CHAPTER- V

FINDINGS, IMPLICATIONS AND SUGGESTIONS.

Present study was undertaken to study an important psychological factor, *Scientific Creativity* which effects not only academic achievements of students but also each and every aspect of any individual’s life. The study particularly aimed to investigate scientific creativity among students of XI grade in relation to primary academic variables like intelligence, personality and study habits. The sample of the study consist of 617 students (315 male students, 302 female students) enrolled in XI grade of Uttar Pradesh (U.P.) Board. The preceding chapter was primarily focused on analysis of data, its result and discussion. Present chapter is an effort to enumerate and highlight the prime findings of the study, suggestions for the further researches and educational implications of findings of the present research.

5.1 FINDINGS OF THE RESEARCH

The finding of the research can be summarized as follow:

5.1.1 Study the relationship between Scientific Creativity and Intelligence among male and female students of XI grade.

1) ‘*Fluency*’ factor of scientific creativity is insignificantly related to intelligence of male and female students of XI grade.

2) ‘*Flexibility*’ factor of scientific creativity is negatively correlated to intelligence of male students of XI grade.

3) ‘*Flexibility*’ factor of scientific creativity is positively correlated to intelligence of female students of XI grade.

4) ‘*Originality*’ factor of scientific creativity is positively correlated to intelligence of male students of XI grade.

5) ‘*Originality*’ factor of scientific creativity is negatively correlated to intelligence of female students of XI grade.

6) ‘*Inquisitiveness*’ factor of scientific creativity is insignificantly related to intelligence of male and female students of XI grade.

7) Overall scientific creativity is positively correlated to intelligence of male students of XI grade.
8) Overall scientific creativity is negatively correlated to intelligence of female students of XI grade.

5.2.2 Study the relationship between Scientific Creativity with the 16 factors of Personality of male and female students of XI grade.

1) ‘Fluency’ factor of scientific creativity is positively correlated to personality Factor L, Trusting vs. Suspicious in male students of XI grade.

2) ‘Fluency’ factor of scientific creativity is negatively correlated to personality Factor A, Schizothymia vs. Cyclothymia; Factor C, Affect by feelings vs. Emotionally stable; Factor F, Sober vs. Happy-go-lucky; Factor H, Shy vs. Venturesome; Factor N, Forthright vs. Shrewd; Factor Q2, Group Dependent vs. Self-Sufficient and Factor Q3, Undisciplined Self Conflict vs. Controlled of male students of XI grade.

3) ‘Fluency’ factor of scientific creativity is insignificantly related to personality Factor B, Less Intelligent vs. More Intelligent; Factor E, Humble vs assertive; Factor G, Expedient vs. Conscientious; Factor I, Tough minded vs. Tender minded; Factor M, Practical vs. Imaginative; Factor O, Placid vs. Apprehensive; Factor Q1, Conservative vs. Experimenting and Factor Q4, Relaxed vs. Tense of male students of XI grade.

4) ‘Fluency’ factor of scientific creativity is positively correlated to personality Factor E, Humble vs assertive; Factor G, Expedient vs. Conscientious; Factor I, Tough minded vs. Tender minded; Factor L, Trusting vs. Suspicious and Factor M, Practical vs. Imaginative of female students of XI grade.

5) ‘Fluency’ factor of scientific creativity is negatively correlated to personality Factor A, Schizothymia vs. Cyclothymia; Factor F, Sober vs. Happy-go-lucky; Factor H, Shy vs. Venturesome and Factor Q2, Group Dependent vs. Self-Sufficient of female students of XI grade.

6) ‘Fluency’ factor of scientific creativity is insignificantly related to personality Factor B, Less Intelligent vs. More Intelligent; Factor C, Affect by feelings vs. Emotionally stable; Factor N, Forthright vs.
Shrewd; **Factor O**, Placid vs. Apprehensive; **Factor Q₁**, Conservative vs. Experimenting; **Factor Q₃**, Undisciplined Self Conflict vs. Controlled and **Factor Q₄**, Relaxed vs. Tense of female students of XI grade.

7) ‘Flexibility’ factor of scientific creativity is positively correlated to personality **Factor B**, Less Intelligent vs. More Intelligent; **Factor G**, Expedient vs. Conscientious and **Factor I**, Tough minded vs. Tender minded of male students of XI grade.

8) ‘Flexibility’ factor of scientific creativity is insignificantly related to personality **Factor A**, Schizothymia vs. Cyclothymia; **Factor C**, Affected by feelings vs. Emotionally stable; **Factor E**, Humble vs. Assertive; **Factor F**, Sober vs. Happy-go-lucky; **Factor H**, Shy vs. Venturesome; **Factor L**, Trusting vs. Suspicious; **Factor M**, Practical vs. Imaginative; **Factor N**, Forthright vs. Shrewd; **Factor O**, Placid vs. Apprehensive; **Factor Q₁**, Conservative vs. Experimenting; **Factor Q₂**, Group Dependent vs. Self-Sufficient; **Factor Q₃**, Undisciplined Self Conflict vs. Controlled and **Factor Q₄**, Relaxed vs. Tense of male students of XI grade.

9) ‘Flexibility’ factor of scientific creativity is positively correlated to personality **Factor F**, Sober vs. Happy-go-lucky; **Factor I**, Tough minded vs. Tender minded; **Factor N**, Forthright vs. Shrewd; **Factor Q₁**, Conservative vs. Experimenting and **Factor Q₃**, Undisciplined Self Conflict vs. Controlled of female students of XI grade.


11) ‘Originality’ factor of scientific creativity is positively correlated to personality **Factor I**, Tough minded vs. Tender minded and **Factor Q₁**, Conservative vs. Experimenting in male students of XI grade.
12) ‘Originality’ factor of scientific creativity is negatively correlated to personality Factor H, Shy vs. Venturesome; Factor M, Practical vs. Imaginative; Factor O, Placid vs. Apprehensive; Factor Q4, Relaxed vs. Tense of male students of XI grade.

13) ‘Originality’ factor of scientific creativity is insignificantly related to personality Factor A, Schizothymia vs. Cyclothymia; Factor B, Less Intelligent vs. More Intelligent; Factor C, Affected by feelings vs. Emotionally stable; Factor E, Humble vs. Assertive; Factor F, Sober vs. Happy-go-lucky; Factor G, Expedient vs. Conscientious; Factor L, Trusting vs. Suspicious; Factor N, Forthright vs. Shrewd; Factor Q2, Group Dependent vs. Self-Sufficient and Factor Q3, Undisciplined Self Conflict vs. Controlled of male students of XI grade.

14) ‘Originality’ factor of scientific creativity is negatively correlated to personality Factor B, Less Intelligent vs. More Intelligent; Factor H, Shy vs. Venturesome; Factor I, Tough minded vs. Tender minded; Factor L, Trusting vs. Suspicious; Factor M, Practical vs. Imaginative; Factor Q1, Conservative vs. Experimenting and Factor Q4, Relaxed vs. Tense of female students of XI grade.

15) ‘Originality’ factor of scientific creativity is insignificantly related to personality Factor A, Schizothymia vs. Cyclothymia; Factor C, Affected by feelings vs. Emotionally stable; Factor E, Humble vs. Assertive; Factor F, Sober vs. Happy-go-lucky; Factor G, Expedient vs. Conscientious; Factor N, Forthright vs. Shrewd; Factor O, Placid vs. Apprehensive; Factor Q2, Group Dependent vs. Self-Sufficient and Factor Q3, Undisciplined Self Conflict vs. Controlled of female students of XI grade.

16) ‘Inquisitiveness’ factor of scientific creativity is positively correlated to personality Factor A, Schizothymia vs. Cyclothymia; Factor B, Less Intelligent vs. More Intelligent; Factor E, Humble vs. Assertive; Factor O, Placid vs. Apprehensive and Factor Q3, Undisciplined Self Conflict vs. Controlled in male students of XI grade.

