentiality has been largely neglected by education. Our academic education is mostly anticiative. The unchallenging classroom activities fail to inspire the scientific creativity among students.

Eversince, the research has been started in the field of creativity, it was realized that in order to extend the frontiers of knowledge, the research in the field of scientific creativity is very important. There have been found a large variety of studies in the field of creativity conducted by researchers in India and also in abroad (e.g. Raina, 1971; Goyal, 1972; Torrance, 1973; Gakhar, 1975 and Trowbridge, 1978).
But there is paucity of research in the field of scientific creativity, as compared to the other areas of education. So, in the light of this point of view, there is need to enrich the content and subject matter of scientific creativity.

The importance of development of scientific creativity in this atomic age also itself is contributory to accelerate the pace of research activity in scientific and other fields of life. This scientific creativity is helpful in the scientific and technological advancement of this country.

As the progress of nation depends highly upon the manpower, especially the creative personnel, therefore, this is the responsibility of our teachers and education system to develop the creative talents of the children. The purpose of education is also to develop abilities and potentialities, personal expression, gifted leadership and ultimately preparation for practical life and this cannot be possible without the development of creativity in science. So, this study will have far-reaching implications for pedagogy of teaching and learning.

This study, when completed would reveal significant trends as to the degree and extent of predictability and relationship of intelligence, personality, cognitive styles and selected environmental catalysts with scientific creativity and thus will motivate and encourage educationists and curriculum framers to design academic experiences in a way that these will
help to foster the development of scientific creativity among the students right from the school stage. This will also be helpful in the development of scientific creativity in accordance with the students' abilities, personality traits, learning and cognitive styles and their home, school or psychological environment.

The findings of the present study will be helpful for the teachers to identify creative talents of the students in science. Because, the teachers get fail to identify them due to the reason that they have inadequate knowledge and understanding of the creative process and lack of knowledge of factors which inhibit and accelerate the development of creativity. Thus, from the findings of the present study, the teachers can inspire the students to creativity, keeping in mind their abilities, personality, cognitive styles and environmental factors. Accordingly, they can inspire and nourish the future scientists by providing good and congenial environment. Since, creativity does not just happen. It can be fostered and not be forced.

On completion, the present study will provide a standardized tool, that is, Environmental Catalysts Scale, for assessing the role of catalysts of environment in developing the scientific creativity among the students. It is well remarked that people seem to possess the seeds of creativeness but climate for its germination is absent. Also, the standardized
tool, that is, Scientific Creativity Test, can help the teachers to identify the talented and scientifically creative students.

Parents, from the findings of the present study, can understand what their children expect from them and what kind of environment should be created for them, so that the creative talents in science must be flourished.

Further, one's intelligence, personality, cognitive styles and environment play vital role in the development of scientific creativity. The findings of the present study will not tell only the relationship of scientific creativity with intelligence, personality, cognitive styles and selected environmental catalysts by using single variable approach which gives distorted picture of the relationship between different variables, but will tell the conjoint predictive efficacy of different variables in predicting the scientific creativity of the students.

National Policy of Education (1986) has also emphasized to make changes in the content and methodology of teaching and learning of science, in order to prepare manpower to use modern technology. So, encouraged by these facts, the investigator had chosen to conduct research in the field of scientific creativity for further exploration.
METHOD AND PROCEDURE

DESIGN:

The present study was completed in two phases. In the first phase, the preparation and standardization of Scientific Creativity Test and Environmental Catalysts Scale, were completed.

In the second phase of the study, bivariate and multivariate correlational analysis involving the use of product moment, factor analysis and regression equations were employed. In order to find out the nature and extent of relationship of intelligence, personality, cognitive styles and selected environmental catalysts with the scores of scientific creativity, product moment correlation was worked out. Further, technique of factor analysis and rotation of factors were employed in order to identify the constellation of factors underlying independent variables of intelligence, personality, cognitive styles and selected environmental catalysts with the scientific creativity of the students. Step-up regression equations were set-up for determining variance contributed by predictor variables, namely intelligence, personality, cognitive styles and selected environmental catalysts towards the criterion variable of scientific creativity of the students separately and conjointly. t-ratios were also worked out to find out differences in level of scientific creativity in relation with levels of intelligence, cognitive styles, sex, environmental catalysts and area-wise differences among the students.
SAMPLE:

According to design, the present study was conducted on different sets of samples for the standardization of Scientific Creativity Test. The preliminary tryout of this test was done on a sample of 10 students and final tryout of Scientific Creativity Test was conducted over a sample of 200 students. Similarly, another set of sample was considered for the standardization of Environmental Catalysts Scale. The preliminary tryout of ECS was done on a sample of 10 students and for final tryout, sample of 200 students was considered.

