Chapter One

The Problem

“Problems can not be solved by thinking within the
framework in which the problems were created.”

– Einstein

(as cited in Lewis, 1995)

1.01: Introduction

The development of a nation in any field depends on the quality of human resources working in that field. The development of human resources is the responsibility of a system of education of a nation. Hence every nation invests its physical as well as human resources for the building of its future generation through education as education is rightly termed as the 'Great engine of human development' by Mandela (1994). The professional preparation of human resources as a 'teacher' takes place in 'Teacher Education Institutions'. The researcher is working as a teacher educator from last few years in a Teacher Education Institute (a B.Ed. college). By sharing the personal experiences, the researcher wants to draw the attention towards a major problem related to the 'would be teachers'.

1.02: Personal Experiences of the Researcher as a Teacher Educator

During the guidance sessions for practice lessons, the researcher has realized some disturbing facts. The student teachers though are graduates
(in some cases even post graduates or double graduates) of a particular discipline of study, are very weak in (mental processing) thinking.

Majority of them are unable to **reorganize** the content matter in different ways than a text book, to **paraphrase** it in number of ways, to **visualize** the consequences of a phenomenon, to **classify** the given data on various different bases, to seek **alternate solutions**, to **associate** the experiences with the present content, to **relate** the present content to day to day happenings in the life of their students, to **summarize** the matter, to **assign** a proper **heading** or title to a teaching point, to **interpret** the situation, to **guess** all possible causes behind the failure of a science experiment and so on.

Because of these inabilities they hardly experience the joy of learning. That’s why ‘teaching learning’ process is mere mechanics according to most of them. The overall tendency of the student teachers to follow the set practices has apparently become a legitimate practice.

As described by Postman (1969) the reason behind this phenomenon may be a ‘closed system’ of education in which student teachers; being unaware, lock themselves into predetermined decisions by limiting all kind of resources. They act as if they are what the system makes them.

Unfortunately, every year, behaviour of most of the student teachers support the previous observations. This has raised some questions in the mind of the researcher. They are:

1. Is this a universal problem?
2. Will these teachers, weak in thinking, go beyond the set practices during their tenure as a school teacher?

3. Will these student teachers provide proper intellectual leadership in schools?

4. What is the present situation in schools?

5. Are the systemic efforts necessary to undertake the teaching of thinking as a programme?

   There were some efforts on the part of the researcher to motivate the student teachers to think. But those were merely of incidental type and there was no consistency too.

   One incidence led the researcher to think further and deeper.

1.03: One Inspiring Incidence

   Some five-six years ago, three B.Ed. student teachers had attended a camp organized by ‘Jnanaprabodhini’, Pune namely ‘रूप पालतू शिक्षणाचे’ (Let us change the nature of education) after their final university examinations were over. When they shared their experiences with the researcher, the researcher found those student teachers quite happy about what they had learnt there. When asked “Which session did you like the most?” All the student teachers replied “The decision making session.” According to them, they had learnt the method of thinking behind decision making. Also, they were able to apply it when such situation occurred.
The parting comment by the students became an introspecting one. It was said, “We have learnt such valuable things there, that were not even touched during the whole of the B.Ed. course.”

This comment, though exaggerated, was an eye-opening one for the researcher.

It led the researcher to acquire a clear understanding of the problem. Following are the attempts of the researcher, in gaining an insight about the problem implicitly hinted at by student teachers and perceived by the researcher in her professional work as a teacher educator.

1.04 (a) : Field experiences

Personal experiences of the researcher were supported by the field experiences of the researcher. Interactions with some other teacher educators revealed that there is a wide gap between theoretical inputs and learning outcome in case of student-teachers. The concepts and theories are introduced at the information level and they remain on that level because the transaction takes place through conditioning approach. This does not help the student teachers to apply it in different situations. Authoritarian culture in teacher education institutions, vast curriculum, limited time span, internal marks were some factors which seemed to disappoint the student teachers who were interested in doing something different, taking challenge and it ultimately resulted in their regression.

The field experiences of the researcher were supported by Taneja V. R. (1988) (as cited in Pandit, 1999, P. 18). He said, “A candid review of
current scenario of teacher education is distressing. **Irrelevance, obsolescence** and **lack of touch with the latest expertise** in Science and Technology of pedagogical processes characterize the pattern. Very little is done to generate in the prospective teachers, the spirit of inquiry, initiative and science temper. There is **resistance to innovativeness and creativity**, as it involves hard work on the part of teacher.”

After acquainting with the opinions about current teacher education programme the researcher intended to analyse the current B.Ed. curriculum of University of Pune with special focus on the scope of ‘thinking’ in Psychology.

1.04 (b) : **Analysis of present B. Ed. Curriculum of University of Pune**

B. Ed. Curriculum of University of Pune (revised 2002) was analysed in the context of ‘thinking process’. There was a topic of ‘Higher order mental processes’ in a subject of ‘Psychology of learning and development’. But the topic was simply at conceptual level and the objectives were also of understanding level and not of application level. Unfortunately, students get acquainted with mere information of thinking process and not with the process itself missing thereby the linking between ‘Thinking . . . . feeling and Action’.

It may become helpful to consider the outputs of various researches about teacher education programmes in India.
1.04 (c) : Research findings about Indian Teacher Education Programme

The research findings throw light on the status of teacher education programme of various Indian Universities.

- **Shrivastav (1982)** studied the effectiveness of teacher education programme of Avadh University (U.P.). According to the findings, Secondary Teacher Education Programme was rated as ‘least useful’ by secondary teachers, educational administrators and Principals of school and colleges.

- **Gogate, S.B. (1985)** made a case study of Teacher Education Programme in Marathwada, Maharashtra.

  He found out that students admitted to B.Ed. colleges had no faith either in theory or in methodology of teaching because they felt that they would not be able to use either theory or methodology in actual practice.

- **Bhatia (1987)** evaluated a new curriculum of B.Ed. of University of Bombay. Her major findings were “large majority found that the B.Ed. curriculum is mechanical and book oriented. Practical work is not organized seriously.”

- **Bordoloi, A. (1990)** had evaluated critically a Teacher Education Curriculum in Assam. His major findings were:
  1. B. Ed. Curriculum was found to be too heavy for one academic year.
  2. Training teachers did not get the chance to apply the technique of teaching they learnt in the actual classroom.
• **Nagpure, V. R. (1991)** had studied critically the system of teacher education at secondary level in Maharashtra. One of his findings was that innovative methods like team teaching and models of teaching were rarely tried in Colleges of Education.

It shows that the above findings reiterate the previous observations. The ‘gap’ found in theory and practice may lead to term it as ‘least useful’ or irrelevant and following the ‘old traditions’ etc.

A recent study of B. Ed. Curriculum of University of Pune, gives perceptions of student teachers about the course.

**1.04 (d) : A Study of B. Ed. Course of University of Pune**

A study submitted to NCERT in July 2005 regarding ‘Preservice teacher education at secondary stage in emerging diverse educational context : perspectives, practices, prospects’ was undertaken by ‘Aapanach’, a non-governmental organization, from Pune.

In this study an impact of teacher education programme on beginners was mentioned. It was as follows:

1. B. Ed. helps in developing certain qualities, like stage daring, oratory and punctuality.
2. It also helps in understanding various teaching methods but does not give enough practice of the same.
3. According to beginner teachers, microteaching is the most effective exercise in B. Ed., as it provides practice of various pedagogical skills.
4. Awareness of emerging issues like peace education, human rights, children’s right, environmental education, population education is
developed but a deeper understanding of their implications in schools is not developed.

5. Very few aspects that are learnt in B. Ed. are found useful in schools.

This supports the isolation of B. Ed. Colleges from school which was pointed out by Kothari Commission. From the findings of researches and the perceptions of student teachers it is revealed that there is a wide gap between theory and practice.

1.04 (e) : Kothari Commission on Teacher Education

Kothari Commission (1964-66, P.124) has pointed out following major weaknesses in teacher education system of India.

1. Set patterns and rigid techniques are followed in practice teaching without due regard to present day needs and objectives.

2. Training institutions for primary and secondary teachers have remained isolated from the main stream of academic life of a university as well as from the daily problems of schools.

It was further stated in the same report that the quality of training institutions remain with a few exceptions, either mediocre or poor. Vitality and realism are lacking in the curriculum and programme of work which continue to be largely traditional and set patterns and rigid techniques are followed in practice teaching with a disregard for present day needs and objectives.

It can be summarized from the research findings and the comments by Kothari Commission that ‘Teacher Education Programme’ is ‘least useful’, is not ‘relevant’, having a wide gap between theory and practice.
It shows that the teacher education programmes do not cater properly to the needs of student teachers and of society as well. The words ‘rigid’, ‘set patterns’ indicate that nothing new is generated or nothing previous is modified.

If such is the case of teacher education, what is its impact on school education is obviously a pertinent question. This has prompted the researcher to study the effect of teacher education programme on education system.

1.05 : Education System in India

While describing the educational scenario in India, Passi (nd. P.3) said “The over emphasis on ‘acquisition of knowledge’ has become a deterrent to other type of learning. The formal system has promoted superficial learning and undermined meaningful and indepth learning.”

According to his analysis, the factors badly affecting the present educational system were: overburdening of the curriculum, development of text books which promote rote memorization, de-empowerment of teachers, increase in rigidity of teaching-learning situation, centralization of decision making process and traditional bureaucratic management.

In other words it supports ‘Banking concept of education’ by Paulo Friere (1996, P. 53) in which he termed the learning process as receiving, filling and storing of the deposits. It is the people themselves who are filed away through the lack of creativity, transformation and knowledge in this (at best) misguided system.
Same are the impressions about schooling in India by the renowned literary artist R. K. Narayana and a novelist from south India, K. Shivrama Karanth (mentioned by Shotton, 1998). According to them the key issue is relationship between freedom and education.

While discussing about the present Indian education system, Sudeshkumar and Sasidharan (2004, P.1) mentioned, “Normally the context of learning in our classrooms is characterized by tension and fear and anxiety on the part of students. Teachers are building the classroom environment creating tension, fear and anxiety among the students. Students have lost the smoothness and flexibility of their learning. The ultimate result is that students may develop aversion toward classroom process, consequently classroom learning becomes a boring, fearful and tensed event and an event in which the teacher dominates and tries to get things done for him/her and not for the students.”

