CHAPTER VIII

CREATIVITY IS NOT A RARE COMMODITY. EVERYONE HAS
CREATIVE ABILITY TO SOME DEGREE. IN YOUR OWN WORK, YOU ARE
PROBABLY MAKING CREATIVE CONTRIBUTIONS REGULARLY. BUT LIKE
MANY CREATIVE PEOPLE, YOU MAY BE CREATING INTUITIVELY—WITHOUT
A KNOWLEDGE OF THE CREATIVE PROCESS.

- Value Engineering Dept. of Lockheed

- Georgia

CONTENTS

8.1 Programme Development
8.2 During the Programme Implementation
8.3 Findings of the Study
8.4 Educational Implications
8.5 Suggestions for Further Research
Complete picture of this investigation has been reviewed in this chapter. At the same time the results obtained during the study and deserving comments regarding further research also have been summed up here. The chapter will have the following captions.

8.1 Programme Development
8.2 During the Programme Implementation
8.3 Findings of the Study
8.4 Educational Implications
8.5 Suggestions for Further Research

8.1 Programme Development

This research was based upon the development of a training programme of the mental ability named creativity. So it would be useful to recall the concept and development of creativity.

"A fact is discovered and a theory is invented but only a masterpiece is created, for creation must engage the whole mind". ¹

These words of Bronoski give the gist of creativity in brief. It tries to prove the importance of training the whole mind, i.e. impact of education on creativity development in other words. For the training some programmes should be made available.

In order to meet the above requirement of preparing such training programme, three types of programmes viz., Multi Response Programme, Hidden Shapes Programme and Make Up Problems Programme were selected. The training programme was prepared in Mathematics and it was meant for the class-room teaching. It was the main reason to reject any other programmes that would be applicable individually.

Particular types of students were selected as a sample for the study, because psychologists like J.P. Guilford and E.P. Torrance have vociferously declared that minimum 110 IQ is required for the creativity development. The experimenter selected the sample in strict accordance with this view among other criteria just to develop a suitable training programme. The sample was, therefore, the purposive sample. Important characteristics regarding the sample are listed below.

1. The sample was selected from the urban area.
2. A school complex having three minimum divisions at each grade was preferred.
3. The students of the sample were selected from the upper socio-economic level.

4. The students having general IQ more than 110 were selected.

For the IQ level, past records and their educational reports from the school were considered as a basis.

Keeping all the above points in mind, the training programme was developed and implemented as discussed below.

8.2 During the Programme Implementation

Appropriate sample is most essential for better administration of any type of educational work. In the field of divergent thinking training also the sample plays a very important role, as the success depends entirely on responses of the students. So the identical purposive sample for the implementation of the programme was selected.

Teacher - the second important factor is also considered, as the 'teacher effect' is very high on the creativity development. The teacher is the same here throughout the training period of six weeks. Moreover necessary instructions along with proper class room climate were imparted to the students. Some points out of 20 essential points as listed
in the second chapter, caption 2.7 were taken into consideration for creative classroom climate. They are as under:

1. Be on the alert for new ideas and encourage the pupils to develop all their creative talents.
2. Make children more sensitive to environmental stimuli.
3. Develop tolerance of new ideas.
4. Develop creative classroom atmosphere a free, relaxed and unhurried one.
5. Teach the child to value his creative thinking. Encourage the students to note their ideas in concrete form whenever possible, perhaps in special note book set aside for that purpose.
7. Develop constructive criticism—not just criticism.
8. Encourage the acquisition of knowledge in a variety of fields.

Such a healthy and creative atmosphere encouraged the students to think in various dimensions of life. Consequently they gave numerous and varied responses.

It was observed during the implementation, that a short interval of a minute between the two stages of the
responses served the purpose of the "incubation stage", termed by Wallas as discussed in 2nd chapter in a miniature form. When the responses of all the three stages as mentioned in chapter 3.4.1 are compared with one another to verify the above statement, it is found that the responses obtained in the second stage are superior to those of the first stage. But the third stage responses are not superior to the second stage responses, in the case of Multi response and Hidden shapes programmes. In the language of psychology, the 'threshold' in thinking may affect the students by the end of the second stage responses. It is worth to note here that in the case of Make up problems programme, somewhat reverse is the sequence of the responses. The students are asked to prepare questions from the given information in this type of programme. Our students are not trained to form or raise questions from the given data. So they are not habituated to think in such a reverse way. This might be the reason to have inferior responses at the first and the second stage, although the higher time limit was allotted to both the stages.