The second phase of the proposed study was conducted on a sample of 500 students, selected on the basis of multi-stage randomization technique. For the wider applicability of the results, urban and rural institutions, private and government institutions, both coeducational as well as for boys and girls institutions were included in the sample.

TOOLS:

The following tools were used for the data collection in the present study:

(1) Group Test of General Mental Ability (Jalota, 1967).
(2) 16 Personality Factors Questionnaire (Cattell and Eber, 1967).
(3) Group Embedded Figures Test (Witkin et al., 1971).
(4) Scientific Creativity Test (This test was prepared and standardized by the investigator herself). The description of this test had been given in Chapter V).

(5) Environmental Catalysts Scale (This scale was constructed and standardized by the investigator herself. The detailed account of this scale had been presented in chapter VI).

DATA COLLECTION

The data for the present study was collected from the students involved in the study, that is, from the students of XI Class from schools and colleges of Punjab State.

First of all, cooperation was sought from the heads of the various institutions. A good testing rapport was established with the students before starting administration of the tests. After distributing the copies of the tests as well as response sheets, the students were asked to fill up all the preliminaries given at the top of the test booklet and response sheets, that is, the subjects were asked to write their names, sex, age, name of the school/college and date etc. Instructions were read in a loud voice for each test so that the subjects fully understood how the responses were to be made. If any item or question was not clear to the subjects, he/she was free to ask that. Since all the tests were group tests, so these were administered on small groups of nearly 20 to 40 students at a time in their classrooms, in three sittings spreaded over a period of 3 to 4 days, because scientific
creativity test was lengthy one.

After collecting the response sheets from the students, the scorings were done. The response sheets of Group Test of General Mental Ability, 16 Personality Factors Questionnaire and Group Embedded Figures Test were done according to the rules and norms given in their respective manuals. The response sheets of Scientific Creativity Test were scored on the basis of fluency, flexibility, originality and correctness of responses. The detailed account of scoring had been given in Chapter V along with the description of test. The response sheets of Environmental Catalysts Scale (ECS) were scored on the basis of their agreed, neutral and disagreed responses the detailed description of scoring had been presented in Chapter VI.

After scoring all the response sheets, the data was tabulated for computerization.

**STATISTICAL TECHNIQUES USED:**

Following statistical techniques were used for analysing the data:

(1) The approach of upper-lower index and technique of critical ratio (CR) were used for item analysis of Environmental Catalysts Scale (ECS).

(2) Part-whole correlational technique was used for standardization of Scientific Creativity Test.

(3) Descriptive statistics like mean, median, SD, measure of
skewness and Kurtosis were worked out for ascertaining the nature of distribution based on the measures of various variables.

(4) Pearson's Product moment correlation values were calculated for finding out the correlation between the independent variables of intelligence, personality, cognitive styles and selected environmental catalysts with the criterion variable of scientific creativity.

(5) Factor Analysis (Hotteling's Axes Method of factor analysis and Varimax rotation factors by Kaiser's technique) was employed to study the factor structure underlying the variables of intelligence, personality, cognitive styles, selected environmental catalysts and scientific creativity.

(6) Regression equations were set up by stepping up one variable at a time, to know the percentage contribution to Criterion variable by each variable and prediction of maximum possible R by the combination of these variables.

(7) Technique of t-ratio was employed for locating differences in levels of scientific creativity in relation to different levels of intelligence, cognitive styles, sex, environmental catalysts and area-wise differences.
CONCLUSIONS:

On the basis of the analysis of data and discussion of results, the following conclusions are drawn:

(I) CONCLUSIONS BASED ON TECHNIQUE OF COEFFICIENT OF CORRELATION

Conclusions on the basis of variable of intelligence:

Variable of intelligence correlates significantly with the criterion measure of total scientific creativity Part A and scientific creativity Part B of the urban students. Like urban sample, the variable of intelligence also correlates significantly with total scientific creativity Part A and scientific creativity Part B of the rural students.