17) ‘Inquisitiveness’ factor of scientific creativity is negatively correlated to personality Factor C, Affected by feelings vs. Emotionally stable and Factor F, Sober vs. Happy-go-lucky of male students of XI grade.
18) ‘Inquisitiveness’ factor of scientific creativity is insignificantly related to personality Factor G, Expedient vs. Conscientious; Factor H, Shy vs. Venturesome; Factor I, Tough minded vs. Tender minded; Factor L, Trusting vs. Suspicious; Factor M, Practical vs. Imaginative; Factor N, Forthright vs. Shrewd; Factor Q1, Conservative vs. Experimenting; Factor Q2, Group Dependent vs. Self-Sufficient; Factor Q4, Relaxed vs. Tense of male students of XI grade.

19) ‘Inquisitiveness’ factor of scientific creativity is positively correlated to personality Factor A, Schizothymia vs. Cyclothymia; Factor C, Affected by feelings vs. Emotionally stable; Factor E, Humble vs. Assertive; Factor G, Expedient vs. Conscientious; Factor L, Trusting vs. Suspicious; Factor O, Placid vs. Apprehensive; Factor Q1, Conservative vs. Experimenting and Factor Q3, Undisciplined Self Conflict vs. Controlled of female students of XI grade.

20) ‘Inquisitiveness’ factor of scientific creativity is negatively correlated to personality Factor F, Sober vs. Happy-go-lucky of female students of XI grade.

21) ‘Inquisitiveness’ factor of scientific creativity is insignificantly related to personality Factor B, Less Intelligent vs. More Intelligent; Factor H, Shy vs. Venturesome; Factor I, Tough minded vs. Tender minded; Factor M, Practical vs. Imaginative; Factor N, Forthright vs. Shrewd; Factor Q2, Group Dependent vs. Self-Sufficient and Factor Q4, Relaxed vs. Tense of female students of XI grade.

22) Overall scientific creativity is positively correlated to personality Factor B, Less Intelligent vs. More Intelligent; Factor F, Sober vs. Happy-go-lucky; Factor G, Expedient vs. Conscientious; Factor M, Practical vs. Imaginative; Factor Q1, Conservative vs. Experimenting; Factor Q2, Group Dependent vs. Self-Sufficient; Factor Q3, Undisciplined Self Conflict vs. Controlled and Factor Q4, Relaxed vs. Tense in male students of XI grade.

23) Overall scientific creativity is negatively correlated to personality Factor C, Affected by feelings vs. Emotionally stable and Factor I, Tough minded vs. Tender minded of male students of XI grade.

24) Overall scientific creativity is insignificantly related to personality
Factor A, Schizothymia vs. Cyclothymia; Factor E, Humble vs. Assertive; Factor H, Shy vs. Venturesome; Factor L, Trusting vs. Suspicious; Factor N, Forthright vs. Shrewd; Factor O, Placid vs. Apprehensive of male students of XI grade.

25) Overall scientific creativity is positively correlated to personality Factor E, Humble vs. Assertive and Factor M, Practical vs. Imaginative of female students of XI grade.

26) Overall scientific creativity is negatively correlated to personality Factor A, Schizothymia vs. Cyclothymia; Factor C, Affected by feelings vs. Emotionally stable; Factor L, Trusting vs. Suspicious and Factor Q4, Relaxed vs. Tense of female students of XI grade.

27) Overall scientific creativity is not related to personality Factor B, Less Intelligent vs. More Intelligent; Factor F, Sober vs. Happy-go-lucky; Factor G, Expedient vs. Conscientious; Factor H, Shy vs. Venturesome; Factor I, Tough minded vs. Tender minded; Factor N, Forthright vs. Shrewd; Factor O, Placid vs. Apprehensive; Factor Q1, Conservative vs. Experimenting; Factor Q2, Group Dependent vs. Self-Sufficient and Factor Q3, Undisciplined Self Conflict vs. Controlled of female students of XI grade.

5.2.3 Study the relationship between Scientific Creativity and Study Habits among male and female students of XI grade.

1) ‘Fluency’ factor of scientific creativity is positively related to study habits of male students of XI grade.

2) ‘Fluency’ factor of scientific creativity is insignificantly related to study habits of female students of XI grade.

3) ‘Flexibility’ factor of scientific creativity is insignificantly related to study habits of male students of XI grade.

4) ‘Flexibility’ factor of scientific creativity is positively correlated to study habits of female students of XI grade.

5) ‘Originality’ factor of scientific creativity is insignificantly related to study habits of male students of XI grade.

6) ‘Originality’ factor of scientific creativity is negatively correlated to
study habits of female students of XI grade.

7) ‘*Inquisitiveness*’ factor of scientific creativity is insignificantly related to study habits of male and female students of XI grade.

8) Overall scientific creativity is positively correlated to study habits of male and female students of XI grade.

5.2.4 *Study the Scientific Creativity of male and female students of XI grade with different levels of Intelligence.*

1) As compared to average and below average male students, students with above average intelligence are found to be more fluent.

2) Male students with average intelligence are found to be more fluent than below average intelligence male students.

3) Female students with above average, average and below average intelligence do not differ significantly with each other on *fluency* factor.

4) Male students with above average, average and below average intelligence do not differ significantly from one another on *flexibility* factor.

5) As compared to average and below average female students, students with above average intelligence are found to be more flexible.

6) Female students with average intelligence are found to be more flexible than below average intelligence female students.

7) Male students with above average, average and below average intelligence do not differ significantly from one another on *originality* factor.

8) Female students with above average, average and below average intelligence do not differ significantly from one another on *originality* factor.

9) Male students with above average, average and below average intelligence do not differ significantly from one another on inquisitive factor.

10) As compared to average and below average female students, students with above average intelligence are found to be more inquisitive.
Female students with average intelligence are found to be more inquisitive than below average intelligence female students.

As compared to average and below average male students, students with above average intelligence are found to be more scientifically creative.

Male students with average intelligence are found to be more scientifically creative than below average intelligence male students.

Female students with above average, average and below average intelligence do not differ significantly from one another on overall scientific creativity.

### 5.2.5 Study the Scientific Creativity of male and female students of XI grade with different levels of Personality.

1) Male students belonging to above average, average and below average group on personality factor A, C, F, G, H, I, L, N, O, Q₁ and Q₂ do not differ from one another in *fluency* factor of scientific creativity.

2) Male students belonging to above average and average groups on personality factor ‘Less Intelligent vs. More Intelligent’, ‘Humble vs. Assertive’, ‘Practical vs. Imaginative’ and ‘Relaxed vs. Tense’ do not differ from one another on *fluency* factor of scientific creativity.

3) Male students belonging to above average and average groups on personality factor ‘Undisciplined Self Conflict vs. Controlled’ differ significantly from one another on *fluency* factor of scientific creativity.

4) Male students belonging to above average and below average groups on personality factor ‘Less Intelligent vs. More Intelligent’, ‘Humble vs. Assertive’, ‘Practical vs. Imaginative’ and ‘Relaxed vs. Tense’ differ significantly from one another on *fluency* factor of scientific creativity.

5) Male students belonging to above average and below average groups on personality factor ‘Undisciplined Self Conflict vs. Controlled’ do not differ significantly from one another on *fluency* factor of scientific creativity.

6) Male students belonging to average and below average groups on
personality factor ‘Less Intelligent vs. More Intelligent’, ‘Humble vs. Assertive’ and ‘Practical vs. Imaginative’ do not differ from one another on fluency factor of scientific creativity.

7) Male students belonging to average and below average groups on personality factor ‘Undisciplined Self Conflict vs. Controlled’ and ‘Relaxed vs. Tense’ differ significantly from one another on fluency factor of scientific creativity.

8) Female students belonging to average and below average group on personality factor B, C, E, F, G, H, I, M, N, O, Q2, Q3 and Q4 do not differ from one another in fluency factor of scientific creativity.

9) Female students belonging to average and below average groups on personality factor ‘Schizothymia vs. Cyclothymia’ do not differ from one another on fluency.

10) Female students belonging to average and below average groups on personality factor ‘Trusting vs. Suspicious’ and ‘Conservative vs. Experimenting’ differ significantly from one another on fluency factor of scientific creativity.

11) Female students belonging to average and below average groups on personality factor ‘Schizothymia vs. Cyclothymia’ and ‘Conservative vs. Experimenting’ differ significantly from one another on fluency factor of scientific creativity.

12) Female students belonging to above average and below average groups on personality factor ‘Schizothymia vs. Cyclothymia’ do not differ from one another on fluency factor of scientific creativity.