Authority, monopoly were the features of educational system in India before independence as perceived by Yogi Arvinda and Ravindranath Tagore (mentioned in Shotton, 1998). Prior discussion supports the view of Arvinda and Ravindranath.

1.05 (a) : Indian Education from Industrialists point of view

Azim Premji (2006, P.154) while discussing about school education, has pointed out, “We teach children that this body of knowledge is a static entity; that it has already been created and packaged – and the child’s job is to possess this end product.” (Again supporting the banking concept of education).
Hence according to him, teaching invariably becomes a didactic and mechanical one way process and children respond to this with rote learning.

While concentrating on the consequences of current teaching-learning processes, Vijay Govindrajan (2006, P.164) has said “India’s education system focuses too much on ‘left brain’ thinking: too much emphasis on imparting knowledge by rote. Rote memorization develops brilliant engineers who are world class in reverse engineering. However, the country’s need is not just people who ‘do’ but those who ‘dream’, who imagine new industries and open up new possibilities”.

Pertinent observations about classroom climate mentioned by Foster (1971) (quoted by Umrao Singh Chaudhari 2005, P.2) are “The present day home and classroom climate is permeated by authoritarianism, narration sickness and censor. They lack flexibility, openness and psychological freedom which play an important part in facilitation and release of creative potential of the learners.”

Analysis of all the above referred work helps highlight the following characteristics of our system of education.

- Merely mechanical
- Rigid
- Teacher/authority centered.
- Negligence towards individual differences.
- Emphasis on information storage
- No place for thinking.
It shows that most of the characteristic features of teacher education programme and of school education go hand in hand. Hence, it can be said that school education mirrors a substantial influence of teacher education programme. Basically the reforms in school education have to have their roots in the reforms in teacher education system.

While discussing about the reforms, it was mentioned that it should satisfy the present day needs. To know the present day needs, it is essential to ponder over the question “What is the present world characterized of?”

1.06 : Present world and its requirements

As pointed out by Alwin Tofler (1981) 21st century is recognized as an Information age (i.e. the Third wave) and obviously one cannot face the challenges of this age with the old means in hand. According to Tofler (1981, P.174) “Human intelligence, imagination and intuition will continue in the foreseeable decades to be far more important than the machine”. "Learning the treasure within” a report submitted to UNESCO (1999), deals with the future expectations from education for 21st century.

The report mentions that education for 21st century should be based on four basic pillars. They are ‘learning to know’, ‘learning to do’, ‘learning to live together’ and ‘learning to be’. In section, ‘learning to do’, a point “How can people be prepared to innovate?” is discussed. It pointed out that “In all countries, lastly, growing importance of small groups, networking and partnership highlights the likelihood that excellent interpersonal skills will be an essential job requirement from now on.
What is more, the new working patterns, whether in industry or in the service sector, will call for the intensive application of information, knowledge and creativity. All things considered, the new forms of personal competence are based on a body of theoretical and practical knowledge combined with personal dynamism and good problem solving, decision-making, innovative and team skills.

In a further discussion of ‘learning to be’ it is expressed that ‘In a highly unstable world where one of the main driving force seems to be economic and social innovation, imagination and creativity must undoubtedly be accorded a special place.”

In addition to these characteristics, one more characteristic feature of today’s world is ‘Rapid change’. With the traditional thinking methods it is not possible to cope up with ‘change’. According to Edward De Bono (1994, PP. 206-207) “We find dealing with change particularly difficult because traditional western thinking was never designed for ‘change’. It was designed for a stable society, in which there could be no concept of the very rapid changes of the last one hundred years or so.”

According to him, ‘Traditional thinking’ is based on analysis, judgement and logic. Since logic itself likes to work with facts, for logical thinking certainty is essential.

It can be said that, in a world of rapid changes, the thinking based on stability may not be effective enough. There has to be another way of thinking which will be based on possibilities, which will help an individual to
think not about ‘What is’ but ‘What can be?’ and the alternate thinking is ‘creative thinking’.

In a public lecture in Namur- Belgium, on the subject ‘Humans in information and communication society – How we will live, learn and work’ Gunilla Bradley (1998) had dealt with important competencies that would be needed in the future. According to him, in today’s ICT pervaded world, following competencies seem to be needed.

- Leadership rather than management.
- **Creativity**
  - Problem solving capacity
  - Social competence and communication skills.
  - To work and function in multi-cultural environments.
  - To cope with stress and psychological strain.

It can be summarized that present century is recognized as an information age. Rapid change is its prominent feature. In order to cope successfully in today’s world our traditional thinking has to be changed embracing creative thinking skills instead.

The importance of creativity has never been felt so strongly as in modern times.

Frank Baron (as mentioned in Pathak, 2002, PP. 1-2), a psychologist has aptly remarked “There are rivers to be washed, air to be cleaned, mouths to be fed, diseases to be conquered, justice to be ensured to all, new opportunities to be created, communication and empathy to be
increased, secrets of the cosmos and the mind to be understood………For all this, creativity is put to work.”

This reveals that creativity has a major role in nation’s progress. The linkage between learning, creativity and progress of a nation is very finely expressed by our present president of India, A.P.J. Abdul Kalam (2004, P.166).

“When learning is purposeful,
Creativity blossoms,
When creativity blossoms,
Thinking emanates,
When thinking emanates,
Knowledge is fully lit,
When knowledge is fully lit,
Economy flourishes.”

Passi (nd. P.4) while discussing the consequences of not teaching thinking skills said, “If we do not teach thinking skills, then the only intellectual activity open to the intellectually energetic is to be ‘against everything’ because this requires the least thinking skills. That leads to a society that can only progress through disruption and opposition.”

Indicating the same threat, Torance (1969) (cited in Sharma, K. 1991, P. 9) had argued, “If the deplorable waste of human talent is to be prevented and if creatively gifted students are not to choose the paths of delinquency, mental illness or at best a life of mediocrity and unrealized potentialities, it becomes undoubtedly essential that serious attempts are made towards measurement of factors which would determine creativity.”
As discussed earlier, the present rigid, authoritarian education system is not helpful to promote creative thinking in schools. On the contrary, it does not recognize this kind of ability, and throws away such creative students from the system. Ravindranath Tagore is one example of this.

Rousseau (1962) (as cited in Sharma 1991, P.2) has very rightly commented about this by saying “In every underdeveloped country, potential Einsteins and Fords are herding cattles or breaking stones.”

Thus the organization of our schools, our curricula, our text books and our teaching methods pay homage to what Osborn (1963) (as mentioned in Sharma, 1991, P.8) said in his ‘God of Conformity’.

Guilford (1957) (as cited in Deshmukh, M. N. 1984, P.3) while supporting this point mentioned, “Education has emphasized abilities in the area of convergent thinking and evaluation, often at the expense of development in the area of divergent thinking. We have attempted to teach student how to arrive at correct answers that our civilization has taught us correct. This is convergent thinking. Outside the arts, we have generally discouraged the development of divergent thinking abilities unintentionally but effectively”.

Buzan (2001) discussed about research carried out in Utah, America, studied the amount of creative potential used by people at different ages. This study supported Torrance’s proposition cited above.

To research the ‘development’ of creativity through all stages of life – kindergartton children, junior school children, high school, university students
and adults were surveyed to determine the amount of creative potential used through. The results were traumatic. They are given in Table 1.

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<td><strong>Use of Creativity in different age groups</strong></td>
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<tr>
<td><strong>Age Group</strong></td>
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<tr>
<td>Kindergarten children</td>
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<td>Junior school children</td>
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<td>Highschool / University students</td>
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<td>Adults</td>
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Reason behind is as the children grow all the things about creativity gradually get shunted out of their lives, only the husks and discarded shells of creativity remaining.

But now there is a growing awareness about the importance of creativity. Hence attempts to reform education system accordingly are made by some countries.

1.07: International perspectives about teacher education of the future

a) Case of China:

In a chapter “New education and new teacher education: A paradigm shift for the future” Cheng (2001) mentioned that from the ancient Chinese wisdom, three key elements were identified for an effective education and teacher education. They were:

1. Tian Shi: In education, the focus of Tian Shi is on long term relevance of education.
2. **Di li**: In education, the focus of Di li is on the environmental strengths for education.

3. **Ren He**: It refers to promoting human synergy, initiative, **creativity**, social harmony, and staff development for completing a task or achieving the mission of educational institution.

**b) Case of Hong Kong**: 

In chapter 7, namely "Challenges and contemporary educational reforms to Teacher Education : The case of Hong Kong", Pang (2001) informed that Education Commission of Hong Kong had prepared a comprehensive reform proposal ‘An educational blueprint for 21st century’ in May 2000.

The blue print has mapped out exciting plans to improve the quality of education in Hong Kong.

Emphasizing a student-centered approach and a concept of whole person development through life long learning, the commission recommends a wide range of reform initiatives to create space for facilitating the teaching profession to achieve excellence and to develop students who will enjoy learning, be effective in communications, have a strong sense of **commitment** and **be creative** in thought, expression and action the so called ‘ECCC’ as the four key strategic aims for the new century.

(ECCC – Enjoyment of learning, Communicative abilities, **commitment** and **creativity**
c) Case of Singapore - International Perspective

In a report on ‘Teaching thinking skills for Preservice and Inservice Teachers in Singapore’ Seng (1998) had mentioned that –

“To face the challenges of 21st century there is a need to develop a nation of thinkers, capable of solving critically and creatively in all spheres of life.”

NIE i.e. National Institute of Education is the only teacher training Institution of Singapore, working towards improved teaching of thinking skills within preservice teacher education.

The establishment of Singapore Centre for Teaching Thinking (SCTT) is an important initiative to demonstrate NIE’s commitment to realizing the vision of ‘Thinking schools, Learning Nation’.

The SCTT is jointly sponsored by the National Centre for Teaching Thinking located in Boston, Mass in USA and a steering committee has been set up consisting of members of different professions and academic institutions to give direction, advice and support for the centre’s activities.

Some of the courses conducted so far were,

1) Infusing critical and creative thinking.
2) The art of cognitive coaching.
3) Instructional methods for teaching thinking.
4) Teaching critical thinking in college.
5) Assisting creative and critical thinking.

According to Makiguchi (2001, P.4), a Japanese educationist, “Human beings are creative by nature. It is the essence of humanness to be creative
and humans will express this creativity in their behaviour unless that creative potential is stifled or destroyed."