An intelligence correlates similarly in both the samples, with the scientific creativity Part A and Part B, therefore, hypothesis 1(a) that intelligence of urban and rural students correlates differentially with their scientific creativity Part A; and hypothesis 1(b) that intelligence of urban and rural students correlates differentially with their scientific creativity Part B, are rejected.

Conclusions on the basis of Personality Factors:

(1) In both the samples, three personality factors, i.e., factor G (Consciousness Vs. Expediency), factor H (Shy Vs. Venturesome) and factor N (Forthright Vs. Shrewd)
show a consistent picture of relationship with the criterion measures of total scientific creativity Part A and scientific creativity Part B.

(2) In urban sample, only one personality factor out of 16 factors, i.e., Personality Factor A (Reserved Vs. Outgoing) correlates negatively and significantly with the criterion measures, whereas, in the rural sample none of the personality factor correlates with the criterion measures.

(3) Criterion measures of total scientific creativity Part A and scientific creativity Part B correlate significantly and positively with three personality factors i.e., Factor G (Conscientious Vs. Expediency), Factor H (Shy Vs. Venturesome) and Factor N (Forthright Vs. Shrewd) out of 16 personality factors in case of urban sample.

(4) In case of rural sample, criterion measures of scientific creativity correlates and positively with twelve personality factors, i.e., Factor B (Less Intelligence Vs. High Intelligence), Factor C (Affected by Feelings Vs. Emotionally Stable), Factor E (Humble Vs. Assertive), Factor G (Conscientious Vs. Expediency), Factor H (Shy Vs. Venturesome), Factor L (Trusting Vs. Suspicious), Factor M (Practical Vs. Imaginative bent of mind), Factor N (Forthright Vs. Shrewd), Factor Q (Conservative Vs. Experimenting nature), Factor Q2 (Dependency Vs.
Self Sufficiency), Q₃ (Indisciplined Vs. Controlled) and Q₄ (Relaxed Vs. Tense) out of 16 personality factors.

Picture of significant correlation of criterion measure with personality factors as obtained in urban sample is different to one obtained from rural sample. For example, personality factor A (Reserved Vs. Outgoing) is found to be significantly negatively correlating with criterion measure in case of urban sample only. Similarly, personality factor B (Less Intelligence Vs. High Intelligence), factor C (Affected by feelings Vs. Emotionally stable), factor E (Humble Vs. Assertive), factor L (Trusting Vs. Suspicious), factor M (Practical Vs. Imaginative bent of mind), factor Q₁ (Conservative Vs. Experimenting nature), factor Q₂ (Dependency Vs. Self sufficiency), Q₃ (Indisciplined Vs. Controlled) and Q₄ (Relaxed Vs. Tense) correlate significantly with the criterion measures in case of rural sample only.

Personality factor F (Sober Vs. Happy go lucky), factor I (Tough minded Vs. Tender minded) and factor O (Placidness Vs. Apprehensiveness) are not found to be correlated significantly with the criterion measures in any of the sample.

The overall picture of personality factors of urban sample, that emerges positively or negatively correlate with the criterion measure of Scientific Creativity Part A and Part B characterizes the urban students
as stiff, cool, aloof, conscientious, socially bold, skilfull, ingenious and having dexterous nature.

The overall picture of personality factor of rural sample, that emerges positively correlated with the criterion measure of total scientific creativity Part A and scientific creativity Part B characterizes the rural students as intelligent, conscientious, assertive, crazy, hard worker, socially bold, curious, suspicious, unconventional, skilfull, ingneous, restless, having dexterous and independent nature, controlled, impatient and tensed individuals.

Thus, the hypothesis 2(a) that Personality traits of urban and rural students correlate differentially with their scientific creativity Part A; and hypothesis 2(b), that personality traits of urban and rural students correlate differentially with their scientific creativity Part B are accepted.

Conclusions on the basis of Cognitive Styles

Criterion measure of total scientific creativity Part A and scientific creativity Part B is found to be significantly correlated with the Cognitive styles in case of rural sample. But in case or urban sample, the criterion measure shows insignificant correlation with independent variables.