In the beginning of the training programme the students were not happy with the work, but after a few days a little more understanding and interest were apparent on their faces that were reflected in their responses. By the end of the training, treatment group students were filled with more
enthusiasm as compared with those of the non-experimental classes of the same school. Here is a supporting statement to the above observation given by R.P. Crawford.²

"A person starting to teach creative thinking encounters blank looks on the faces of his students during the first few weeks. To them it seems strange that anyone should tamper with 'Those mysterious laws of creation' and assume that they, just students, could have ideas. After a few weeks the blank looks fade and, by the end of the semester, the students usually have a surprisingly large number of workable ideas."

This implementation is followed by the findings of the study as under:

8.3 Findings of the Study

Under this caption various findings are considered together and discussed in the light of the objectives, with which this study was started. Study 1 to 7 of this research is narrated with reference to the hypothesis, observations and conclusions.

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8.3.1 **Study 1 and 2**

**Hypothesis 1**

Creativity is increased by the divergent thinking programme in Mathematics with and without feedback.

**Observations**

01 Table 6.5 shows that

\[ P_{\text{obs}} (9.94) > F_{\text{tab}} (5.21) \text{ at .01 level} \]

Thus, the experimental groups are found to be superior to control group at both grades in study-1.

02 Table 6.10 shows that

\[ P_{\text{obs}} (6.60) > F_{\text{tab}} (5.21) \text{ at .01 level} \]

Thus, the experimental groups are also found to be superior to control group of either sex in study-2.

03 The adjusted means of all the three treatment groups \( T_1, T_2, T_3 \) are observed from the tables 6.6, 6.11, 6.16, 6.21 and are found in the following order during both the studies.

\[ M_{y,x} \text{ (one)} > M_{y,x} \text{ (two)} > M_{y,x} \text{ (three)} \]

04 The experiment groups \( T_1, T_2 \) are given two types of treatments: one, training with feedback and two, training
only. From the tables 6.6, 6.11, 6.16, 6.21, it is observed that there is no significant difference between two adjusted means \( M_{y,x}^{(one)} - M_{y,x}^{(two)} \) of both treatment groups in both the studies.

Conclusions

\( C_1 \) The divergent thinking programme in Mathematics is an essential tool to develop the creativity of VIII & VII graders. Thus,

\[
\text{Expt. Groups (VIII)} > \text{Cont. Groups (VIII)}
\]
\[
\text{Expt. Groups (VII)} > \text{Cont. Groups (VII)}
\]

\( C_2 \) This programme is equally useful to develop creativity in either sex. Thus,

\[
\text{Expt. Group (Boys)} > \text{Cont. Group (Boys)}
\]
\[
\text{Expt. Group (Girls)} > \text{Cont. Group (Girls)}
\]

\( C_3 \) From the last two observations, it is concluded that there is no significant difference between two adjusted means \( M_{y,x}^{(one)} - M_{y,x}^{(two)} \) of both the experimental groups.

Thus

\[
M_{y,x}^{(one)} \approx M_{y,x}^{(two)}
\]
It proves that the training is an effective technique irrespective of feedback.

8.3.2 Study-3

Hypothesis 2:

(a) Fluency is increased by the divergent thinking programme in Mathematics with and without feedback.

(b) Flexibility is increased by the divergent thinking programme in Mathematics with and without feedback.

(c) Originality is increased by the divergent thinking programme in Mathematics with and without feedback.

Observations:

01 Table 6.25 shows that

\[ F_{\text{ob.}} = 22.91 > F_{\text{tab}} = 4.80 \text{ at } 0.01 \text{ level.} \]

Thus the experimental groups are found to be superior to control group for fluency component.

02 Table 6.26 shows that observed \( F_x \) and \( F_y \) in ANOVA are negative. No further computations, therefore, could be carried to check the effect of the programme on flexibility.