He further noted that ‘We begin with the recognition that humans cannot create matter. We can, however, create value i.e. in fact our very humanity.’

d) Case of Korea:

The Korean government passed a gifted Education Act in April 2002 that initiated programmes for every elementary, middle and high school in the country (Korean Educational Development Institute 2003). According to Seo (2005), Korean gifted education act has focused primarily on Mathematics and Science and those departments are highly interested in creativity because ingenuity in those fields is tied to fiscal prosperity and competition within the global economy.

This shows that Korean government has perceived that economic prosperity in future in Korea will be the result of attempts of fostering creativity of school children of present generation.

In Hong Kong also creativity and creative thinking skills are major generic skills decided by the Curriculum Development Institute. According to that, creativity training programmes were also undertaken. At present, a feedback on the conduct of these programmes and further improvements is organized. It shows that Hong Kong is one step ahead of Korea.

Having seen the attempts of other countries about inclusion of creativity in their policy framework of teacher education programme let’s look
into the information about Indian perspectives regarding ‘Place of creativity in teacher education’.

1.08 : National Perspectives about creativity in Teacher Education

• National Perspective

It was expected in National Policy on Education (1986) (as cited in Pandit, 1999, P.18) that “Teacher training would have to be totally revamped with a view to equip the teachers with attitudes for innovative and creative work.”

1.08 (a) : Characteristics of a Good Teacher

In a Handbook for Secondary College of Education published by NCERT, characteristics of a good teacher are mentioned (as cited in Pandit, 1999) are:

1. Creating own methods according to the situation.
2. Creative with individuality, originality and spontaneity.
3. Adequately expressive in their ideas.
4. Resourceful in tackling problems.
5. Not exhibiting any object conformity.

Raja Ramanna, (as cited in Shah, H. 2005, P.30) in one of the international conferences, said, “The education must not only aim at intellectual development but also at creative expression.”
1.08 : (b) Rammurti Committee

Rammurti Committee formed in 1990 for review of National Policy on Education envisaged the profile of a teacher educator (as cited in Bansal, 2004).

About the personal attributes of a teacher educator it states that –

Teacher educators should have –

- ability to think and work with a sense of independence.
- ability to act against the prevalent or populist opinion.
- ability to convince and catalyse people.
- ability to lead both by percept and practice.
- ability for creative and sustained action.
- ability to motivate resources both human and financial from within and outside community.
- ability to work with different segments of society.

For ‘creative action’ to take place, it is implicit that creative thinking should occur prior to action. Teacher educators are basically the products of teacher education institutions. Hence for teacher educators to think creatively, an input of creative thinking should be given through teacher education curriculum itself. In this connection, it is essential to know the view of NCTE, a national body of teacher education.

1.08 (c) : View of NCTE

NCTE expects that “Efforts need to be directed towards developing in the teacher trainee, certain competencies and skills which would be helpful
in the shaping of the teacher for an effective role play. It is essentially
directed towards capacity building which may embrace, among other
competencies managerial skills, organizational efficiency, leadership skills,
democratic attitudes, innovative and creative abilities.”

Emphasising the same point, NCTE further says that, “Education, as
a field of specialized studies, is interdisciplinary in its very nature. Since
different branches of learning are involved in understanding the presage,
process and product variables of education, it is essential that formulation of
teacher education programmes adopts a holistic approach in order to
promote proper understanding, insight and thinking on matters pertaining to
this field. The complementary character of theory and practice needs to be
emphasized at every step. The prospective teachers may be encouraged to
organize, express and communicate their ideas clearly in the class. It has to
be accepted as a communicative process of an intensive, teacher-learner
dialogue and renewal of a two way process as opposed to ‘The banking
concept’ of teaching. The emphasis must be laid on cultivation, formation
and development of the power of mind in contrast to the prevalent tendency
of aiming at success in the examination alone. Student teachers will have to
employ the use of divergent thinking and problem solving strategy in
classroom transactions.”

In a research, Salunke (2000) had proposed a curriculum of B. Ed.
Course for Yashwantrao Chavan Maharashtra Open University. Specific
objectives of the proposed curriculum were mentioned in that report. One of
them was – “To enable the student teacher to think creatively for
reconstruction of knowledge.” It was reflected in theory papers but again at the conceptual level.

From the efforts at international level it can be said that the educationists world over have taken due cognizance of creative thinking. They have not only included creative thinking in their policy but in actual implementation also. Whereas all our apex bodies responsible for national system of education have given due importance to creative thinking systemic changes accordingly are still awaited.

Various points discussed above can be summarized as under:

The present teacher education programmes do not provide any substantial input to develop thinking skills especially creative thinking skills. This gap results into a fixed framework about teaching in the minds of student teachers. School education gets affected naturally by such student teachers who work as a teacher in various schools after the completion of B. Ed. The teacher education programmes at present do not satisfy the needs of student teachers and the needs of present world also.

For our future generations to think creatively, it is necessary that their teachers should be competent in creative thinking.

Hence there has to be such a kind of input of creative thinking in teacher training institutions.

The contemplation about this problem had motivated the researcher to undertake the systematic efforts to develop creative thinking in case of student teachers.
1.09 : Nature of the Problem

The problem here is the ‘weak outcome’ of interactions of various variables that take part in the preparation of a ‘teacher’ through a preservice teacher education programme.

The researcher tried to present it with the help of figure 1.

FIGURE 1 : Present status of Teacher Education Programme
To increase the input of some variables or to decrease the proportion of the variables is the routine practice when one wants to improve the system.

Increase in time span of B. Ed. Course or shortening of curriculum may be some of the ways to sort out the problem. This may improve the situation to some extent but it may not induce the desired effect. Because to have student teachers flexible in mind set, resourceful and thinking creatively as an output; the process of teaching-learning has to happen in an ‘open’ non-authoritarian atmosphere where self confidence, originality, self-reliance, enterprise and independence are encouraged as pointed out by Postman (1969).

Here the researcher was interested in testing the combined effect of interaction amongst relevant learning experiences, conducive atmosphere and facilitator’s approach on raising the level of creativity in teaching of student teachers.

Therefore the researcher decided to undertake a study in the area of teacher education and educational psychology, having the title as “An experimental study of student teachers from University of Pune, for improving their creativity in teaching.” To have a clear idea of present status of student teachers regarding their creativity in teaching a survey supporting the experiment was also decided to be undertaken. Elaborating further, a statement of the problem was framed as under:
1.10 : Statement of the Problem

"A survey of status of student teachers of University of Pune regarding their creativity in teaching with a view to improving the same through a training programme and testing its effectiveness with special reference to College of Education, Sangamner from Ahmednagar district."

1.11 : Aim

The study aimed at finding out strategies, ways and means for vitalizing the teaching process through orientation of creative thinking and creativity in teaching in case of student teachers. The main concern of the study was finding out processes for being creative teachers.

1.12 : Objectives

Following were the objectives of the study.

1. To find out the present status of creativity in teaching of student teachers from B. Ed. Colleges of University of Pune.

2. To prepare a programme for enhancement of creativity in teaching.

3. To assess the effectiveness of the programme prepared for improving creativity in teaching.

4. To study the relationship between exposure and creativity in teaching.

1.13 : Assumptions

Before the study began, some assumptions were made. They were :

1. Training facilitates thinking.
2. Creative thinking leads to creative act.
3. There is a transfer of learning.

1.14 : Hypotheses

It was observed that previous researches in the area of creativity show that creative thinking can be developed through training programmes. Hence the hypotheses for this study were formulated as follows:

1. Programme prepared for the development of creativity in teaching is effective.
2. Average performance on the test of creativity in teaching of experimental group of student teachers will be more than that of the control group.

1.15 : Research questions

Apart from hypotheses, following research questions were also raised.

1) Is there any correlation between achievement scores of students at degree level and their creativity in teaching?
2) Is there a faculty wise difference in creativity in teaching of student teachers?
3) Is creativity in teaching a function of gender of a student-teacher?

1.16 : Operational definitions

The researcher had used some words with their specific meanings restricted for the present study. These operational definitions of such words are given below:
1) **Student Teacher** :

A student who is studying in college of education under the jurisdiction of University of Pune for B. Ed. Course, studying through ‘Marathi medium’ in the year 2004-05

2) **Creativity in Teaching** :

There is a presence of creativity in teaching, when a teacher makes use of his/her competencies such as openness, sensitivity to the problem, fluency, flexibility, originality, elaboration, redefinition and resourcefulness, while discharging his/her duties as a facilitator of learning process. In other words it is the total score on the test prepared by the researcher measuring Creativity in teaching.

3) **Exposure** :

It is the score on the researcher made tool which measures the extent of opportunities of variety of experiences made accessible to the student teachers at their school and college level (i.e. in their interactions at previous formal education institutions).

4) **Emotional quotient** :

It is the total score on a test which measures emotional intelligence. ‘Emotional intelligence’ refers to the capacity for recognizing our own feeling and those of others, for motivating ourselves and for managing emotions well in ourselves and in
our relationships. (The test used in the study is translated into Marathi by the researcher.)

5) Programme :

It is a series of learning experiences designed to achieve, within a specified period of time, certain specific instructional objectives. In this study the objectives included the development of processes of creativity and their use in practice.

6) Rural Student Teacher :

A student teacher who has passed his secondary school examination from a school in rural area is called as Rural student teachers. Rural area is a place not having municipality, corporation, cantonment board or notified town area committee as mentioned in the census of India 2001.

7) Urban Student Teacher :

A student teacher who has passed his secondary school examination from a school in urban area is called as Urban Student teacher. Urban area is a place having municipality, corporation, cantonment board or notified town area committee as mentioned in the census of India 2001.

1.17 : Method of Research

As is mentioned in the statement of problem itself, the methodology adopted by the researcher is mainly an experimental one, supported by a
status survey about creativity in teaching of student teachers from University of Pune.

Sample of Survey: From every B. Ed. College, 25% of Marathi medium student teachers were selected randomly as a sample for survey.