13) Female students belonging to average and below average groups on personality factor ‘Schizothymia vs. Cyclothymia’, ‘Trusting vs. Suspicious’ and ‘Conservative vs. Experimenting’ do not differ significantly from one another on fluency factor of scientific creativity.

14) Male students belonging to average and below average group on personality factor A, C, E, F, G, I, L, M, N, O, Q1, Q3 and Q4 do not differ from one another in flexibility factor of scientific creativity.

15) Male students belonging to average and below average groups on personality factor ‘Less Intelligent vs. More Intelligent’, ‘Shy vs. Unassertive’ and ‘Practical vs. Imaginative’ do not differ from one another on fluency factor of scientific creativity.
“Venturesome” and ‘Group Dependent vs. Self-Sufficient’ differ significantly from one another on flexibility factor of scientific creativity.

16) Male students belonging to average on personality factor ‘Less Intelligent vs. More Intelligent’, ‘Shy vs. Venturesome’ and ‘Group Dependent vs. Self-Sufficient’ are more flexible than male students with above average personality traits.

17) Male students belonging to above average and below average groups on personality factor ‘Shy vs. Venturesome’ and ‘Group Dependent vs. Self-Sufficient’ differ significantly from one another on flexibility factor of scientific creativity.

18) Male students belonging to above average and below average group on personality factor ‘Less Intelligent vs. More Intelligent’ do not differ from one another in flexibility factor of scientific creativity.

19) Male students belonging to average and below average groups on personality factor ‘Less Intelligent vs. More Intelligent’, ‘Shy vs. Venturesome’ and ‘Group Dependent vs. Self-Sufficient’ do not differ significantly from one another on flexibility factor of scientific creativity.

20) Female students belonging to above average, average and below average group on personality factor A, B, F, G, H, L, M, N, O, Q₂, Q₃ and Q₄ do not differ from one another in flexibility factor of scientific creativity.

21) Female students belonging to above average and average groups on personality factor ‘Affected by feelings vs. emotionally stable’, ‘Tough minded vs. Tender minded’ and ‘Conservative vs. Experimenting’ do not differ significantly from one another on flexibility factor of scientific creativity.

22) Female students belonging to above average and average groups on personality factor ‘Humble vs. Assertive’ differ significantly from one another on flexibility.

23) Female students belonging to above average personality factor-E ‘Humble vs. Assertive’ are found to be more flexible than those with average females on personality factor-E.
24) Female students belonging to above average and below average group on personality factor ‘Affected by feelings vs. emotionally stable’ and ‘Humble vs. Assertive’ do not differ from one another in flexibility factor of scientific creativity.

25) Female students belonging to above average and below average group on personality factor ‘Tough minded vs. Tender minded’ and ‘Conservative vs. Experimenting’ differ significantly from one another in flexibility factor of scientific creativity.

26) Female students belonging to below average group on personality factor ‘Tough minded vs. Tender minded’ and ‘Conservative vs. Experimenting’ are found to be more flexible than female students with above average personality factor.

27) Female students belonging to average and below average group on personality factor ‘Affected by feelings vs. emotionally stable’ differ significantly from one another in flexibility factor of scientific creativity.

28) Female students belonging to average personality factor-C ‘Affected by feelings vs. emotionally stable’ are found to be more flexible than females on below average factor-C.

29) Female students belonging to average and below average group on personality factor ‘Humble vs. Assertive’, ‘Tough minded vs. Tender minded’ and ‘Conservative vs. Experimenting’ do not differ significantly from one another in flexibility factor of scientific creativity.

30) Male students belonging to above average, average and below average group on personality factor B, E, H, I, L, M, O, Q₁, Q₃ and Q₄ do not differ from one another in originality factor of scientific creativity.

31) Male students belonging to above average and average groups on personality factor ‘Schizothymia vs. Cyclothymia’ and ‘Expeditious vs. Conscientious’ do not differ significantly from one another on originality factor of scientific creativity.

32) Male students belonging to above average and average groups on personality factor ‘Affected by feelings vs. emotionally stable’, ‘Sober vs. Happy-go-lucky’, ‘Forthright vs. Shrewd’ and ‘Group Dependent vs. Self-Sufficient’ differ significantly from one another on
originality factor of scientific creativity.

33) Male students belonging to above average groups on personality factor ‘Affected by feelings vs. emotionally stable’ are found to be more original than those students with average group of personality traits.

34) Male students belonging to average groups on personality factor ‘Sober vs. Happy-go-lucky’, ‘Forthright vs. Shrewd’ and ‘Group Dependent vs. Self-Sufficient’ are found to be more original than those students with above average personality trait.


36) Male students belonging to average groups on personality factor ‘Schizothymia vs. Cyclothymia’, ‘Affected by feelings vs. Emotionally stable’, ‘Sober vs. Happy-go-lucky’ and ‘Expedient vs. Conscientious’ are found to be more original than those students with below average personality traits.

37) Male students belonging to below average groups on personality factor ‘Forthright vs. Shrewd’ and ‘Group Dependent vs. Self-Sufficient’ are found to be more original than those male students with above average personality traits.


39) Female students belonging to above average, average and below average group on personality factor A, B, C, E, G, H, I, L, M, N, O, Q1, Q3 and Q4 do not differ from one another in originality factor of scientific creativity.

40) Female students belonging to above average and average groups on
personality factor ‘Sober vs. Happy-go-lucky’ differ significantly from one another on originality factor of scientific creativity.

41) Female students belonging to average on personality factor ‘Sober vs. Happy-go-lucky’ are found to be more original than those students with above average personality trait.

42) Female students belonging to above average and below average groups on personality factor ‘Group Dependent vs. Self-Sufficient’ differ significantly from one another on originality factor of scientific creativity.

43) Female students belonging to above average on personality ‘Group Dependent vs. Self-Sufficient’ are found to be more original than those students with average personality trait.

44) Male students belonging to above average, average and below average group on personality factor B, C, E, F, H, I, M, N, O, Q₁, Q₂, Q₃ and Q₄ do not differ from one another in inquisitiveness factor of scientific creativity.

45) Male students belonging to above average and average groups on personality factor ‘Schizothymia vs. Cyclothymia’, ‘Expedient vs. Conscientious’ and ‘Trusting vs. Suspicious’ do not differ significantly from one another on inquisitive factor of scientific creativity.

46) Male students belonging to above average and below average groups on personality factor ‘Expedient vs. Conscientious’ do not differ significantly from one another on inquisitive factor of scientific creativity.

47) Male students belonging to above average and below average groups on personality factor ‘Schizothymia vs. Cyclothymia’ and ‘Trusting vs. Suspicious’ differ significantly from one another on inquisitive factor of scientific creativity.

48) Male students belonging to below average groups on personality factor ‘Schizothymia vs. Cyclothymia’ are found to be more inquisitive than those with above average personality trait.

49) Male students belonging to above average groups on personality factor ‘Trusting vs. Suspicious’ are found to be more inquisitive than those with below average personality trait.
Male students belonging to average and below average groups on personality factor ‘Expedient vs. Conscientious’ differ significantly from one another on inquisitive factor of scientific creativity.

Male students belonging to average groups on personality factor ‘Expedient vs. Conscientious’ is found to be more inquisitive than those students with below average personality trait.

Female students belonging to above average, average and below average group on personality factor A, B, C, F, G, I, L, M, N, O, Q₂, Q₃ and Q₄ do not differ from one another in inquisitiveness factor of scientific creativity.

Female students belonging to above average and average groups on personality factor ‘Humble vs. Assertive’ and ‘Shy vs. Venturesome’ differ significantly of inquisitive factor of scientific creativity.

Female students belonging to above average groups on personality factor ‘Humble vs. Assertive’ are found to be more inquisitive than those with average personality factor-E.

Female students belonging to average groups on personality factor ‘Shy vs. Venturesome’ are found to be more inquisitive than those with above average personality factor-H.

Female students belonging to above average and below average groups on personality factor ‘Conservative vs. Experimenting’ are found to be differ significantly on personality factor-Q₁.

Female students belonging to average group on personality factor ‘Conservative vs. Experimenting’ are found to be more inquisitive than those with below average personality factor-Q₁.