So, the hypothesis 3(a), that Cognitive styles of urban and rural students correlate differentially with their scientific creativity Part A; and hypothesis 3(b), that
Cognitive styles of urban and rural students correlate differentially with their scientific creativity Part B, are accepted.

Conclusions on the basis of Environmental Catalysts (EC)

(1) In case of both the samples, i.e. urban and rural, the two factors of EC, namely EC I (Home environment) and EC III (Personal attributes) correlate significantly and positively with the criterion measures of total scientific creativity Part A and scientific creativity Part B.

(2) In rural sample only one factor EC II (School environment) shows insignificant correlation with criterion measure of total scientific creativity Part A and scientific creativity Part B. Also, in case of rural sample two factors; namely EC IV (Socio-economic status) and EC V (Psychological environment) correlate insignificantly with the criterion measure of scientific creativity Part B only.

(3) The correlation picture clearly shows, that in case of both urban and rural samples, the students' scientific creativity, i.e., fluency, flexibility, originality and problem solving ability is highly influenced by the environmental catalysts such as, home environment, school environment, personal attributes, socio-economic status and psychological environment.
(4) Picture of significant correlation of criterion measure with environmental catalysts as obtained in urban sample is almost similar to that obtained in rural sample, because, all the factors or catalysts of environment correlate significantly with total scientific creativity Part A and scientific creativity Part B of the students in both the samples.

Thus, the hypothesis 4(a), that Environmental Catalysts, such as, home environment, school environment, personal attributes, socio-economic status and psychological environment of the urban and rural students correlate differentially with their scientific creativity Part A; and hypothesis 4(b), that Environmental Catalysts, such as home environment, social environment, personal attributes, socio-economic status and psychological environment of the urban and rural students correlate differentially with their scientific creativity Part B, are rejected.

(II) CONCLUSIONS BASED ON TECHNIQUE OF FACTOR ANALYSIS AND ROTATION OF FACTORS:

(1) It is observed that 61.42% of total factor variance is explained by the criterion variable of total scientific creativity Part A, out of which 45.11% and 16.31% variances are explained by Original Factor I and II respectively in case of urban sample. In case of criterion variable of scientific creativity Part B, 55.92% of total factor variance is explained, out of which 31.21% and 24.71% variances are
explained by Original Factors I and V respectively. In case of independent variable of intelligence, 67.76% of total variance is explained, out of which 9.10% and 58.66% variance are explained by Original Factors I and V respectively. In case of variable of personality traits, only 8.21% variance is explained by Original Factor V. Similarly, in case of Cognitive style, 15.25% total factor variance is explained by only Original Factor I, whereas, 74.36% of total factor variance in case of variable of environmental catalysts is explained by Original Factor II only.

It is also noticed that highest percentage of variance in Original Factor I is shared by the criterion variable of total scientific creativity Part A (45.11%) followed by scientific creativity Part B (31.21%) and Cognitive style (15.25%). In case of Original Factor II, highest percentage of variance is shared by the variable of environmental catalysts (74.36%) followed by criterion variable of total scientific creativity Part A (16.31%) and thus, there is more closeness between the criterion variable of total scientific creativity Part A and the variable of environmental catalysts. It is also revealed that in case of Original Factor V, highest percentage of variance is shared by the variable of intelligence (58.66%) followed by the criterion variable of scientific creativity Part B (24.71%) and independent variable of personality traits (8.21%) and thus, it can be said that there is more nearness between criterion variable scientific creativity Part B and independent variable of intelligence. In this Original Factor V,
no variance is explained by the criterion variable of scientific creativity Part A and independent variable of cognitive style and environmental catalysts.

In case of Varimax Factors, it is observed that total percentage of variance explained in Factors I, II and V by the criterion variables of total scientific creativity Part A, total scientific creativity Part B and independent variables of intelligence, personality traits and environmental catalysts are 71.44 %, 58.48 %, 45.28 %, 7.34 % and 73.56 % respectively. In Varimax Factor I, highest total factor variance is explained by the criterion variables of total scientific creativity Part A (60.03 %) and total scientific creativity Part B (40.11 %). In Varimax Factor II, only the independent variable of environmental catalysts is having the sharing of 73.56 % followed by criterion variable of total scientific creativity Part A (11.41 %) and therefore, there is closeness between independent variable of environment catalysts and the criterion variable of scientific creativity Part A. In Varimax Factor V, highest variance is explained by the variable of intelligence (45.28 %) followed by the criterion variable of scientific creativity Part B (18.37 %) and independent variable of personality traits (7.34 %) and hence there is closeness between criterion variable of scientific creativity Part B and the independent variable of intelligence. Criterion variable of total scientific Part A does not share any variance in this factor.