From 80 student teachers admitted in academic year 2004-05 for B. Ed. Course in College of Education, Sangamner, two groups of 40 student teachers in each were made by random selection. Random treatment was given to decide experimental and control groups. Both the groups were tested initially about their creativity in teaching. Then the experimental group was subjected to variable X. (i.e. programme of creativity in teaching). After the training both the groups were retested. In short, the research design adopted by the researcher was “Pretest – Post test control group design.” There was a provision of one more equivalent control group of 80 student teachers from a nearby B. Ed. College (S.S.B. College of Education, Shrirampur). This control group was also subjected to a pre and post test. Other variables being the same, this provision helped the researcher to identify the effect of contamination on a control group of 40 student teachers, compared to the above mentioned control group.

This had further helped the researcher to confirm whether the improvement in case of student teachers was only because of the programme or not. Symbolically, it can be represented as:

\[
R \quad O_1 \times O_2 \quad X - treatment \quad O_1 \& O_3 \rightarrow Pretest
\]

\[
R \quad O_3 - O_4 \quad R - randomization \quad O_2 \& O_4 \rightarrow Posttest
\]
1.18 : Action Plan

The researcher had prepared an action plan for the study in hand which comprised of following steps :

1. Background reading of related literature.
2. Preparation of a test measuring creativity in teaching.
3. Preparation of rough outline of a programme of enhancement of creativity in teaching.
4. Administration of test of creativity in teaching to the student teachers of B. Ed. Course in University of Pune.
5. Refinement and implementation of a programme of enhancement of creativity of teaching.
6. Administration of a post-test to experimental as well as control groups.
7. Analysis and interpretation of data.
8. Formulation of findings.
10. Drafting of dissertation.

1.19 : Delimitations

In order to interpret and use the findings of the study it is essential to note the scope and limitations of the study.

1. The present study covered student teachers studying only through Marathi medium in all colleges of education affiliated to University of
Pune in the year 2004-2005. The experiment was conducted on Marathi medium students of College of Education, Sangamner.

Since admissions are centralised (Appendix ‘A’) and other norms being the same, observations and findings may hold good for any B. Ed. College (having ‘Marathi’ as a medium of instruction) from University of Pune and also for any B. Ed. College from any other university in Maharashtra having similar conditions.

2. The researcher herself implemented the programme. Hence the investigator and experimenter were the same.

3. The tool for measuring creativity in teaching was a researcher made tool. It was prepared following the steps in Test construction and was used after testing and ascertaining its validity and reliability.

1.20: Significance of the Study

The study undertaken is significant for various reasons. They are given below.

1. This study is not only a remedial one, used to lessen the deficiencies of student teachers from a particular college, but it has a strength to bring out the ‘change’ recommended by various education policy makers and an apex body of teacher education, NCTE. Hence this research can be treated as a primary step of adding new dimensions in teacher education programme as regards ‘creativity in teaching.’

2. This research also provides a test for measurement of creativity in teaching.
3. This study gives a technique of thinking creatively while teaching for conventional B. Ed. Course, in service training and D. Ed. Course also.

Summary:

In this chapter the researcher had tried to express the need of the topic of research, statement of the problem, operational definitions related to the problem, objectives of the study, hypotheses to be tested, area of research, limitations, scope and significance of the study.

In the next chapter, review of related literature is presented.

"Is it too late to change our way of thinking?"

– Edward de Bono (2000)
References:

Books:


ibid. P. 169


ibid P. 4


ibid. P.150


ibid. P.8

ibid P.3


ibid P. 36


Magazines:


**Theses:**


ibid. P.18.

ibid. P. 9


Reports :


Curriculum of B.Ed. course of University of Pune. *(revised and implemented from June 2002)*


### Web references


Seng, Seokhoon (1998). *Teaching Thinking skills for Preservice and In-service Teachers in Singapore*. Paper presented at the International Conference on Critical Thinking and Educational Reform (Zamboanga,


Chapter Two

Review of Related Literature

“When I examined myself and my methods of thought, I come to the conclusion that the gift of fantasy has meant more to me than my talent for absorbing positive knowledge.”

– Einstein

(as cited in Lewis, 2004)

2.01 : Introduction

Through First Chapter, the researcher has tried to provide the rationale behind this study. She has attempted to express the need of inclusion of creativity in teaching through a programme in B. Ed. course.

In this chapter, a review of literature, related to theoretical aspects of creativity and findings of researches (related to creativity) so far carried out in India and abroad are discussed.

For the ease of presentation, the researcher has divided this chapter into two sections. Section I deals with the theoretical aspects whereas Section II is based on research and findings about creativity.
SECTION – I

Theoretical aspects of Creativity

2.02: Historical / Traditional view about creativity

According to Hota (1998, P.20), "Traditionally, creativity was considered as a rare mysterious phenomenon blessed with divine inspiration occurring mainly in a few outstanding geniuses like Da-Vinci, Mozart, Shakespeare and Einstein; although it was realised that many other generally more mediocre artists or scientists produced occasional or minor creative work.

Creativity was also thought of as a divine inspiration, certain reformers, poets, philosophers like Plato, Kalidas, Tagore supported this view. Madness was often associated with creativity. (Believers are Nietschze, Plato, Vangogh, Lambrase).

One more belief was creativity involves only fun, enjoyment and merry making. Therefore creativity can not involve anything of substance or hard work.

It was also regarded as intuitive genius. Kant in his classical work 'The Critique' of pure research says that 'Creativity is natural and therefore cannot be developed.' One can infer from this that, all these beliefs seem to have become detrimental in scientific enquiry about creativity in earlier days.

2.03: Asset to Human Kind

But now creativity is treated as the greatest asset to human kind. After the 'Sputnick' shock in 1957, creativity began to be seen as a way of
achieving world supremacy. Adopting human capital approach, discussions of creativity have since then become prominent in business and manufacturing fields. Industry or business field is far ahead of education in establishing creative problem solving programmes and similar educational efforts towards the development of human capital.

All this discussion may impose a question as to what is creativity? what is its nature?

2.04 : 4 P's of Creativity

After collecting about sixty definitions of creativity Rhodes (1961) (as cited in Puccio, 1999) pointed out "As I inspected my collection, I observed that the definitions are not mutually exclusive. They overlap and intertwine. When analysed, as through a prism, the content of definitions form four strands. Each strand has unique identity academically, being unity do the four strands operate functionally."

The relationship amongst four P's of creativity is presented as in Fig. 2.

![FIGURE 2 : Four P's of Creativity](image-url)
The four strands or approaches to creativity have been described as identifying the qualities of product which make it creative; understanding the traits, characteristics or attributes of creative personality; investigating the nature of environment (or press) which is conducive to or inhibitive of creativity; and describing the stages of thinking or the process creative people use to invent something new and useful.

2.05 : Definitions of Creativity

If we focus our attention to the derivation of the word 'creativity', it shows that it is derived from the Latin word 'crea' means to 'create'.

Dictionary meaning: "Creativity is the ability or power to bring into existence, to produce through imaginative skill, to make something new."

– Webster's dictionary (as cited in Wilson, 2004)

2.06 : Product-based Definitions

Below are some product based definitions.

"Creativity is that process which results in a novel work that is accepted as tenable or useful or satisfying by a group at some point in time."

– Stein (1963) (as cited in Tripathi, 1996, P. 42)

"Stein's definition emphasises both novelty and utility. Novelty means newness whereas utility/usefulness is not limited to articles of day to day use. It is to be interpreted in a broader sense. Anything that increases the dimensions of our understanding and knowledge is to be considered as creative."
Murray (1959) (as mentioned in Tripathi, 1996, P. 43) has given a definition which is similar to that of Stein. He says, "Creation in many contexts of the present discourse, will refer to the outcome of a composition which is both new and valuable."

Murray elaborates the meaning of 'new' and 'valuable'. New according to him, will mean that, the entity is marketed by more than a certain degree of novelty or originality, relative to sameness or replication, and valuable will mean either intrinsically or extrinsically valuable as such to one or more persons or generative of valuable compositions in the future."

Some more definitions which perceive creativity as a product are –

"The occurrence of a composition (product) which is both new and valuable."

– Henry Miller (writer) (as cited in Wilson, 2004)

"Any thinking process in which original patterns are formed and expressed."

H. H. Fox (scientist) (as cited in Wilson, 2004)

"Creativity is the process of bringing something new into being."

– Rollo May (philosopher) (as cited in Wilson, 2004)

"Bringing into being something that was not there before."

– Edward de Bono (as cited in Wayne, 2004)

The definitions of 'creativity' as a product raise questions about the characteristics of product.

The meaning of 'new' and valuable is given by Murray and Stein.
Cropley (2001, P.6) puts a new dimension about the 'product'. According to him, "novelty, effectiveness and ethicality should be three characteristics of a creative product."

1. **Novelty**: a creative product, course of action, or idea necessarily departs from the familiar.

2. **Effectiveness**: It works, in the sense that it achieves some end. This may be aesthetic, artistic, spiritual, but may also be material such as winning or making a profit.

3. **Ethicality**: The term 'creative' is not usually used to describe selfish or destructive behaviour, crimes, war mongering and the like.

   Cropley (2001) sees the third property as a crucial property which arises from the fact that the term **creativity has highly positive connotations**. It is difficult to think of the effective and relevant novelty of new weapons of mass destruction as creative, even though they might contain all the necessary elements discussed above.

   An obvious example would be the creativity displayed by a thief who developed a novel way to embezzle money from a bank. Thus the ethical element takes on a particular importance.

   As an effect, creativity is a property of products. These are often tangible and material and frequently take the form of works of art, musical compositions or written documents, on the one hand of machines, buildings or other physical structures such as bridge and the like. They can also be intangible although relatively specific such as plans and strategies for solving problems in business, manufacturing, government and similar areas. Finally,
they can consist of more general thoughts or ideas - systems for conceptualizing the world - as in philosophy, Mathematics or indeed all reflective disciplines as pointed out by Cropley (2001).

2.07 : Process based definitions

Number of psychologists have proposed definitions of creativity which center around the process of creativity. Among these some are Torrance, Khatena, Mednick, Kubie and Koestler.

Torrance (1988) has given three definitions of creativity. The first definition he calls the research definition and the other two - the artistic definition and the survival definition. In research definition, he describes creative thinking as:

"The process of sensing difficulties, problems, gaps in information, missing elements, something askew making guesses and formulating hypotheses about these deficiencies; evaluating and testing these guesses and hypotheses; possibly revising and retesting them and finally communicating the results."