Male students belonging to above average, average and below average group on personality factor C, E, F, G, H, I, L, N, O, Q₁, Q₃ and Q₄ do not differ from one another in overall scientific creativity.

Male students belonging to above average and average groups on personality factor ‘Less Intelligent vs. More Intelligent’ differ significantly from in overall scientific creativity.

Male students belonging to above average personality factor ‘Less Intelligent vs. More Intelligent’ are found to be more scientifically creative than those of students with average personality factor-B.
Male students belonging to above average and below average groups on personality factor ‘Schizothymia vs. Cyclothymia’, ‘Less Intelligent vs. More Intelligent’ and ‘Group Dependent vs. Self-Sufficient’ differs significantly from in overall scientific creativity.

Male students belonging to below average personality factor ‘Schizothymia vs. Cyclothymia’ are found to be more scientifically creative than those of students with above average personality factor-A.

Male students belonging to above average personality factor ‘Less Intelligent vs. More Intelligent’ and ‘Group Dependent vs. Self-Sufficient’ are found to be more scientifically creative than those of students with below average personality factor-A.

Male students belonging to below average personality factor ‘Practical vs. Imaginative’ are found to be more scientifically creative than those of students with average personality factor-A.

Female students belonging to above average, average and below average group on personality factor A, C, E, F, G, I, N, O, Q, Q, and Q are not differ from one another in overall scientific creativity.

Female students belonging to above average and average groups on personality factor ‘Less Intelligent vs. More Intelligent’, ‘Shy vs. Venturesome’, ‘Trusting vs. Suspicious’ differ significantly in overall scientific creativity.

Female students belonging to above average groups on personality factor ‘Less Intelligent vs. More Intelligent’ and ‘Shy vs. Venturesome’ are found to be more scientific creative than those with average group personality trait.

Female students belonging to average groups on personality factor ‘Trusting vs. Suspicious’ are found to be more scientific creative than those with above average group personality trait.

Female students belonging to below average groups on personality factor ‘Practical vs. Imaginative’ and ‘Conservative vs. Experimenting’ are found to be more scientific creative than those with above average group personality trait.
5.2.6 **Study the Scientific Creativity of male and female students of XI grade with different levels of Study Habits.**

1) Male students with above average, average and below average study habits do not differ significantly from one another on *fluency* factor of scientific creativity.

2) As compared to above average and average female students, students with above average study habits are found to be more fluent.

3) As compared to above average and below average female students, students with above average study habits are found to be more fluent.

4) Male students with above average, average and below average study habits do not differ significantly from one another on *flexibility* factor of scientific creativity.

5) Female students with above average, average and below average study habits do not differ significantly from one another on *flexibility* factor of scientific creativity.

6) Male students with above average, average and below average study habits do not differ significantly from one another on *originality* factor of scientific creativity.

7) Female students with above average, average and below average study habits do not differ significantly from one another on *originality* factor of scientific creativity.

8) Male students with above average, average and below average study habits do not differ significantly from one another on inquisitive factor of scientific creativity.

9) Female students with above average, average and below average study habits do not differ significantly from one another on inquisitive factor of scientific creativity.

10) As compared to above average and below average male students, students with above average study habits are found to be more scientifically creative.

11) As compared to above average and average female students, students with average study habits are found to be more scientifically creative.

12) As compared to average and below average female students, students with average study habits are found to be more scientifically creative.
5.2.7 To study the extent of which Intelligence, Personality and Study Habits contributes to the prediction of Scientific Creativity of students of XI grade.

1) Among male students of XI grade personality factor A, H and O i.e. ‘Schizothymia vs. Cyclothymia’, ‘Shy vs. Venturesome’ and ‘Placid vs. Apprehensive’ are found to be the best predictor of ‘fluency’ factor of scientific creativity.

2) Among female students of XI grade personality factor B, I, Q₁ and Q₂ i.e. ‘Less Intelligent vs. More Intelligent’, ‘Tough minded vs. Tender minded’, ‘Conservative vs. Experimenting’ and ‘Group Dependent vs. Self-Sufficient’ are found to be the best predictor of ‘fluency’ factor of scientific creativity.

3) Among male students of XI grade personality factor A, H and Q₂ i.e. ‘Schizothymia vs. Cyclothymia’, ‘Shy vs. Venturesome’ and ‘Group Dependent vs. Self-Sufficient’ are found to be the best predictor of ‘flexibility’ factor of scientific creativity.

4) Among female students of XI grade personality factor F, L, O and Q₃ i.e. ‘Sober vs. Happy-go-lucky’, ‘Trusting vs. Suspicious’, ‘Placid vs. Apprehensive’ and ‘Undisciplined Self Conflict vs. Controlled’ are found to be the best predictor of ‘flexibility’ factor of scientific creativity.

5) Among male students of XI grade personality factor B, C, M and Q₁ i.e. ‘Less Intelligent vs. More Intelligent’, ‘Affected by feelings vs. Emotionally stable’, ‘Practical vs. Imaginative’ and ‘Conservative vs. Experimenting’ are found to be the best predictor of ‘originality’ factor of scientific creativity.

6) Among female students of XI grade personality factor B, G and O i.e. ‘Less Intelligent vs. More Intelligent’, ‘Expedient vs. Conscientious’ and ‘Placid vs. Apprehensive’ are found to be the best predictor of ‘originality’ factor of scientific creativity.

7) Among male students of XI grade personality factor B, G and Q₃ i.e. ‘Less Intelligent vs. More Intelligent’, ‘Expedient vs. Conscientious’ and ‘Undisciplined Self Conflict vs. Controlled’ are found to be the best predictor of ‘inquisitiveness’ factor of scientific creativity.
Among female students of XI grade personality factor B, H, Q1 and Q3 i.e. ‘Less Intelligent vs. More Intelligent’, ‘Shy vs. Venturesome’, ‘Conservative vs. Experimenting’ and ‘Undisciplined Self Conflict vs. Controlled’ are found to be the best predictor of ‘inquisitiveness’ factor of scientific creativity.

Among male students of XI grade personality factor F, N and Q2 i.e. ‘Sober vs. Happy-go-lucky’, ‘Forthright vs. Shrewd’ and ‘Group Dependent vs. Self-Sufficient’ are found to be the best predictor of overall scientific creativity.

Among female students of XI grade personality factor B, L and Q1 i.e. ‘Less Intelligent vs. More Intelligent’, ‘Trusting vs. Suspicious’ and ‘Conservative vs. Experimenting’ are found to be the best predictor of overall scientific creativity.

5.2 EDUCA TIONAL IMPLICATIONS

5.2.1 Scientific Creation: A need for Educational Innovations

Scientific creation is never restricted to the limits of creating something new or usable only, it also enables its beholder to modify or to reconstruct the solution to any problem scientifically, in which important steps of sensing a problem, understanding the cause of problem and logically guessing for the most probable solution to the problem is included. This probablesolution is tested again and again in the similar or defined differential problematic situation by an expert to find in for solution of the similar problem creatively. The characteristic feature of creating any novel product or modifying the pre-existing product in such a way that it may result in to some purposive and fruitful outcome is considered as creativity, which is not the characteristic of few selected individuals but it is also a process or characteristic that is exhibited by every individual to some extent. This creative insight can be developed by nurturing specific traits which enhances creative potential of any individual. This creative insight is the essential part of survival process and creativity holds the key to stability and prosperity of the future society (Petroska, 1983). It is this creative problem solving process through which mankind have taken available energy, material and information from the environment and transformed them in specific ways to improve efficiency and effectiveness in attaining the goals (Mettal, 1977).
Similarly, for a success of any creative educational research work, it should begin with the felt problem in the field of education and after pointing the problematic situation, seeking for probable solution and testing it in different situations, it must return to that problem with an efficient and viable solution of not to that problem only but it must also be useful and can be accessible to sort out such similar problems to a large extent. This educational usability can be implied to any field of educational research also, which should emphasise to follow some basic procedure which enhances its reliability and validity when used in different educational situations. Educational implications of any scientific research findings can be considered as the most important and authentic part of any research work conducted, because by defining the exact regimes and proper procedure to follow to which, conducted research work can provide the solution to the concerning problem and also provides authenticity to the work conducted. It also provides an individual, the most appropriate and fruitful solution to any problem, in any field including the field of education too.