It is also observed that independent variables of intelligence, personality traits, cognitive style, environmental catalysts share common variance with the criterion variables of total scientific creativity Part A and scientific creativity
Part B but are independent of each other in case of Original and Varimax Factors I, II and V.

Hence, in the light of above results, hypothesis 5(a) that variables of intelligence, personality, cognitive style and selected environmental catalysts cluster together in group factors with scientific creativity of the urban students, are accepted.

(2) In case of rural sample (Group II), it is observed that 90.59%, 35.60%, 32.02%, 71.52%, 22.94% and 81.70% of total factor variance are explained by the criterion measures of total scientific creativity Part A and scientific creativity Part B and independent variables of intelligence, personality traits, cognitive style and environmental catalysts respectively. In case of Original Factor I, the highest percentage of variance is shared by the variable of personality traits (56.19%) followed by the criterion variables of total scientific creativity Part A (16.17%) and scientific creativity Part B (15.26%), variable of environmental catalysts (9.38%) and intelligence (8.13%) and thus, the variable of personality traits and the criterion variables of total scientific creativity Part A and scientific creativity Part B are found to be in close proximity to each other in Original Factor I.

In Original Factor II, the highest percentage of variance is shared by the criterion variable of total scientific creativity Part A (50.11%) followed by scientific creativity Part B (22.34%), and independent variable of personality
traits (11.23%). In Original Factor III, the highest percentage of variance is shared by independent variable of environmental catalysts (48.79%) followed by criterion variable of total scientific creativity Part A (24.31%) and the variable of intelligence (14.72%). Therefore, there is closeness between the criterion variable of total scientific creativity Part A and independent variable of environmental catalysts. Criterion variable of scientific creativity Part B shares no variance in this Original Factor III.

In case of Varimax Factors 52.27%, 56.97%, 46.22% 49.88%, 51.61% and 91.50% of total factor variance are explained by the criterion variable of total scientific creativity Part A and scientific creativity Part B and the independent variables of intelligence, personality traits, cognitive style and environmental catalysts. In Varimax Factor I, highest factor variance is explained by the independent variable of personality traits (49.88%) followed by variable of intelligence (17.32%). In Varimax Factor II, highest variance is explained by the criterion variables of total scientific creativity Part A (52.27%) followed by scientific creativity Part B (28.16%) and independent variable of intelligence (12.18%). In Varimax Factor III, the highest variance is shared by the variable of environmental catalysts (67.11%) followed by variable of intelligence (16.72%) and criterion variable of total scientific creativity Part B (14.56%). In Varimax Factor V, the highest variance is explained by the variable of cognitive style (51.61%) followed by measures of environmental catalysts (16.23%).
and the criterion measure of scientific creativity Part B (14.25%). Criterion variable of total scientific creativity Part A does not share any variance in this Varimax Factor V.

Thus, it is observed from the results, although the independent variables of intelligence, personality traits, cognitive style and environmental catalysts shared common variance with the criterion variables of total scientific creativity Part A and scientific creativity Part B yet they are found to be independent of each other in case of Original and Varimax Factors II, III and V. On the basis of these observations, thus, the hypothesis 5(b), that variables of intelligence, personality, cognitive style and selected environmental catalysts cluster together in group factors with scientific creativity of the rural students, is accepted.

Keeping in view the results obtained from factor analysis and rotation of factors, the following inferences can be drawn:

(1) In urban sample (Group I), three Original Factors (I, II and V) as well as three Varimax Factors (I, II and V) are identified, whereas, in case of rural sample, three Original Factors (I, II and III) and three Varimax Factors (II, III and V) are identified, in which criterion measures of total scientific creativity Part A and scientific creativity Part B shared common variance with the independent variables of intelligence, personality traits, cognitive style and environmental catalysts.
Variable of intelligence shares significant loadings with the criterion measures of total scientific creativity Part A and total scientific creativity Part B in Original Factors I and V and Varimax Factor V in case of urban sample. Whereas, variable of intelligence shares significant loadings with criterion measures of total scientific creativity Part A and scientific creativity Part B in Original Factors I, II and III and Varimax Factors II and III in case of rural sample.