03 Table 6.32 shows

\[ F_{\text{ob.}} = 6.44 > F_{\text{tab}} = 4.88 \text{ at } 0.01 \text{ level.} \]
Thus the experimental groups are found to be superior to the control group for originality component.

\[ M_{y,x} (one)_{81.50} > M_{y,x} (two)_{73.9} \] of table 6.26 shows that the experimental group with feedback is superior to the training group without feedback.

Conclusions

C1 The divergent thinking programme in Mathematics is useful to raise the fluency of the students as

\[ \text{Expt. group} > \text{Cont. Group} \]

C2 As the computations are not possible for flexibility, no effect of DTM can be inferred but it can be said that DTPM is not a useful tool for flexibility.

C3 Originality is increased, due to the programme for the experimental groups as observed in 03 - 8.3.2.

C4 There is a significant increase in the scores of first group students. So the programme with feedback is more effective for fluency component.

8.3.3 Study 4

Hypothesis 13

There is no significant grade difference in creativity scores measured on post-test scores.
Observations

01 Table 7.1 shows that

\[ t_{(VII-VII)}^{(one)} < t_{(tab.)}^{(0.05)} \]

The difference between the adjusted means of VII and VII graders is not significant, when the training with feedback was given.

02 Table 7.1 shows that

\[ t_{(VIII-VII)}^{(two)} < t_{(tab.)}^{(0.05)} \]

The difference between the adjusted means of both the graders is not significant when only training was given.

Conclusions

C1 This null hypothesis is accepted when the training with feedback and only training is imparted to the students of VIII and VII grade.

For each treatment group, the observed mean adjusted mean favours the VIII graders in developing creativity. But the difference between two above means does not reach the level of significance at 0.05 level. So whatever the difference exists, is due to a chance.
8.3.4 **Study-5**

**Hypothesis 4**

There is no significant sex difference in creativity scores measured on post-test scores.

**Observations**

0₁ Table 7.2 shows that

\[ t(B-G) \text{ one tail} < t(\text{tab}) \]

The difference between the adjusted means of boys and girls is not significant, when the training with feedback was given.

0₂ Table 7.2 shows that

\[ t(B-G) \text{ two tail} < t(\text{tab.}) \]

The difference between the adjusted means of both the sex is not significant when only training was given.

**Conclusions**

C₁ The above null hypothesis is accepted even when the training with feedback is imparted to boys and girls.

For each treatment group, the girls possess high mean score on creativity test. But the difference between
two above means does not reach the level of significance at 0.05 level. Hence the observed difference is due to the chance.

8.3.5 Study-6

**Hypothesis :**

There is no significant effect of DTPM on the students of high and low creative levels.

**Observations**

In this 2 x 3 factorial experiment, there are two main effects vis., creativity levels (A) and treatments (B) and one interaction effect AxB.

For ANCOVA, table 7.6 shows that

\[ F_A \sim 3.09 > F_{(\text{tab})} 4.12 \text{ at 0.05 level.} \]

It is observed here, that there is no significant effect of DTPM on the students of high and low creative levels.

But for the ANOVA, table 7.5 shows that

\[ F_A \sim 98.42 > F_{(\text{tab})} 7.42 \text{ at 0.01 level.} \]

Table 7.5 and 7.6 shows that

\[ F_B > F_{\text{table 5.27 at 0.01 level}} \]
It is observed that the treatments have the significant effect on their creativity. This observation supports our past findings in study 1 and 2.

Table 7.5 and 7.6 shows that

\[ F_{AxB} < F_{tab. 3.09 \text{ at } 0.05 \text{ level}} \]

It means that there is no interaction effect of creative levels and treatments.

Conclusions

C₁ From the observation one of this caption, it is concluded that DTPM has no significant effect on the students of extreme creative levels. The null hypothesis, therefore, is accepted. The ANOVA F is highly significant, while ANCOVA F approaches to nearby level of significant at .05 level. Hence it is concluded that the replication of study is badly needed for further research.

C₂ From the observation 2 it is concluded that either of the two treatments is effective variable to increase the creative levels. Our sample for the study is of purposive sampling. It includes the students having the same school climate, minimum IQ, 110 and socio-economic status above average. Hence these factors are the cause for accepting the null hypothesis.
8.3.6 **Study-7**

From this study it is observed that the opinions regarding the programme given by the students tend towards the favourable attitudes. It is seen from the tables 7.7 and 7.8. Hence the effectiveness of the DTPM validated by these opinions.