In summarizing the creative effect of educational implication of any scientific research, which is bounded to follow some pre-decided and particular scientific steps of scientific exploration, it is obligatory to every researchers to provide a complete detailed account of all his creative experience and thinking involved, in experiencing the need to the conduct the concerning creation, irrespective to the fields in which the most probable solution to the defined problem was hunched at, methodology included in conduction of research, proper and appropriate justification of tools and statistical techniques involved in the scientific creation, the proper and objective focussed findings of research conducted and also defining the area of problems to which it concerns and can be used again with maximum efficiency. In a research methodology report titled, ‘Understanding Educational Research’ by Van Dalen (1973), researcher aptly and precisely explained that the format and the development of a research should not be limited to concern field only for solving the existing problem but, it should also provide preliminary know-how to proceed for future research and also as a wayout to solve out such similar or advance problem in any concerning field with less effort and time yet with more effectiveness, taking the reference of the research conducted.

As stated before, the aim of this study was to determine the interrelation in
between overall scientific creativity and its various factors viz. fluency, flexibility, originality and inquisitiveness, among adolescence students in relation with some of their primary psychological variables like Intelligence, Personality, Study Habits and their relational differentiation noticed on their gender basis by applying valid and reliable psychological tools. Results to the overall finding of research infers that the primary personality characters like intelligence and personality are very much correlated to different factors of scientific creativity independently, development of which helps an individual to ensure any task completion or problem sorting in any stages of life. Study on the scientific creativity regarding determination of various factors of scientific creativity of adolescence students of XI grade on the basis of their varied personality traits, accepted that overall creativity is an important aspect of scientific skills and logical thinking which equally effects other psychological determinants with a clear interrelation and can ensure not only better academic achievements of students but also develops a capability to deal with any problematic situation of life, creatively.

When the concept of primary variables like scientific creativity, intelligence, personality and study habits are considered for research it is firmly accepted among various problems, that the most important problem of students is their incapability to solve problems creatively which they face in their daily life. Psychologists and educational researchers always have a keen interest to work in the concerning field and gives an array of factors associated or solutions which can deal with all problematic situations including, low-achievement of students. Researcher with the review of the literature has revealed considerable divergences of opinion, to find out interrelations in between various psychological variables to develop to search for creative insight of solution finding following the scientific procedure which may provide more efficient and wide spreaded solutions to number of problem which can be sorted out by the development of a single effecting psychological variable. Researcher has observed the development of scientific creativity as a closely associated psychological variable which can be enhanced with the development of related psychological variables which are equally essential to deal any problematic situation of life including, better achievement in academics too. In the same way investigator has tried out to figure some of the most important educational implications along with the development of various other aspects related to life, like
problem solving, hypothesis formulation, experiment planning, logical thinking and technical innovation which requires a specific type of creativity, peculiar to science.

The importance of research is evaluated on the aspect of its usability, its exactness in solving the concerning problem or the similar problems related to research done and on its reliability to produce solution or to solve the similar problematic situation with its maximum perfection. More the areas to which the research findings are able to fulfil the mentioned operations are considered to be more fruitful. The most important and behavioural aspect to which any educational research can solve the purpose is developing the firm knowledge of research problem to which it deals and enable its concerning people to use the findings and suggestions of the research as per their need. The most preliminary challenge included in dealing with the students or individuals gifted with high creativity is to identify the child or adolescent with high creative potential. Specific levels of personality traits like fluency, flexibility, originality and inquisitiveness are found essentials to develop creative potential as well as to identify a creative student in normal classroom situations.

The research also attempts to classify basic difference in types of creativity briefly but in practical situations difference between creative student and an over-active problematic child is hard to differentiate. On a whole, a scientifically creative individual can be characterised by a person possessing the specific qualities like longitudinal or fluency in idea production, a wide aspect of imposing or producing flexible solution to a problem, uniqueness in idea which may results in to the production of novel or much efficient solution to a problem faced and the level of inquisitive nature, which a child possess which acts as a raw material for scientific creation. Finding of the study reveals that, adolescences possessing high creative character are generally found to be more emotionally stable, assertive, dominant, self-assured having high self concept, control, venturesome, self-sufficient and relaxed than their normal counterparts, which demands to be treated according to their uniqueness of their personality traits they possess. The research findings derived in this research explaining the basic meaning, nature, significance, identification and specific treatment which should be provided to creative adolescences to enhance their creative potential along with their academic achievement on various fields of life can
be summarised under the following heads, which are very much responsible for developing or hindering the creative talent which an individual possess which is initiated in the preliminary stage of their adolescence. Research implications are classified under the headings of:

- Research implications in education.
- Research implications for parents.
- Research implications for educational administrative authorities.
- Research implications for teachers.
- Implications for guidance and counselling.

5.2.2 Research Implications in Education

This study has brought into some light on some of the important factors which are considered to be important in not only keeping pace with changing situations of life of an individual but also provides a significant help to adolescence to cope with the most stressful and unstable time of any individual’s life. These factors of scientific creativity, intelligence, personality and study habits no doubt, can be considered as the most important psychological factors which are not only responsible for achieving equilibrium in anyone’s life but also helps any individual in perceiving and developing the behavioural meaning of education which helps them in their future life also. Their intercorrelation and differentiation with factors like, fluency, flexibility, originality and inquisitiveness provides a firm knowledge to develop scientific instinct of creation in any individual which is equally important in the field of education also.

Scientific creativity is the base which provides or tends to develop environmental conditions, needs and goals which are of paramount importance in creating something innovative and purposeful in any field of life, where a creative individual acts as a mediator between externally defined needs and goals (Mackinnon, 1963). The most important aspect of scientific creativity is that it develops or nurture insight which helps the matrices of thoughts and creates a much effective and relevant idea in a specific field to fulfil any goal. The finding of the study reveals that upto a very large extent various intercorrelations in between scientific creativity-intelligence, scientific creativity-personality and scientific creativity-study habits exhibits a defined behavioural pattern which also ensures
fulfilment of academic needs of students along with the overall development of their personality.

In first correlational analysis in between various factors of scientific creativity and intelligence of male and female students, factors like flexibility, originality and overall scientific creativity were found to have significant correlation with intelligence of male and female students. It indicated that these variables somewhere plays a significant role in development of scientific creativity in both male and females students which ultimately leads to better intelligence. These finding provides support for the preliminary studies conducted by Barron (1961); Getzel and Jackson(1962); Ripple and May(1962) etc which concluded that creativity is a normal possession generally found in students with normal intelligence irrespective of their gender differentiation. Findings of the study are also found partially supported on different factors, by the studies done by De Fruyt and Mervielde (1996); Lievens, B Coetsier, De Fruyt and De Maeseneer (2002); Rubinstein(2005); Deary, Strand, Smith and Fernandes(2007); Flores-Mendoza, Jardim, Abad and Rodrigues (2010); Flores-Mendoza, Widaman, Mansur-Alves et-al.(2013); Kaufman, Pumacahua and Holt (2013); Jauk, Benedek, and Neubauer(2014); Pozzebon, Ashton and Visser(2014) etc.

Similarly correlational analysis of scientific creativity and personality aspect of male and female students on various factors of scientific creativity, indicates that the personality Factor B, Less Intelligent vs. More Intelligent; Factor H, Shy vs. Venturesome; Factor M, Practical vs. Imaginative; Factor L, Trusting vs. Suspicious and Factor Q₁, Conservative vs. Experimenting are generally found to be significantly correlated in male and female students, which implies that for development of intellectual ability in male and female students, specific personality traits like general intelligence, firm belief and determination to test and adopt new tools and techniques, fluent and flexible mind set to seek solution to any problem or new invention etc plays a significant role. These finding provides partial support to the findings of Pearce(1968), Taylor and Barron(1963), Scheier(1965); Drevdahl(1954); Trapmann, Hell, Hirn and Schuler(2007); Richardson and Abraham(2009); Richardson, Abraham and Bond(2012); Julie et-al(2014)etc. where factors to create or innovate were found to possess a correlational significance with
some specified factors of personality traits exhibited by students.