Few Personality factors share significant loadings in Original as well as Varimax Factor V in urban sample, whereas in case of rural sample, nearly all 16 personality factors shared significant loadings with the criterion measures of total scientific creativity Part A and scientific creativity Part B.

Variable of cognitive style shares significant loadings only in Original Factor I in urban sample and Original Factor III and Varimax Factor V in case of rural sample.

Measures of environmental catalysts constellate themselves in Original as well as Varimax Factor II in urban sample and in Original Factors I, II and III and Varimax Factors II, III and V in case of rural sample.
Although, number of relevant factors identified for
the two groups of sample are nearly comparable, yet the
pattern of constellation of dependent variables, i.e.,
intelligence, personality traits, cognitive style and
environmental catalysts with the criterion measures
of total scientific creativity Part A and scientific
creativity Part B is different in both the groups.

Criterion measures of total scientific creativity Part A
and scientific creativity Part B share maximum variance
with the variable of intelligence in Original and
Varimax Factor V in urban sample, and also the criterion
measures share maximum variance with the variable of
environmental catalysts in Original as well as Varimax
Factor II in case of rural sample.

Criterion measures of total scientific creativity Part A
and scientific creativity Part B share maximum variance
with the variable of personality traits in Original
Factor I in rural sample, and also share maximum variance
with the variable of environmental catalysts in Original
as well as Varimax Factor III. Criterion measures also
share maximum variance with the cognitive style in
Varimax Factor V in case of rural sample.

"Group Factor of Scientific Creativity" appears in both
the samples (Original and Varimax Factor I in urban
sample and Original and Varimax Factor II in rural
sample).
"Factor of Cognitive Ability" is identified only in urban sample (Original as well as Varimax Factor V).

"Group Factor of Environmental Catalysts" is identified in both the samples (Original as well as Varimax Factor II in case of urban sample and Original and Varimax Factor-III in case of rural sample.

"Factor of Cognitive Style" appears only in rural sample (Varimax Factor V).

"Group Factor of Personality Traits" was identified in rural sample (Original and Varimax Factor I).

Therefore, in the light of above results, the hypothesis 5(c), that the factor structure underlying the variables of intelligence, personality, cognitive style, selected environmental catalysts and scientific creativity of the urban and rural students differ, is accepted.

(III) CONCLUSIONS BASED ON TECHNIQUE OF STEP-UP REGRESSION EQUATIONS:

The following inferences can be drawn on the basis of technique of Multiple Regression Equations:

1. Variable of intelligence is a good predictor of scientific creativity Part A and Part B of both the urban as well as rural students. Thus, the hypothesis 6(a), that variable of intelligence is a significant predictor of scientific creativity Part A and scientific creativity Part B of the urban students, and hypothesis 6(a'), that variable of intelligence is a significant predictor of scientific creativity Part A and scientific creativity Part B of the rural students, are rejected.
Variable of personality is not a good predictor of scientific creativity Part A and Part B of the urban students. Also, in case of rural sample, out of 16 personality factors, only two factors, i.e., Factor L (Trusting Vs. Suspicious) and Factor Q2 (Dependency Vs. Self-sufficiency) are found to be significant predictors in predicting scientific creativity Part A and Part B. Therefore, the hypothesis 6(b), that variable of personality is a significant predictor of scientific creativity Part A and Part B of the urban students, and hypothesis 6(b'), that variable of personality is a significant predictor of scientific creativity Part A and Part B of the rural students, are rejected.

Variable of cognitive styles is found to be a good predictor in predicting scientific creativity Part A and Part B of both urban as well as rural students. Therefore, hypothesis 6(c), that variable of cognitive styles is a significant predictor of scientific creativity Part A and Part B of the urban students, and hypothesis 6(c') that variable of cognitive styles is a significant predictor of scientific creativity Part A and Part B of the rural students are accepted.