− Torrance (1988)

(as cited in Tripathi, 1996, P.44)

Through the above definition given, Torrance orients us to perceive "creativity as a problem solving process."
This definition can be presented with a Flow Chart 1 giving various stages as below:

**FLOW CHART 1 : Sequential steps in Creative thinking**

Through this definition, Torrance has tried to provide a sequence of mental processes behind the occurrence of a creative product. But it shows that it is beyond only on 'Problem solving'. This may imply that creative thinking consists of problem solving only.

In other definition, called artistic definition, Torrance has given the process of artistic creativity.
The artistic definition given by Torrance (as mentioned in Tripathi, 1996, PP. 44-45) consists of a no. of drawings illustrating the creative process. It is given in Table 2.

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>CREATIVE ACT</th>
<th>DRAWING SHOWING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curiosity</td>
<td>Wanting to know</td>
<td>open book with a face.</td>
</tr>
<tr>
<td>Indepth study through various angles</td>
<td>Digging deeper</td>
<td>A spade and a pit.</td>
</tr>
<tr>
<td></td>
<td>Looking twice</td>
<td>A bespectacled face.</td>
</tr>
<tr>
<td></td>
<td>Listening for smells.</td>
<td>A face with a hand on one ear.</td>
</tr>
<tr>
<td>Efforts attempts</td>
<td>Listening to a cat</td>
<td>Face of cat.</td>
</tr>
<tr>
<td></td>
<td>Getting in</td>
<td>Two fishes inside water.</td>
</tr>
<tr>
<td></td>
<td>Getting out</td>
<td>A closed door.</td>
</tr>
<tr>
<td></td>
<td>Having a ball</td>
<td>A girl with a ball.</td>
</tr>
<tr>
<td>Use of various alternatives</td>
<td>Cutting holes to see through</td>
<td>A pair of scissors and paper.</td>
</tr>
<tr>
<td></td>
<td>Cutting corners.</td>
<td>Paper whose four corners have been cut.</td>
</tr>
<tr>
<td></td>
<td>Plugging into the sun</td>
<td>Wire whose one end is attached to the sun and the other to a plug.</td>
</tr>
<tr>
<td></td>
<td>Building sand castles</td>
<td>A castle with a sand, a bucket &amp; a spade in front of it.</td>
</tr>
<tr>
<td></td>
<td>Singing in your own key</td>
<td>A bird like figure singing.</td>
</tr>
<tr>
<td>Future oriented</td>
<td>Shaking hands with tomorrow</td>
<td>An extended hand.</td>
</tr>
</tbody>
</table>

The researcher has tried to identify the dimensions behind the creativity acts. These are mentioned in the left side column. What Torrance called an artistic definition is actually a list of activities that characterises a creative worker.

A third definition is what Torrance calls survival definition. Examples of this type of creativity are best seen when a person tries to overcome an
extremely unfavourable situation like shipwreck trying to escape from enemy territory, facing extreme climate conditions and the like. This type of creativity in words of Torrance is "Imaginatively gifted recombination of old elements into new configurations."

Another process based definition of creativity is by Khatena (1973) who has chosen to define originality rather than creativity.

"Originality is the power of imagination to break away the perceptual set so as to restructure new ideas, thoughts and feelings into novel and meaningful associative bonds."

– Khatena & Torrance (1973)

(as cited in Tripathi, 1996, PP. 45-46)

Whereas Mednick (1964) emphasising the importance of remote association says, "Creative thinking consists of forming new combinations of associative elements, which either meet specified requirements or are in some way useful. The more mutually remote the elements of new combination, the more creative is the process of solution.

– Mednick (1964)

(as cited in Tripathi, 1996, P.46)

The main similarity between the above two definitions is to break the old bonds (patterns) or come out of the old bond.

Kubie's Definition: Kubie (1967) defines creative process as:

"By the creative process we mean the capacity to find new and unexpected connections to voyage freely over the seas, to happen on America as we
seek a new route to India to find new relationships in time and space and thus new meanings."

– Kubbie (1967) (as cited in Tripathi, 1996, P.47)

Combining the need, process and product; a comprehensive definition of creativity is given by Tripathi (1996, P. 51). It is "creativity arises to fill a sensed gap resulting in a new insight in which ideas, not usually associated together are combined or some ideas are perceived in a new perspective leading to a novel and useful or an aesthetically pleasing product."

All these definitions reveal that:

- Creativity is perceived as a process or a product.
- Formation of new and valuable product (tangible or untangible) and problem solving comprise creativity.
- To come into existence a new and valuable product, previous experiences are manipulated in different/unusual ways.

**New Attempt**: Dilip Mukerjea (2001) (as cited in Wayne, 2004, P. 6) has described creativity in an innovative way. He describes creativity as the "spark" that ignites new ideas. In his book, "Surfing the intellect" he provides a formula for creativity.

According to him,

\[ C = (ME)^x \]

In this formula, \( C \) = creativity, \( M \) = mass of data, information, knowledge and wisdom acquired over life time.
E = The sum of experiences and the enlightenment gained thereby that serves to energize one's life. In that equation, Dilip Mukerjea wants to establish the relationship between process of creativity and then product. According to equation, the quality (novelty, utility) of product is a function of number of experiences received and the knowledge generated thereby and outstanding combination of those.

\[ M \times E \] increases multiplicity of combination of ideas. When a single experience is added, potential connections mentioned by Wayne, (2004) increase exponentially is as shown in table 3:

### TABLE 3

<table>
<thead>
<tr>
<th>Experience/knowledge</th>
<th>Potential connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
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<td>10</td>
<td>45</td>
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<td>:</td>
<td>:</td>
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<tr>
<td>50</td>
<td>1225</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
</tr>
<tr>
<td>100</td>
<td>4950</td>
</tr>
<tr>
<td>1000</td>
<td>499500</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
</tr>
<tr>
<td>1,000,000</td>
<td>4,99,999,500,000</td>
</tr>
</tbody>
</table>

* adapted from Wayne, L. (2004). Flicking your creative switch - developing brighter ideas for business. P. 49
This implies that as no. of experiences increase, the potential connections tend to infinity. It is very appropriate for ideas to have an upper limit of \( \infty \) (infinity). It can be said that the amount of variety of experiences and combination of them in number of ways leads to a creative act.

2.08 Creativity as a Person: The other way of looking at creativity is to study the creative person himself. This view starts from the assumption that the creative product is neither a happy accident nor simply the result of a faithful pursuit of proper methodology. On the other hand, creative work is treated as the expression of a creative personality.

- Vernon (1967) considers creativity mainly as 'an ability' and 'a form of cognitive activity' (as cited in Sharma, 1991, P.17).
- Drevdhal (1956) defines creativity as the capacity to produce compositions, products or ideas of any sort which prove new or novel and previously unknown to the producer himself (as cited in Sharma, 1991, P.18).
- Ausubel (1963) (as cited in Sharma, 1991, P. 19) used the term 'creativity' to refer to 'rare and unique talent' in a particular field of behaviour which has the capacity for developing insights, sensitivities and appreciation in areas of intellectual and artistic activity.
- Khandwalla, P. (2003, P. 38) provides a formula relating to creative personality. According to him,

\[
\text{Creative potential} = \text{Creativity traits} + \text{creativity spurring motives} - \text{mental blocks that impede creativity.}
\]
According to him, the key elements of the creative personality are certain traits and motives and the absence of certain mental blocks.


Dellas and Gaier (1970) (as cited in Cropley, 2001) concluded that creative people are characterised by a special pattern of traits that distinguish them from the less creative. They identified eleven typical traits of which nine would generally be regarded as positive.

They are:

- Independence
- Dominance
- Introversion
- **Openness**
- Breadth of interests
- Self acceptance
- Intuitiveness
- Flexibility
- Social poise

The remaining two lack of concern of social norms and antisocial attitudes are less positive.
According to Dacey (1989) (as cited in Cropley 2001, P. 60) there are nine traits that characterize creative people.

- Tolerance of ambiguity
- Stimulus freedom
- Functional freedom
- **Flexibility**
- Risk taking
- Preference for complexity
- Androgyny (possession of both male and female characteristics)
- **Acceptance of being different**
- Positive attitude to work.

Eysenck (1997) (as cited in Cropley, 2000, P. 60) concluded that researchers typically emphasize following characteristics of creative personality.

- Authority
- Non-confirmity
- **Openness to stimulation**
- Flexibility
- Tolerance of ambiguity
- Inner directedness
- Ego-strength

Some common traits of creative personality are evolved from the above three researches. They are **flexibility, openness** and **tolerance of ambiguity**.
All these traits have relation to the environmental setting of the society.

2.09 : Creativity as a Press /Environment

The environment is not simply a passive recipient of whatever creative people offer, but itself determines what kind of novelty is produced. Only creative solutions will be tolerated by a particular environment.

The social setting determines what kinds of new ideas emerge by setting limits to the degree and/or kind of divergence that is seen, by guiding creative thinking into particular channels or by affecting motivation. There is little incentive to produce novelty or surprise that no one else is willing to support. Despite this, exceptional individuals who swim against the current such as Galileo, who was condemned for heresy are still seen.

Simonton (1999) (as cited in Cropley, 2001, P. 7) has shown that “The effects of the environment are not only specific, affecting the creativity of a particular individual, but also general in that they influence the kind of novelty that is produced in the society as a whole.”

Khandwalla (1984) (as cited in Tripathi, 1996, P. 142) provided a list of 10 important environmental factors that foster creativity. These factors are:

1. A stimulating environment in which one has to respond to new tasks and challenges.
2. An environment that encourages and rewards creativity.
3. An environment that does not induce defensiveness.
4. An environment in which one can get critical but constructive evaluation.
5. An environment that provides rigorous technical training.
6. An environment which is rich in diversity and intellectual ferment.
7. An environment that provides freedom along with accountability and effective performance.
8. An environment in which innovators, pioneers and creators are looked up to as role models.
9. An environment which provides reasonable physical facilities for creative work.
10. An environment in which admired or loved high status individuals favour creativity and communicate expectations about creative effort to the individual.

In the above list 3 main points have come forth –
1. Role model should be innovator.
2. High status persons should communicate their expectations about creativity.
3. Rigorous training and accountability should be combined with freedom of action.
The basic principles behind each theory and their applications in teaching is given in appendix B.

2.11 Techniques for creative thinking:

There emerged many techniques and methods which are tested and proved for developing creativity among the individuals. The researcher does not intend to go into details of each.