The research findings concludes with the results in having strong inter-correlational significance in between overall scientific creativity and study habits of male and female students. Most of the students belonging to different academic categories indicated strong or significant relationship in between study habits and overall scientific creativity of both male and female students. Some of the creativity factors like, fluency and flexibility are found to be significantly correlated with study habits of male and female students respectively. It can be inferred that overall scientific creativity and study habits are significantly correlated as a whole and can result into significant achievement of students at any level of their academic performance, thus significant programmes should be planned and executed to develop the effective and appropriate study habits in the students. This part of study provides support to studies conducted by Apps (1982); Rooney and Lipume (1992) and Reed (1996). The research findings also find partial contradiction to conclusions with the study conducted by Mirza and Malik(2000). Overall significance of study habits was finded which were having positive correlation with scientific creativity and various personality traits including study habits of students provides support to the studies conducted by Charkins, O'Toole and Wetzel(1985); A.W.Carns and M.R.Carns(1991); Dunn, Griggs, Olson, Beasley and Gorman(1995); Lovelace (2005); Bostrom and Lassen(2006); Dunn et al.(2009) etc.

The differential analysis in between scientific creativity and intelligence of males and female students in relation to their different categories of intelligence indicates a significant relationship in high achievers and below average achievers in male students on the factors of fluency and overall scientific creativity whereas for female students it was found significant for the female scoring above average in their academics on the flexibility and inquisitive factors of scientific creativity. It can be inferred that the intercorrelational pattern between scientific creativity and intelligence in students of various categories of intelligence, is found to be primarily affected by specific scientific factors of fluency, flexibility and inquisitiveness. It can also be inferred that the differential correlational relationship in between various factors of scientific creativity and intelligence of male and female students is not very much affected if various subclasses of intelligence and gender is taken collectively.
Thus on the whole, special treatment or additional care should be provided to students with high intellect and below average scoring students irrespective of their gender differences, which preliminary demands for their in-time identification so that the proper and needed treatment can be provided to these students.

Similarly in the differential analysis of various factors of scientific creativity and personality specific factors like Factor B, Less Intelligent vs. More Intelligent; Factor M, Practical vs. Imaginative; Factor H, Shy vs. Venturesome and Factor Q$_2$, Group Dependent vs. Self-Sufficient these are found to be differentiating for above scorers and below scorers male students on different factors of scientific creativity, whereas for female students on various factors of scientific creativity personality Factor A, Schizothymia vs. Cyclothymia; Factor L, Trusting vs. Suspicious; Factor Q$_1$, Conservative vs. Experimenting and Factor Q$_4$, Relaxed vs. Tense are found to be having significant differential personality effects. Overall it can be inferred that primarily Factor A, Schizothymia vs. Cyclothymia; Factor B, Less Intelligent vs. More Intelligent; Factor M, Practical vs. Imaginative and Factor Q$_1$, Conservative vs. Experimenting acts as the differentiating factors for development of creative trait in personality development of both male and female students. Study done by Cross et-al(1967) is partially supported by the research finding which concluded that artists/individual generally differ on twelve out of fifteen factors of 16PF (intelligence excluded), particularly on artistic or bohemian tendency and Hysteric Unconcern(Factor-M). Similar finding were also finded in studies done by Barron and Taylor(1963), White(1968), Jha(1972) etc. It implies that specific personality traits like intelligence, emotional stability, dominance, experimental tendencies, paranoid projections, self-sufficiency etc should be encouraged significantly by the educational programme to inculcate creative tendencies in students. Similar finding were found for the study habits tendency of male and female students, on various factors of scientific creativity, male students were found significantly correlated with overall scientific creativity whereas, female students were found to be significantly correlated with fluency and overall scientific creativity of female students.

Prediction of different factors of scientific creativity viz. fluency, originality and overall scientific creativity are significantly correlated with personality Factor A, Schizothymia vs. Cyclothymia; Factor B, Less Intelligent vs. More Intelligent;
**Factor H**, Shy vs. Venturesome; **Factor M**, Practical vs. Imaginative and **Factor Q<sub>2</sub>**, Group Dependent vs. Self-Sufficient in male students whereas for female students factors of flexibility, originality and inquisitiveness can be predicted primarily by personality **Factor B**, Less Intelligent vs. More Intelligent; **Factor O**, Placid vs. Apprehensive; **Factor Q<sub>1</sub>**, Conservative vs. Experimenting and **Factor Q<sub>2</sub>**, Group Dependent vs. Self-Sufficient significantly. Overall it can be inferred that on the defined norms and variables the educational needs are very much similar on various aspects and thus, education should be such that it should motivate students to inculcate the creative potential in them, which is itself capable of providing solution to every problem which an individual faces in educational as well as in their daily life. Specific character traits like fluency, originality and overall scientific creativity are found similarly correlated to male and female students’ intelligence and personality traits which suggests the development of educational objectives and procedure in such a way that it may enhance the primary personality character of students along with the development of life skills impartially on the criteria of gender discrimination.

### 5.2.3 Implications for Parents

Home is considered as the first school of any individual. The climate of home and interaction which adolescence find in their home, created by their parents and other family members, plays an important role in not only determining the academic achievement of students, but also decides the extent to which other essential psychological qualities will be developed in them as their individualistic traits. Scientific Creativity is also no exception, which is affected by and affects equally the child-parent relationship on an equal note. Better home environment and parental relationship acts as a firm base on which other basic psychological qualities like intelligence, personality, attitude, logical reasoning, understanding etc develops. When child moves from home to a whole new environment of school as its first outing experience of life, educational experiences which a student gets from their home acts as foundation of his formal educational achievement which it is going to achieve throughout his entire life.

The justification theory involved behind finding such special and unique qualities in scientifically creative childrens are not that easy to imbibe and moreover the special treatment they demand to nurture and channelize their creative talent on
the path where they affect not only themselves but also put in some contribution for the betterment of society, also demands to some creativity favourable conditions to them. Researches indicates that parental contribution may result to snuffs out the twin candle of curiosity and creativity present in childrens (Rogers, 1969) or may results to limit the intervening conditions that stimulates or suppresses differential abilities of child (Bing, 1963) or may result into failure of complete educative process (Rejai, 1979). The finding of the study revealed that there exist a strong positive effect of multi dimensions of scientific creativity like flexibility, fluency, originality, inquisitiveness and many others on development the psychological factors like intelligence, personality and study habits which not only helps them to achieving high in their academics but also enables them to deal up with any changing situations of life. Research inferences indicates that the factor of developing high creativity need not need some special setup or any unique requirement which is hard to achieve in daily lives of any individual, but they do require in-time identification, assessment of creative potential, specialized treatment to nurture creative potential, develop and follow up procedure of certain specific traits and insights which can be considered as an essential requisite for the development of scientific creativity in childrens especially, adolescence, which withstands with them throughout their whole life.

Overall on the larger extent, most of the interactive analysis in between creativity factors of male and female students with various psychological variables mentioned in the study, indicates that there is a strong similarity in the developmental pattern of these psychological variables in males and female students and similarly very less or negligible interactional difference is found in analysis of combine effect of these psychological variables with gender of the students. It favours and suggests patents to provide equivalent and needed behavioural and environmental support to their ward irrespective of their gender discrimination. Maximum needed support and affection should be provided to adolescence by their parents and other family members, so that their childrens should be able to realize their potential, area of interest and efficiency in which they can work with their full interest and efforts. Findings of the study also enables parents to act according to Gamble’s advice, which suggests to enhance parental efforts to develop positive characteristics of classroom situation in home so that the much needed contribution to develop scientific creativity in adolescence can be ensured and initiated from homes. Elaborating the law, positive
and supportive atmosphere should always be provided to childrens, particularly by their nearby persons, so that they may develop their psychological capabilities to its maximum extent.