All the measures of environmental catalysts are good predictors of scientific creativity Part A and Part B in case of urban sample, whereas in rural sample, only two factors i.e. ECI (Home environment) and
EC III (Personal attributes) are found to be the good predictors of scientific creativity Part A and Part B. Thus, hypothesis 6(d), that variable of environmental catalysts is a significant predictor of scientific creativity Part A and Part B of the urban students and hypothesis 6(d'), that variable of environmental catalysts is a significant predictor of scientific creativity Part A and Part B of the rural students are accepted.

So, by viewing the above findings, the hypothesis 6(e) that variables of intelligence, personality, cognitive styles and selected environmental catalysts conjointly contribute greater variance towards scientific creativity Part A and Part B of the urban students as compared to their individual contribution, and hypothesis 6(e'), that variables of intelligence, personality, cognitive styles and selected environmental catalysts conjointly contribute greater variance towards scientific creativity Part A and Part B of the rural students, as compared to their individual contribution, are accepted.

(IV) Conclusions Based on Study of Discrete Variables (t-Ratio):

From the results of effect of discrete variables on the scientific creativity Part A and Part B of the urban and rural students, the following inferences can be drawn:

1. Level of intelligence is found to be a significant factor in causing differences in total scientific creativity Part A and scientific creativity Part B in urban as well as rural sample. Thus, the hypothesis 7(a), that urban
students differ significantly in their scientific creativity Part A and Part B on different levels of intelligence; and hypothesis 7(a'), that rural students differ significantly in their scientific creativity Part A and scientific creativity Part B on different levels of intelligence, are accepted.

2. Type of cognitive styles of the students in urban as well as in rural setting has significant impact on total scientific creativity Part A and scientific creativity Part B. Therefore, hypothesis 7(b), that urban students differ significantly in their scientific creativity Part A and scientific creativity Part B on the basis of different types of cognitive styles; and 7(b'), that rural students differ significantly in their scientific creativity Part A and scientific creativity Part B on the basis of different types of cognitive styles, are accepted.

3. There exist insignificant differences in total scientific creativity Part A and scientific creativity Part B on the basis of sex differences among urban and rural students. Therefore, the hypothesis 7(c) that urban students differ significantly in their scientific creativity Part A and scientific creativity Part B on the basis of sex differences; and 7(c'), that rural students differ significantly in their total scientific creativity Part A and scientific creativity Part B on the basis of sex differences, are accepted.
4. There exist significant differences in total scientific creativity Part A and scientific creativity Part B between two groups, as classified on the basis of their scores on 'Environmental Catalysts Scale', in case of both urban and rural (only mean values differences are significant) students. Thus, the hypothesis 7(d), that urban students differ significantly in their scientific creativity Part A and scientific creativity Part B on different levels of environmental catalysts; is accepted; and the hypothesis 7(d'), that rural students differ significantly in their scientific creativity Part A and scientific creativity Part B on different levels of environmental catalysts; is partially accepted.

5. Urban students are better in scientific creativity ability (Part A and Part B) as compared to the rural students. Hence, the hypothesis 7(e), that urban and rural students differ significantly in their scientific creativity Part A and scientific creativity Part B, is accepted.

EDUCATIONAL IMPLICATIONS:

After having reported the results of the present study in the preceding paragraphs, some of the practical implications are pooled together here to consider their importance.

1. The research findings derived regarding the meaning, nature, significance and measurement of scientific creative talent naturally have practical implications for teachers. The study suggests that among the various variables under investigation, some have a direct bearing on scientifically
creative performande.

In the present conditions, our schools do not make any attempt to foster and identify the creative talents. Our teachers only expect good positions and scores from their students. The school authorities try to produce only good grade getters. So, there is need to identify the potentially creative talents at each grade and at every stage of mental development of children.

2. Torrance (1977) in his paper on 'Uses of Creativity Testing in Education', has given the various implications of creativity tests, as: (i) for obtaining a more complex understanding of the human mind and personality and their functioning; (ii) as a possible basis for individualized 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 programmes; (iv) as a means of assessing the differential effects of various kinds of experimental programmes, new curricular arrangements of materials, organizational arrangements, teaching procedures and the like, and (v) as indicator of growth potential and future guidance needs (Torrance, 1977). Out of these functions, the creativity in writing, science and medicine can be most easily predicted by creativity tests administered in high schools.