The most widely used techniques are:

1. Brainstorming (Osborn)
2. Synectics (Gordon William)
3. Attribute listing (Grawford, Rober)
4. Morphological Analysis (Davis)
5. Bionics (Papanek)
6. Role playing (Moreno)
7. Zaltman Metaphor Technique (ZMET) (Ronald, Leibber)
8. Creative problem solving
   - Devis Method
   - Polya Method
   - Parnes Method
   - Oech Method
   - Wallas Method
9. Six Thinking Hats (Edward DeBono)
10. Lead User Technique: Outside_the_box_Thinking
11. SCAMPER
12. Mind mapping (Buzan).
2.12 : Creativity and Guilford's Structure of Intellect (SOI) Model

The credit for initiating systematic research in the field of creativity goes to J. P. Guilford. In his presidential address to American psychological Association in 1950, Guilford gave his ideas on creativity. He remarked: Creative acts can therefore be expected, no matter how feeble and how infrequent of almost all individuals (1950). This was a novel view. Till so far it was believed that only a few gifted individuals could be creative.

In 1956, Guilford published a paper ‘Structure of Intellect’ in the psychological Bulletin. He there presented a system through which the various factors of intellect could be arranged. Under this system only forty factors were identified.

In 1959, again, he presented a revised model of intellect – Three faces of Intellect”. This model was consisting of 120 factors.

Later on one component was split raising the number from 120 to 150. The recent model of SOI by Guilford (as mentioned in Tripathi, 1996, P. 88) is as shown in figure 4.

FIGURE 4 : Guilford's Structure of Intellect
According to Guilford any mental activity has three aspects: a mental operation, its content and its product. Under each of these three aspects, there are sub categories. They are:

<table>
<thead>
<tr>
<th>Mental operations</th>
<th>Contents</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Memory - M</td>
<td>2. Auditory - A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Units - U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Classes - C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Relations - R</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Systems - B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Transformation - T</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Implications - I</td>
</tr>
</tbody>
</table>

Mental Operations

1. **Cognition**: Refers to comprehension and recognition.

2. **Memory**: Refers to retention and recall of information.

3. **Divergent Production**: According to Guilford (1959) it is closely related to creative potential. It is generation of information from given information, where the information is based upon variety and quantity of output from the same source.

4. **Convergent Production**: In convergent production, the problem is such that it leads to any one correct answer.

5. **Evaluation**: Reaching decision for making judgement concerning criterion satisfaction (correctness, suitability, adequacy, desirability etc.) of information.

**Content**: Raw material to which mental process is applied.

1. **Visual**: The visual information can be in concrete form as in objects or in the form of figures.
2. **Auditory**: The information can be in the auditory form. It could be in the form of music or in ordinary signals.

3. **Symbolic**: Symbols which denotes something but have no meaning in themselves.

4. **Semantic**: This type of content is represented by meanings. It commonly finds expression through language. Meaningful pictures also often convey semantic information.

5. **Behavioural**: It is essentially non-verbal information involved in human interaction in terms of needs, attitudes, desires, moods, intentions, perceptions, thoughts etc.

**Product**: When a mental operation takes place with any of the 5 kinds of content, it will give rise to some kind of result. It is called as product.

There are six kinds of product.

1. **Units**: These are relatively segregate or circumscribed items of information. Each unit will represent a product but the products will not be related to each other.

2. **Classes**: These are items of information which are grouped together by virtue of their common attributes.

3. **Relations**: Connections between items of information based upon variables or points of contact that apply to them.

4. **Systems**: These are organised or structured aggregates of items of information. It could be represented by complexes of interrelated or interacting parts. (e.g. a mathematical equation).

5. **Transformations**: Changes of various kinds like redefinition shift or modification of existing information or in its function, it is thus a reinterpretation of an information.
6. Implications: Extrapolation of information, in the form of expectancies, predictions known or suspected antecedants, concomitants and consequences are treated as implications. Thus, 5 contents x 5 operations x 6 products results into 150 factors of intellect.

According to Guilford (1967) (as cited in Hota, 1998) factors included in divergent thinking which constitute creativity are fluency (word, associational, ideational, expressional) flexibility (semantic, figurual, symbolic) originality, elaboration, redefinition (symbolic and semantic).

Later on, he believed that ‘sensitivity to the problems’ falls in the evaluative category is also important for creative activity. For a particular mental operation, i.e. divergent production, each content will produce 6 kinds of products. There are in all 5 contents. So for divergent production there are in all 30 cells. (5 contents x 6 products). Out of which 5 cells are devoted to transformation i.e. redefinition. Rest 25 cells measure fluency, flexibility and originality. Out of these 25, 5 cells are of implications. These are nothing but elaboration. Hence in all there are 20 cells devoted to fluency hence for flexibility and for originality. Guilford pointed out that sensitivity to the problem comes under operation evaluation. Again for evaluation there are 30 cells i.e. for sensitivity to the problem has 30 cells.

Thus, in a structure of intellect of 150 cells, 60 cells (i.e. 40%) are devoted for creative potential according to Guilford. The distribution of cells will be like this:

<table>
<thead>
<tr>
<th>For redefinition</th>
<th>DVT</th>
<th>For elaboration</th>
<th>DVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAT</td>
<td></td>
<td>DAI</td>
<td></td>
</tr>
<tr>
<td>DST</td>
<td></td>
<td>DSI</td>
<td></td>
</tr>
<tr>
<td>DMT</td>
<td></td>
<td>DMI</td>
<td></td>
</tr>
<tr>
<td><strong>Total (5)</strong></td>
<td>DBT</td>
<td><strong>Total (5)</strong></td>
<td>DBI</td>
</tr>
</tbody>
</table>
D - divergent production. V, A, S, M, B - contents

T - Transformation I - Implications

This is presented in figure

![Diagram showing redefinition and elaboration]

**FIGURE 5 : Cells of redefinition and elaboration**

For sensitivity to problem: Distribution of cells for sensitivity to the problem is as follows. They are represented further in figure 6.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EVU</td>
<td>EVC</td>
<td>EVR</td>
<td>EVS</td>
<td>EVT</td>
<td>EVI</td>
</tr>
<tr>
<td>EAU</td>
<td>EAC</td>
<td>EAR</td>
<td>EAS</td>
<td>EAT</td>
<td>EAI</td>
</tr>
<tr>
<td>ESU</td>
<td>ESC</td>
<td>ESR</td>
<td>ESS</td>
<td>EST</td>
<td>ESI</td>
</tr>
<tr>
<td>EMU</td>
<td>EMC</td>
<td>EMR</td>
<td>EMS</td>
<td>EMT</td>
<td>EMI</td>
</tr>
<tr>
<td>EBU</td>
<td>EBC</td>
<td>EBR</td>
<td>EBS</td>
<td>EBT</td>
<td>EBI</td>
</tr>
</tbody>
</table>

(Total 30)
FIGURE 6: Cells of sensitivity to the problem

For fluency (hence for flexibility and originality): Cells of distribution for fluency, flexibility and originality are as follows and represented further in figure 7.

<table>
<thead>
<tr>
<th>DVU</th>
<th>DVC</th>
<th>DVR</th>
<th>DVS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAU</td>
<td>DAC</td>
<td>DAR</td>
<td>DAS</td>
</tr>
<tr>
<td>DSU</td>
<td>DSC</td>
<td>DSR</td>
<td>DSS</td>
</tr>
<tr>
<td>DMU</td>
<td>DMC</td>
<td>DMR</td>
<td>DMS</td>
</tr>
<tr>
<td>DBU</td>
<td>DBC</td>
<td>DBR</td>
<td>DBS</td>
</tr>
</tbody>
</table>

(Total 20)
Hence, there are in all 60 cells devoted to creative potential.

2.13 : Brain and Creativity

Human brain is divided into two parts: Left hemisphere and right hemisphere. These two are connected together by corpuscallosum. Functions of our right side of the body are controlled by left brain whereas functions of left part of the body are controlled by right brain.

Many biologists have studied the brain functions. But the work of Roger Sperry, an American neurologist on split brain subjects has greatly contributed, in the understanding of the functions of two hemispheres. According to him, the left and right hemispheric style is as shown in the table 4.
### TABLE 4

<table>
<thead>
<tr>
<th>Functions of L - R brain hemisphere*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right hemisphere style</strong></td>
<td><strong>Left hemisphere style</strong></td>
</tr>
<tr>
<td>• Intuitive</td>
<td>• Rational</td>
</tr>
<tr>
<td>• Responds to demonstrated instructions</td>
<td>• Responds to verbal instructions.</td>
</tr>
<tr>
<td>• Problem solves with hunches, looking for patterns and configurations.</td>
<td>• Problem solves by logically and sequentially, looking at the parts of things.</td>
</tr>
<tr>
<td>• Looks at similarities.</td>
<td>• Looks at differences</td>
</tr>
<tr>
<td>• Is fluid and spontaneous.</td>
<td>• Is planned and structured</td>
</tr>
<tr>
<td>• Prefers elusive and uncertain information</td>
<td>• Prefers established, certain information.</td>
</tr>
<tr>
<td>• Prefers drawing &amp; manipulating objects.</td>
<td>• Prefers talking and writing.</td>
</tr>
<tr>
<td>• Prefers open ended questions.</td>
<td>• Prefers multiple choice tests.</td>
</tr>
<tr>
<td>• Free with feelings.</td>
<td>• Controls feelings.</td>
</tr>
<tr>
<td>• Prefers collegial authority structures</td>
<td>• Prefers ranked authority structures.</td>
</tr>
</tbody>
</table>

**Simultaneous**
- Is a lumper, connectedness is important
- Is analogic, sees correspondences, esemblances.

Draws on unbounded qualitative patterns that are not organized into sequence, but that cluster around images.

**Sequential**
- Is a splitter, distinction is important.
- Is logical, sees cause and effect.

Draws on previously accumulated organized information.

* Adapted from [http://brain.web.us.com/brain/right_left_brain_characteristics.htm](http://brain.web.us.com/brain/right_left_brain_characteristics.htm)

Figure 8 depicted below will help visualise the L-R brain functions.

![Left and Right Brain Functions](http://encarta.msn.com/media_461516672/Left_Right_Brain_Functions.html)

* Adapted from [http://encarta.msn.com/media_461516672/Left_Right_Brain_Functions.html](http://encarta.msn.com/media_461516672/Left_Right_Brain_Functions.html)

**FIGURE 8 :** L - R brain hemispheres, what do they do ?*
2.14 : Relationship between Divergent thinking, lateral thinking and creativity.