It will be in the fitness of things to cite a few illustrations of the similar programmes, which have been carried out in different countries - both developed and under developed. They all go to strengthen the results obtained by the experimenter.

1. A long range study by General Electric (U.S.A. 1962) showed that company engineers who had received creativity training produced 3 times more patentable inventions than those who did not have this training.\(^3\)

2. A study of productive Thinking Programme (FTP), done by Covington, Crutchfield and Davis of the University of California in 1966 has proved that productive thinking can be developed by this training in primary school children. It is discussed fully in 3.2.1.

3. A study of PCTP, done by Covington, Feldhusen and Crutchfield in Purdue University 1970 has established that such a programme should be implemented in the schools. The programme can develop originality, fluency and elaboration - the components of creativity successfully as shown in 3.2.2.

4. Adaptation of PCTP was done in the University of Brasilia at Brazil by Feldhusen & Fred Widlak. This study, proved that the programme is equally effective for the students of under-developed country like Brazil as discussed in 3.2.3.

5. S. Bhakar of M.S. University has carried out a doctoral study in 1981 on the students of Bangalore district. His findings for sex difference and for lower creative students are exactly similar to this study. The study is given in brief here in chapter 3 (3.3.2).

6. The effect of creative teaching on creative thinking of adolescents was studied by V.N. Shreelatha and Mathew George recently. They have shown by t value that the creativity components are increased highly. This study as discussed in 3.3.6 bears an eloquent testimony to the findings of this research for feedback group.
A study of Jariol done in the University of Indore gives encouragement to the results of this study regarding sex difference. The adolescent children show significant increase. Especially girls show significant increase as compared to boys. This study has been elaborated in 3.3.1. The educational importance is elaborated in the following caption.

8.4 Educational Implications

The present classroom teaching appears to be very low on motivation, teacher directed as well as dominated, providing less opportunity for student involvement and student initiative resulting in low pupil interest and mainly convergent in nature. The first objective of this investigation, therefore, was to find out the extent to which the theoretically postulated creative teaching practices would be applicable in the present classroom. To achieve this objective, divergent thinking programme was developed.

Under the present critical situation, this type of programme in various school subjects would be helpful to motivate the children and to create open classroom climate.
R.P. Crawford\(^4\) also thinks on the same lines as under:

"It is as foolish to say that the process of creative thought cannot be taught as to say that medicines or engineering cannot be taught".

The results of this study have proved that this short term programme has increased the creative ability of the students. So any educational person can use such programme for Gujarati school children applying any of the following methods.

1. **During day-to-day teaching one can spare 5 minutes per week within the educational period to pose a question aiding divergent thinking of the students.**

2. **One can implement the programme during a semester. Period of 35 minutes per week may be allotted after school hours for the purpose.**

3. **It is possible to introduce such thinking programmes when the schools have a spare period per week for co-curricular activities. This activity would enhance the divergent thinking in general. By the end of school education the group of those students will become creative citizens of the country.**

Finally we may turn to the suggestions for further research.

6.5 Suggestions for Further Research

The fact that this investigation has produced some positive and encouraging results, it deserves a few suggestions for further research. They are enlisted hereunder.

i. The same study should be carried out on a larger sample i.e. at district or state level.

ii. All the groups of socio-economic level should be selected as a sample for the replication.

iii. Rural and urban areas should be introduced instead of urban area alone to study the effect of DTPM.

iv. New DTPM might be prepared so that the remaining creativity component—elaboration can be included.

v. This same tool i.e. DTPM might be used for the students of grade IX and X to develop their creativity.

vi. An investigation into the impact of DTPM on creativity in relation with school performance and intelligence.

vii. Post effect of the training programme might be found out as a follow up.
viii. A case study of the students having higher flexibility score may be done.

ix. Various techniques regarding increase in flexibility—a creativity component may be developed.

x. Divergent thinking programmes for teachers may be developed and included in the curriculum of the teachers' training programmes.

These suggestions for further research work shows that research on any subject has no end. In accordance with it, the investigator thinks of the same fact and prays with Šrī Vedā—Ruchā

"Oh God! The incarnated knowledge, give me the gift as if a father gives a gift to his child. And that gift may give me blessings."