5.2.4 Implications for Educational Administrative Authorities

Scientific Creativity is a precious attribute of thoughts and deeds, which can be circumscribed through academic prejudice. Sir Richard Livingstone (1944) stated that frequent teaching generally confuses means and end. The inappropriate and unrealistic determination of educational objectives may ruin each and every plan of its execution, no matter how efficiently it has been designed to achieve on practical aspect. Each and every subject is important as it provides nourishment to the human being in one way or another, but they are destitute in the absence of proper administrative application even in educational field also. Keeping in mind, the most preliminary and essential need of providing appropriate administrative support in the most initial stage of any educational plan, it is very essential to develop a educational plan which suit the need and nature of the targeted individuals, here adolescence. It is essential to frame appropriate aims, curriculum, methods of teaching, promotion and rewards or supplementary treatment which would be provided to the adolescence, as per their need. Educational administrative authorities should take care of educational aims and objectives which are to be achieved following specified educational procedure, which may get differentiated according to the needs of creatives or less-creative adolescence students.

The finding of the study indicates although the gender differentiation is very low on the variables taken in the study and their interactions on various aspects, signifies that the educational needs and personal traits exhibited by creative and less-creative students are quite different and thus the educational policy should be such that it either encourages efforts in creative students to be more creative or motivate low-creators to enhance their creative potentials to create something new and purposeful, but not on the cost of mismanagement or suppression of other child’s creativity. Findings of the study also indicates that on specified variables like fluency, flexibility, originality and inquisitiveness the creative students can be differentiated from the less creative ones, on the basis of which the needed study plan, motivation and treatment should be provided to students. Educational authorities should frame
educational policy with the provision of differential promotion, provision of special classes and schools, curriculum enriched with diversified and thought provoking activities or may include sub-grouping within the class to provide individualised instructions as per need.

Creative talent of adolescence is generally expressed in various forms according to the individualistic differences they possess and thus they need specific or individualistic treatment of planning, forecasting, decision making and communicating which should be pre-decided and particular to specified trait possessing adolescents. Educational administrators should develop and frame educational policies keeping in mind the need of these special childrens. More self-conducting, operational and individualistic instructional techniques like, heuristic approach, problem solving and project method of scientific enquiry should be included in curriculum which can help in nurturing scientific talent of adolescence students. Research findings also supports to the recommendations of White house conference (1970) on childrens, which stated that opportunities should be made available to every child keeping in mind their ability to learn creatively, to grow creatively and to live creatively. This prime objective which should be in mind of educational authorities should be such that it may be achieved in real. Educational programmes should be specifically emphasised on the problems faced by creative and less-creative students based on authentic research works and to focus on the development of the specific talents desired which should also include, deciding roles and treatment provided to targeted adolescences on basis of their creativity, expressions, development and importance of creative outcomes which they produce, with and without special training provided to them.

Research findings may also be helpful to higher educational authorities particularly for principals, supervisors and administrators who are directly involved in designing the educational plan and for its implication to attain desired educational objectives. Research findings diverts the focus of administrative authorities to the most basic problem of actual condition, which highlights the great differentiation in designing and implementation of educational objectives on ground level. Gender discrimination and unrealistic educational objectives are turned out to be the prime cause for which educational policies are unable to attain, for what they are designed
for. Differential analysis of basic psychological traits and their gender based inferences indicates more or less similar developmental pattern of personality traits in male and female students in their adolescence stage, where the discrimination on various aspects affects every child to its maximum extent and decides the fate of their life. Research findings suggest educational authorities to develop the practical working plan keeping in mind the actual educational situation for where it is been designed for. It should also be capable in discriminating creative and less-creative students and must include appropriate working plan or remedial programme to develop creative efficiencies of the needed students, such that they may create their own path to ensure their better achievement in academics as well as be beneficial to society also.

5.2.5 Implications for Teachers

Scientific creativity is the process in which emergence of any scientific action is included resulting in to a novel relational product, which on one handed enhances individualized growth of any person and on another hand it includes materials, events, people or scientific circumstances which expands scientific know-how of any process or phenomenon. Scientific creativity includes a proper scientific procedure to follow which aim to create, develop or to fulfil any open ended task of life provided to adolescence on the basis of their own experience and perception. Each adolescent has an opportunity to experience some degree of success, which can help them to enhance it by following a specific scientific procedure and also provides a great challenge even to the most gifted adolescent to explore the new dimensions of a much efficient and useful world. Scientific creativity thus requires a proper and expert guidance and supervision following to which the basic fundamentals of science can be preserved along with creation of something new and meaningful. This role to introduce the unknown student to the basic concept and procedure of science is performed by teacher who firstly introduce and opens the door of awareness to students which leads an individual to inculcate and adopt any constructive approach.

The role of teacher is very important as they introduces their children to any experience which they are not aware of and the procedure adopted may motivate or demotivate their interest in that topic or concept. It is also an important condition to construct something creatively as the basic knowledge is provided at this stage which
is flourished by the thinking process or manner to conduct any operation which is reflected in their achievement also. Lowenfeld and Brittain (1970) emphasised on the importance of well balanced educational system and tend to develop an educational system where every individual thinking, feeling and perceiving is equally developed in order to unfold their creative abilities by the educators, as an aim to develop a balanced being in all aspect. Finding of the research revealed that some of the primary psychological variables which plays a significant role in achieving prime objective of achieving and enhancing creative potential of students also should be taken in care off, so that it may be further helpful in maintaining equilibrium with the changing situations of life by overcoming the adverse circumstances creatively. A scientifically creative individual is not only capable of maintaining pace with the changing situations of life and benefiting not only to themselves but also their nearby peoplesprimarily by lowering the practices of delinquency, mental illness, mental disequilibrium or unrealized potentiality in the individual, which can be facilitated with the enhancing the creative qualities like inquisitive nature, fluency of thoughts, flexibility in implications which helps a student to develop scientific potential to create something novel and purposive from them. Explaining the importance of creativity in the field of education, Torrance (1977) has described importance of various aspects of creative testing which are helpful to teachers in assessment and in developing various desired educational characteristics in adolescents and are useful to them achieve good in academics andalso in their normal life. In his study, ‘Uses of creative testing in education’ he pointed out:

1. Creativity is important for obtaining a more complex understanding of human mind, personality and their functioning.
2. Creativity acts as a possible basis for individualizing instructions for adolescence students.
3. Creativity acts as a part of the process of guiding mental growth as an indicator of status and as a source of clues for remedial or psychotherapeutic program.
4. Creativity can be a mean of assessing the differential effects of various kinds of experimental program, new curricular arrangements of materials, organizational arrangements, teaching procedures and such other program.
5. Creativity can act as an indicator of growth potential and future guidance needs.

A creative assortment conducted by teacher may help him to identify creative student and also enables them to motivate their creative endeavour which can help them to identify their potential and work accordingly to justify their importance. Scientific creativity generally demands a firm knowledge of scientific procedure and phenomenon which can be provided by teachers and can be manipulated to a certain extent which can lead to create something novel and purposeful adopting scientific procedure under their supervision. This firm knowledge of scientific procedure and phenomenon can be provided by science teachers in the educational campus, thus on a major part science teachers particularly should work in to provide better scientific environment, knowledge and its practical implication so that the actual creative potential of students can be brought in practice, scientifically.

The finding of the present study also suggests teachers to discriminate students on a much diversified norm of academic achievement for constructive development of psychological qualities in them. In most of the cases the developmental pattern of developing psychological traits in the respective groups of their academics is found to be much similar and free from gender biasness, still the differences found in these psychological traits were very much reported as a result of specified interactional pattern in between gender and trait analysis of the members of that group respectively. Thus the most preliminary and important step by which a teacher can start the development of creativity in students is identification of students having creative potentials in them and to encourage them to develop their creative talent in right direction. Generally special training and techniques should also be provided to teachers also so that they may discriminate in between overactive problematic child or less active child from the creative child, so that proper and appropriate treatment can be provided to the needed students without suppressing their creative potential which enables them to solve every problem of life.

5.2.6 Implications for Guidance and Counselling

The findings of this study may be useful for guidance and counselling also particularly for the people engaged in seeking solution to the problems related to
adolescent students, academically and extra-academically. The study indicates many
direct or indirectly related variables which are responsible for the better performance
of students in their academics which also plays a significant role in setting up their
equilibrium with the adverse condition of life. Counsellors can teach and guide
essential activities which should be practised by students as well as teachers dealing
with the students to develop creative potential in the most sensitive period of their life
i.e. adolescence stage. Counsellor’s intervention at this stage is very important as they
can introduce and help the teachers and students to design and to follow the most
appropriate interventional educational programme to enhance creativity and also
introduce them to the basic know-how to prevent from the general flaws which occurs
during their implementation.