- Divergent and convergent thinking are the terms used by Guilford (1967). Vertical and lateral thinking introduced by De Bono (1996). Their meanings are not the same.
- Creativity has a very wide meaning. According to De Bono (1996) there are elements of new and elements of bringing something into being and even elements of value.
- Lateral thinking is directly concerned with changing concepts and perceptions. It is always finding out alternatives.
- Without changing concepts and perceptions, one can be creative but not thinking laterally.
- When one thinks laterally, it is not necessary that he is creative.
- Divergent thinking is interested in multiple/many answers whereas lateral thinking is not.
- Divergent thinking is opposite to logical thinking but lateral thinking is not. Some times it may be logical or sometimes it may not be. The only common thing is all of them result into new ideas.

FIGURE 9 : Creativity and lateral thinking
De Bono (1992) expressed the relation between creativity and lateral thinking. The common portion in them is shaded. This relation is presented in figure 9.

FIGURE 10 : Creativity, lateral thinking and divergent thinking

The relationship between creativity, lateral thinking and divergent thinking is depicted through figure 10.

2.15 : A conceptual framework for creativity in teaching

As mentioned in operational definition "Creativity In Teaching is : There is a presence of creativity in teaching, when a teacher makes use of his competencies such as – openness, sensitivity to problem, fluency, flexibility, originality, elaboration, redefinition and resourcefulness while discharging his duties as a facilitator of learning process." In other words, these competencies on the part of a teacher represent his creativity in teaching. The researcher has decided in all 8 factors of creativity in teaching. Six out of them are from Guilford’s structure of intellect. They are fluency, flexibility, originality, elaboration, sensitivity to the problem and redefinition.
Rest two are included by the researcher. Additional two factors have the following rationale for their inclusion in the operational definition of creativity in teaching.

2.16 : Rationale for openness – when the researcher went through the personal characteristics of a creative person, found by various researchers, she came to know that ‘openness’ is one of the common characteristics. (P.54-55) Words may be different; but the meaning is same.

To initiate the process of creative thinking, openness is necessary. The researcher is dealing with the student-teachers of B. Ed. Course. They have a dual responsibility. To think creatively while teaching and to facilitate their student’s creative thinking also.

For both these functions it is necessary to be open-minded. It is necessary to remove the ‘mental blocks’ which do not allow new things to come in, which do not allow to think other than their routine way of thinking. Hence the researcher decided to include ‘openness’ as a fundamental/basic factor of creativity in teaching as one in the presence of which creative thinking takes places.

In Physics, there is a concept of latent heat. It is the amount of heat required to change the state of matter without changing its temperature. Similarly to initiate the process of creative thinking in teaching, the change in (traditional/stereotyped) mind set is necessary. The factor ‘openness’ can be treated as a ‘latent heat’ for this change of mindset to take place.
2.17 : Rationale for Resourcefulness : Hobelman, Barkan and Wessel have (as mentioned in Torrance, 1962) found out core common characteristics among creative teachers. All of them are highly sensitive, resourceful, flexible and willing to 'get off the beaten tracks'. So resourcefulness is included as a factor of creativity in teaching. Rest of the three are already there.

2.18 : Details about factors of creativity in teaching

1. Fluency : It is the ability to generate many ideas, responses, solutions, questions or suggestions. (Verbal and non-verbal)
   - Flow of ideas/thoughts
   - It is the number or quantity of relevant responses/ideas.

2. Flexibility :
   - It is the ability to generate variety of ideas, questions, causes and solutions etc.
   - It is the number of quantity of variety of responses/various classes/categories of responses.
   - Flexibility of thinking consisting of two factors, namely spontaneous flexibility (defined as ability or disposition to produce a great variety of ideas with freedom from inertia and from preservation) and adaptive flexibility which facilitates the production of a most unusual type of solution.

3. Originality :
   - It is the ability to generate unusual, uncommon, novel, off-the-beaten track ideas, questions, suggestions or ways of doing things.
- A response which is statistically uncommon.

2.18(a) : Relationship among fluency, flexibility and originality

- Fluency, flexibility and originality are quite related to each other.

- Suppose that 'A' be a set of responses which is

\[ \text{Flu}=A = \{x_1, x_2, \ldots, x_n\} \]

Where \(x_1, x_2, \ldots, x_n\) are the number of responses.

Hence fluency score is = \(n\) (as mentioned in the description of fluency)

Now if these \(n\) responses are classified and if we find that there are suppose some \(K\) no. of groups / classes. Then \(\text{flex}=Y = \{Y_1, Y_2, \ldots, Y_k\}\)

Where, \(Y_1 = \{x_1, x_2, x_4\}\)

\(Y_2 = \{x_3, x_5, x_8\}\)

\[ \vdots \]

\(Y_k = \{x_9, x_{10}, x_{11} - x_n\}\)

Then the flexibility scores is = \(K\) (as mentioned in the description of flexibility)

Then according to the definition, there may be any response which comes under any of the class, regarded as unusual. Hence originality response is a subset of fluency.

\[ \therefore \text{originality say } Z \in A \]

Maximum score of flexibility will be equal to the score of fluency i.e. \(k = n\)

Hence upper limit of score of flexibility is \(n\) (i.e. score of fluency)

Minimum score of flexibility will be one. Here basic assumption is that when flexibility / originality exist there exists fluency response also. Rather ‘fluency’ is the basic factor among them. Hence lower limit of flexibility is one while upper limit is the score of fluency.
Lower limit of fluency is also one but fluency has no upper limit. When fluency increases, there is a chance of increase in flexibility. When flexibility increases, there is a chance of existence of originality.

Now let us consider two cases:

**Case 1.** Suppose,

Fluency score is high and flexibility score is 1

Or

Fluency score is one and flexibility score is 1

⇒ There is more emphasis on convergent thinking.

**Case 2.** Suppose,

Fluency score is high and flexibility score is high

⇒ Creative thinking takes place.

Fluency and flexibility are the scores of the individual. They do not change with respect to group. But originality score is ‘relative’. It is judged with reference to others. Originality score has a meaning in the context of a group.

4. Elaboration

- The number of details supplied beyond those necessary to communicate a basic idea, a figure or an object.

- Looking into the implications of ideas (extrapolation of ideas)

5. Sensitivity to problem

- Ability to notice, sense defects, subtle anomalies, gaps, contradictions, paradoxes.
• Seeing defects, need deficiencies, seeing the odd, the unusual.

• Establishing the relationship among the parts of the problem.

• Anticipating the future outcome, if the problem continues.

6. Redefinition

• Ability to improvise operations in situations where a familiar object may be used for unfamiliar functions.

• Ability to give up old interpretation of familiar objects.

• Different from the usual, established or intended way.

• It may be either figural or symbolic or semantic.

7. Openness: Following are the traits of an open-minded person.

• Accessible to new ideas unprejudiced.

• Having number of interests in various fields.

• Democratic in nature.

• Values all emotions.

• Open to re-examining values.

8. Resourcefulness

• Resourcefulness is more of how.

• To be resourceful is the ability to overcome difficulties by using unique and clear strategies.

The relationship between the factors of creativity in teaching as perceived by the researcher is given in the figure 11.
FIGURE 11: Relationship among factors of creativity in teaching

It shows that ‘openness’ is the fundamental or basic factor of creativity in teaching. Openness and exposure are interdependent factors. Increase in one increases the another. Exposure to various experiences helps a person to be open-minded whereas an open minded person is always eager to have new experiences. So these two factors are mutually related.

In the left side of openness are the product factors of creativity in teaching i.e. fluency, flexibility, elaboration, and they ultimately contribute to originality. On the right side of openness are the process factors and they also ultimately contribute to originality.

Fluency increases because of large amount of experiences. When the number of fluency is large, there is high possibility to classify them in various
groups. This ultimately increases the probability of occurrence of originality.

Due to openness only, one can become sensitive to the problems. This leads further either to redefine the problem or to find out the weakness in variable relationship and work accordingly. The unique solution to the problem also contributes to the ‘originality’. The process of creative thinking has no end in originality. It perpetuates.

The innovation, new contribution provides energy to the individual to be more and more open and curious, providing a further momentum to the process. Hence it is a cyclic-spiral process, widening the sphere of experiences.

Conceptual summing up of this section is given in figure 12 on next page.
SECTION – II
Review of Related Literature

2.19 : Introduction

Discussion on conceptual aspects of creativity is a major part of Section I. Section II is devoted to the review of researches carried out on various aspects of creativity. For this review, the researcher could gather total 127 studies in all. While collecting the previous studies she faced some limitations. Through out the study, she could refer the journals and books from libraries of following institutions only.

1. Indian Institute of Education, Pune.
2. Department of Education, University of Pune
3. S. N. D. T. University, Pune.
4. Pradnya Manas Sanshodhika, Jnanaprabodhini, Pune
5. SCERT, Pune and

The researcher had received some 25 researches taken place out of India through Internet service. The researcher is staying in a Taluka place in Maharashtra. Power crisis and time to time failure in connectivity, had put some limitations on her web-search which is resulted into a small number.

So the researcher is quite aware that the uniqueness of the present study is in the realm of reviewed researches only. An overall picture of areas of researches in creativity and various sources of previous researches is given in Table 5 on next page.
2.20(a) : Areas of researches related to creativity:

The following figure shows the major areas of researches in creativity and a place of present research topic in that. It also gives its relation to the field of teacher education.

**FIGURE 13 : Major areas of research in creativity and the present topic**
2.20 (b) : Organisation of related literature

The researcher has arranged the related literature in each area mentioned above in the sequence given in flow chart 2:

FLOW CHART 2 : Organisation of researches related to creativity

2.21 : Area A – Nature of Creativity :

This seems to be a less attractive area in case of creativity research in India. As it is mentioned in the trend report of 4th survey by Raina (1991) that very few researches have been carried out so far in this category in India. From all the 5 surveys of Researches in Education, the researcher could get only two abstracts of studies related to this area.

Gupta (1984) had tried to find that whether the dimensions of fluency, flexibility, originality, elaboration, problem inquisitiveness and persistency are fundamental dimensions of creativity or not. He had also tried to find out
whether the above mentioned dimensions ran common through or not by the
tests in which they were utilized as measuring scales.