Similarly, Scientific Creativity Test developed by
investigator can be proved very useful instrument in locating scientifically creative talents. Scientific creativity is a multidimensional activity and can be measured with the help of different tools and techniques. Many researchers and psychologists have suggested that there should be systematic and continuous evaluation of scientifically creative talents. Also, the construct of scientific creativity is not stable and is everchanging. In this light, the parents, the teachers and peers can help the children in identifying the creative talents in science by the performance of the children on a set of tools at different times. The tests prepared by the investigator, that is, Scientific Creativity Tests can also be used to locate the creative talents.

3. The nurture of creative talents in science is a concern of education. Once the creative students and their potentialities are identified, the parents, the teachers and psychologists and all those individuals, who directly or indirectly are concerned with the students, and nation can think of ways and means to encourage and foster the scientific creativity. Education can only be helpful in fostering the creative talents when multidimensional view of intellectual functioning is kept in mind in our teaching learning process. The scientifically creative individual is characterized by longitude or fluency of ideas, a vide latitude or flexibility of ideas and uniqueness of ideas. He is found to be emotionally
stable, self-determined, assertive, dominant, venturesome, self sufficient and relaxed. He is always busy in searching and seeking material, manipulating and incubating the problem. Keeping in view the characteristics of creative individuals, the teachers in classroom, the parents at home and the friends at play can provide the various opportunities to channelize the creative potential in right direction without blocking it.

4. Also, there is need to tailor the educational system to suit the needs and nature of creative adolescents. The aims, curriculum, methods of teaching, promotion and rewards should be changed. Our educational system inhibit the creative talents even at the later stage after identification by teachers. There is need to bring into academic education a wide range of divergent thinking experiences and greater emphasis on student initiative and freedom.

5. 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.

6. According to the recommendations of White House Conference on children (1970), opportunities be made available for every child to learn creativity, to grow creatively and to live creativity.

The Scientific Creativity is normally distributed,
means 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, it has been said that a person fail to develop a distinctive creative personality because of the environmental press. The creative act is a free and independent force. So, the parents, and the teachers should feel the necessity of providing free, congenial and encouraging environment to the adolescents in order to foster creativity among them as the results show.

(7) The factors and catalysts of environment play significant role in development of scientific creativity among students. It has been generally seen that our teachers, parents and peers feel baffled when highly creative children express themselves. So, it is essential to guide the teachers, parents and peers to how to react and deal with unusual question of scientifically creative children. Also, the parents should be patiently guided to change their outlook towards their children’s future growth, development and adjustment. The parents should not fulfill their aspirations at the cost of child’s creativity.

(8) The results of the study imply that the recognition of independent cognitive styles play an identifiable role in students' expression of creativity in science by helping them to recognize and structure the vague or ambiguous stimuli effectively and to adopt a relatively
intellectual or impersonal approach to problems. Thereby, enabling them to show greater cognitive clarity than global field individuals who tend to experience themselves and world in a discrete, organized and articulate fashion.

(9) Urban students are found to be superior to rural students in scientific creativity as shown by the findings of the present investigation. This fact can also be attributed to better environmental conditions in schools, parental affection, security, economic facilities and freedom of decision making at home, in the urban areas. Keeping in view the above factors, the parents and teachers can enhance and nurture the scientific creativity of the students by creating such type of environment in home as well as in school.

(10) The results of the present study may form a subject of the refresher courses, seminars and workshops organized for teachers, teaching science to senior secondary students.

(11) Keeping in mind the intellectual abilities, cognitive styles, personality characteristics and also the home environment, school environment and psychological environment of the students, the findings of the present study can be used for making the teaching learning situation more effectively and more productive.
SUGGESTIONS FOR FURTHER RESEARCH

(1) The study may be conducted by taking the scientific creativity of different exceptional children such as gifted, backward, physically handicapped and problem children.

(2) The scientific creativity on the students of different age group may be considered.

(3) The various other dimensions of the environment may be taken in relation to scientific creativity of the students.

(4) The comparative studies may be conducted on the different school, college and university teachers and students of science and language.

(5) As the greater significance of psychological contribution is that a change in dynamics of creativity research seems warranted for its future promise. Therefore, the assessment of creativity in science cannot merely rely on singular intellectual trait and it must resort to a multidimensional approach, which is again an area for future researchers.

(6) Replicative studies involving larger and different population, as also follow up studies may be undertaken to establish the validity of findings of the present study.