The psychological traits and behavioural aspect of creative adolescent students
are generally misinterpreted as a problematic child in the normal classroom conditions
and teachers normally don’t know how to deal with the natural curiosity and abnormal
behavioural response exhibited by a creative adolescent student and unknowingly
suppresses the hidden potential to create something useful from them. The normal
guidance, training and proper practice to deal with creative childrens, to enhance their
creative potential and treatment provided to the less-creative childrens can also help to
inculcate their potential to create something novel and purposeful according to the
situational demand. Study suggests that proper knowledge and guidance should be
provided by the experts to the needed childrens, parents and teachers as per their need
to develop purposeful creativity in them. Although, special methodology, courses and
research findings related to creative thinking and its development have proved to be
beneficial to whole educational system as well as to an individual also which can only
be provided under the expert and efficient supervision of the counsellor which helps
in to develop and enhance their ability to find or to create answers to all questions of
life.

There is an abundant opportunity to teach, any subject or phenomenon of life
in number of ways that can result into development of successive personality traits
which demands for more efficient productive thinking rather than following the same
traditional, non-creative, less-productive method of rote memorization. The basic
phenomenon involved in research conducted, methodology involved, tabular
representation of findings and detailed interpretation along with their possible cause, can provide interested individual to develop insight which enforces them to develop the ability to identify the hidden cause or talent of any phenomenon and also to think creatively for the more efficient and productive solution to any problem, if guided by an expert at their preliminary stage. Unfortunately, education process and methodology adopted in present time is been more dominated by learning theory based upon the stimulus-response model of Thondike, Hull or Skinner, where individuals are treated as rats, pigeon or any other such animal who restrict themselves to provide specific response to any specific stimulus, which involves minimum use of their psychological qualities which any individual possesses. In mean time, it is becoming a necessity to make more and more use of the most important gift granted to humans-the intellectual abilities, which includes enormous possibilities to create the appropriate and desired world in which they dreamt to excel.

5.3 SUGGESTIONS FOR FURTHER STUDIES

Researches conducted to study the humanistic nature, setting or exploring factors which affect human behaviour and vice-versa, always include a chance of exploring something new and more relevant from the point where the previous research is concluded. Present study is also a step to reveal a small section of human caliber which tries to explore all the consideration specified in the study. Still enormous possibilities for similar or advanced researches are there which can be conducted to reveal other essential findings to improve students’ creative achievement, which is very important to both, students as well as for teacher. Some of the related studies that can be conducted can be summarised as below.

- Study can be conducted on the large sample and focusing more on the intervening variables which plays an important role in development of scientific creativity along with other psychological traits in students and determines not only their psychological development but also their academic achievement which also enhances their capability to deal with the changing situations of life more effectively.

- The sample also assumes constant differentiation found in the students on the basis of cultural, environmental and economical background of the adolescence students, which can be considered as major
differentiating criteria to study in upcoming studies.

- There is a possibility in the students with differential scientific creativity and other psychological aspect of all cognitive, affective and psychological traits, that they may be influenced by the perception they get in their academic institutions on basis of different factors, like medium of instruction, model of teaching, administrative set-up of institution, individual supervision to students, extracurricular activities in their curriculum and follow up programme practiced in institution. Many similar factors can be considered in upcoming researches which affects students on various aspects.

- Education always enables an individual to develop a sense of changes occurring in environment and providing them with knowledge to reduce it to their lowest possible harmful condition so that the individual may adjust with the changing environment effectively and in this objective, each and every adaptation technique plays a significant role in determining the mode of adaptation which students adopt to cope up with changing situations. These adaptation techniques like particular and identified perception to the changing situations, counter aggressiveness, clowning, apparently ignoring criticism, apathetic aptitude, inconsistency performance, feeling the need and filling the gaps of knowledge, individualistic performance orientation, silence, dominant behaviour etc. also helps equivalently along with the other psychological aspect of individual. The fields like effect of adaptation techniques on individual, efficiency of adaptation technique, selection of appropriate adaptation procedure along with other psychological variables are some areas which can be considered for research in further studies.

**Design of the study** - Few suggestions can also be taken into considerations for further studies regarding methodology of research, population selected and statistical techniques adopted to conduct research which can be summarized as follow:
Method: In the present study, ‘Normative survey method’ has been used to collect extent of scientific creativity found in the adolescent students of XI grade with the help of standardized scientific creativity test. Following suggestions can be implemented in further researches:

1) Personal interview method could be used for collecting the data to evaluate scientific creativity of sample more accurately.
2) Detailed observational method could also be helpful to assess accurate scientific creativity of students.
3) Sociometric techniques or rating methods, involving peer group members of students can also be used to estimate scientific creativity of students considered as sample of the study.

Population of study: In the present study, researcher has selected secondary school students of XI grade enrolled in Uttar Pradesh board having science (PCB) stream. Suggestions regarding concerning area are as follows:

1) Further studies can be made considering all the students of a much evolved group viz. XI grade, graduate or post-graduate level.
2) Students of various other boards viz, CBSE board, ICSE board, regional boards etc can also be included in further studies.
3) Sample classification in between students of X grade and XII grade board appearing students can also be made to study differential interrelation of various psychological variables in board appearing students.

Statistical techniques: In the present study researcher has adopted,

- One way analysis to compare scientific creativity of XI grade students in relation to different variables mentioned in the study.
- Categorised in-group analysis can be done by using, two way analysis, and
- To estimate predictive value of the dependent variable with other independent variables other predictive techniques like Aitkin’s method, Doolittle Method etc can be used.
Further researchers may use other statistical techniques, like t-test, partial correlation, chi-square, ANOCOVA etc, as per need and design of their study.

- Studies in the field of psychological achievement are majorly conducted by detecting interrelations in between cognitive variables only. Detailed psychological studies shows that there exists combined effect of cognitive, affective, familial and even psychomotor variables in which studied conducted are very few. Much more comparative and predictive studies can be conducted on this criteria.

- A major number of studies found on psychological development are been conducted in relation to general intelligence and general creativity only. Studies in specified science stream including related variable like scientific creativity, scientific attitude, scientific approach and other specified related factors are still very rare and can be considered for further research.

- Many studies assume Scientific Creativity or Intelligence as a two distinct dichotomised variables based on certain assumptions, mainly the mean differentiation. Both of these criteria seems to be irrelevant and less effective when psychologically related variables like personality, learning conditions, learning styles, motivational support by parents, friends etc can also be taken into consideration. More detailed and statistically proven studies can be conducted to setup or to explore the interrelation or interdependence in between the psychological variables of these kinds.

- Similar perceptions are founded in the studies with school-environment as a variable. Factors like academic setup, classroom strength, student’s ratio, preliminary academic facilities etc are only considered as to be the school-environment in the studies. Factors like interaction in between student-student, student-teacher etc along with other important factors like medium of instruction, teaching method, academic set-up, child care, follow up programme for both academically low as well as academically high students separately are negligibly considered in researches, which can be considered in further studies.
Scientific creativity is generally considered on the components like fluency, flexibility and originality only although it is equally dependent on the other factors like novelty, inquisitiveness, elaboration etc which are least considered in the evaluation test to predict scientific creativity. These variables should also be considered to study the more effective use and appropriate estimation of scientific creativity which can explore various realms of creativity not only in the field of science but, in each and every field of life also.

The detailed and tedious review of all the research related literature and the concern scope of research conducted by researcher concludes with some specified intercorrelational conclusion, their differential nature in some concerns and predictive assumptions of variables included in study. Some of the finding of the study shows a significant relationship between the selected variables whereas some indicates insignificant relationship in between them. The review of related studies provides supporting evidences for the present study by revealing the results of those works. Simultaneously, the drawbacks and missing elements found by the researcher encourages to conduct more specific, more determined, more detailed and more advanced study in the concerning field, to draw a conclusion which is more applied, objective and effective in evaluating, imparting and inculcating the primary psychological characteristics of students like creativity, intelligence, personality, logics, reasoning aptitude etc which also determines achievement of any student not only in their academics, but also in the achievement of their whole life.