The tests used were Torrance Test of Creative Thinking (TTCT) and
tests of Wallach and Kogan, Baquer Mehdi, Passi B. K. and Char K. R.
which measure creativity. These tests were administered on two hundred
first-year graduate class students from ten affiliated colleges of Avadh
University.

He found that there was a general factor of creativity as in
intelligence. He also found that the tests were separate identities almost as
whole and their dimensions (fluency, flexibility etc.) had a different and
separate factorial nature depending upon their nature and product. Through
the factor loading, he found out five factors. He named them as 'diversifying
responses to figural stimuli, situational involvement, ideational fluency,
capacity for production of associative content, capacity for highly original
innovation.'

Sharma, P. (1991) had attempted to study the nature of creativity in
philosophical psychological and social domains in order to explore the
intrinsic nature of creativity with respect to certain issues of prime
importance of education.

He had drawn his conclusions based on the study of review of
literature available to him.

According to him, philosophical approaches render an explanation for
casual aspects of creativity and explore the metaphysical and cosmological
nature of the process of creation.
He further concluded that the psychological theories are having major concern with measures of creative potential, where as social theories are concerned with an account of creative achievement.

While stating a ‘rare possibility of rational kind of expression of creativity, he added creativity is merely a possibility under a certain set of constraints and not a necessity. According to him, the goals for the process of education are well defined, where as creative process is free and diffuses the person along with it as it proceeds. While pointing out the difference between education and creativity he inferred that education is a rational and intelligent process where as creative process need not be rational and may even possess elements of serendipity in it.

In a journal of National Academy of Psychology, through an article, ‘Implicit Creativity Theories in India’, Panda, M. and Yadav, R. (2005) have pointed out that perception of a creative personality is a culture and gender specific also. They had conducted a study to understand the nature of creativity in the Indian context. Students (N = 290, Graduate & P. G. students from Allahabad University) were asked to list behaviours that describe an ideal creative person.

On the basis of these descriptions, a check list of creative behaviours was prepared and the same was rated by a sample of 205 students. Factor analysis, of these ratings yielded four interpretable factors, tentatively labeled as ‘sociability and social responsibility’, ‘leadership’, unconventional personality orientation and task persistence. This clearly showed that emphasis was on relational, social and interpersonal aspects rather than
cognitive, analytical and utilitarian aspects of creativity. The result also indicated gender differences. The findings suggest certain degree of cultural continuity in implicit creativity theories in the Indian context.

**Criticism**

The review for area A points out mainly that:

- Perception of personality characteristics of creative individual are culture specific.
- Openness comes out as a major characteristic of creative personality.
- Creativity may have a general factor like intelligence.
- Creativity has some element of serendipity and hence can not be associated with education.
- From the responses for personality characteristics, there is a place to doubt that students may not be able to differentiate between ideal creative person and ideal person.

Further the sample taken was only from Allahabad (U.P.). India being a multicultural society, it would not be appropriate to generalize from this data only.

- Sharma (1991) concluded that the process of creativity and education are totally different. He indirectly indicates that creativity and education can not be associated therefore.

  But to keep aside creativity from education is nothing but to go away from the chief goal of education (to draw out what is within). If there is no creativity will the education be relevant?


2.22 : Area B – Correlates of Creativity


**TABLE 6**

Classification of doctoral researches on creativity in major fields

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Major fields</th>
<th>No. of studies</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Theoretical / philosophical aspects of creativity</td>
<td>1</td>
<td>0.73</td>
</tr>
<tr>
<td>2.</td>
<td>Identification and measurement of creativity</td>
<td>15</td>
<td>11.02</td>
</tr>
<tr>
<td>3.</td>
<td>Intelligence, achievement and creativity</td>
<td>13</td>
<td>9.55</td>
</tr>
<tr>
<td>4.</td>
<td>Personality correlates of creativity</td>
<td>68</td>
<td>50.00</td>
</tr>
<tr>
<td>5.</td>
<td>Socio-cultural factors and creativity</td>
<td>23</td>
<td>16.91</td>
</tr>
<tr>
<td>6.</td>
<td>Nurturance of creativity</td>
<td>16</td>
<td>11.76</td>
</tr>
</tbody>
</table>

If the cells of 3, 4 and 5 are combinely treated as ‘correlates of creativity’, then it shows that they occupy 76.56% part of total researches in creativity. (Same thing is reflected in the tables, where majority portion is occupied by correlates of creativity.)
Table 7 can be treated as an overview of review of correlates of creativity in case of school students and student teachers.

TABLE 7

Overview of researches related to correlates of creativity in case of school students and student teachers

<table>
<thead>
<tr>
<th>Correlates of creativity in</th>
<th>school students</th>
<th>student teachers and teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of reviewed studies</td>
<td>43</td>
<td>12</td>
</tr>
<tr>
<td>Duration</td>
<td>1968-2002</td>
<td>1974-2004</td>
</tr>
<tr>
<td>Standard</td>
<td>from Std. VIIIth to std. XII</td>
<td>B. Ed. Student teachers and secondary school teachers</td>
</tr>
<tr>
<td>Sample range</td>
<td>150-1300</td>
<td>75-589</td>
</tr>
<tr>
<td>Tests used i) For creativity measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bager Mehdi’s test for creative thinking (verbal) – 7</td>
<td>Bager Mehdi’s test for creative thinking (verbal) – 2</td>
<td></td>
</tr>
<tr>
<td>Bager Mehdi’s test for creative thinking Non-verbal – 3</td>
<td>Bager Mehdi’s test for creative thinking Non-verbal : - 2</td>
<td></td>
</tr>
<tr>
<td>Torrance test of creative thinking (verbal) – 5</td>
<td>Torrance test of creative thinking (verbal) - 7</td>
<td></td>
</tr>
<tr>
<td>Torrance test of creative thinking Non-verbal – 2</td>
<td>Torrance test of creative thinking Non-verbal – 1</td>
<td></td>
</tr>
<tr>
<td>Torrance test of creative thinking (verbal) – Hindi version – 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Torrance test of creative thinking (verbal) – Telgu – 1</td>
<td>Creative teacher personality scale - 1</td>
<td></td>
</tr>
<tr>
<td>Passi test of creativity – 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wallach &amp; Kogan battery of creativity</td>
<td>Creative personality Check list by Passi – 1</td>
<td></td>
</tr>
<tr>
<td>Wallach &amp; Kogan battery of creativity Oriya version – 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific creativity test by Kalra – 1</td>
<td>Classroom creativity observation scale - 1</td>
<td></td>
</tr>
<tr>
<td>Acharyulu’s Think creatively test – 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creativity test by Chauhan &amp; Tiwari – 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creative expression test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tests for mental ability and intelligence</td>
<td>Related to personality factors</td>
<td>Related to teaching aptitude</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td><strong>Battery of creativity tests</strong>&lt;br&gt;by Venkata Rami Reddy – 1</td>
<td>1. Extroversion – introversion scale by Neymann-Kohlsted – 1</td>
<td>1. General teaching competency scale by Passi &amp; Lalita – 1</td>
</tr>
<tr>
<td>3. Jalota’s general mental ability test – 5</td>
<td>4. Sarason’s test anxiety scale for children – 1</td>
<td>4. Introversion, extraversion inventory by Kundu – 1</td>
</tr>
<tr>
<td>4. Bihar test of general intelligence - 1</td>
<td>5. McClelland’s test of achievement motivation – 1</td>
<td>5. Teaching aptitude test by Prakash &amp; Srivastava – 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tests for SES</th>
<th>Socio-economic status scale by Jalota – 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SES inventory by Patel – 1</td>
<td>SES inventory by Patel – 1</td>
</tr>
<tr>
<td>Nair’s SES scale – 1</td>
<td>Nair’s SES scale – 1</td>
</tr>
<tr>
<td>SES scale by Jalota – 3</td>
<td>SES scale by Jalota – 3</td>
</tr>
<tr>
<td>SES scale by Rao – 1</td>
<td>SES scale by Rao – 1</td>
</tr>
<tr>
<td>Kuppu Swamy’s SES scale – 2</td>
<td>Kuppu Swamy’s SES scale – 2</td>
</tr>
<tr>
<td>SES by Patel &amp; Vora – 2</td>
<td>SES by Patel &amp; Vora – 2</td>
</tr>
<tr>
<td>SES by Venkat Rami Reddy – 2</td>
<td>SES by Venkat Rami Reddy – 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tests of Personality factors</th>
<th>6. Non-violent attitude scale – 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Extroversion – introversion scale by Neymann-Kohlsted – 1</td>
<td>7. Reaction to authority scale by M. V. Reddy (Hindi) – 1</td>
</tr>
<tr>
<td>2. Jalota’s general mental ability test – 4&lt;br&gt;Hindi version – 1</td>
<td>8. Rotter’s locus of control scale – 1</td>
</tr>
<tr>
<td>3. Eyesenck’s Maudsley personality inventory – 3</td>
<td>9. Locus of control scale by Pal – 1</td>
</tr>
<tr>
<td>4. Sarason’s test anxiety scale for children – 1</td>
<td>10. Self concept questionnaire by Saraswat - 1</td>
</tr>
<tr>
<td>5. McClelland’s test of achievement motivation – 1</td>
<td>11. Edwards personal preferences schedule - 1</td>
</tr>
</tbody>
</table>

1. Tondon Group test of general mental ability – 2
The above table shows that correlational studies between creativity and various social, personality factors, achievement and intelligence have been done so far.

The tests used for measuring these variables were standardized most of the time. It is seen that very few researchers have attempted to prepare a test of creativity on their own. When the researcher went through all these studies, she came to know that variables that are correlated with creativity can be classified into 4 groups – they are social factors, personality factors, academic factors and factors related to student teachers.
The various variables that come under these factors are as shown in figure 14.

<table>
<thead>
<tr>
<th>Social factors</th>
<th>Personality factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>autonomy</td>
</tr>
<tr>
<td>age</td>
<td>self-concept</td>
</tr>
<tr>
<td>caste</td>
<td>endurance</td>
</tr>
<tr>
<td>religion</td>
<td>dominance</td>
</tr>
<tr>
<td>birth order</td>
<td>ego-strength</td>
</tr>
<tr>
<td>family background</td>
<td>anxiety (vocational)</td>
</tr>
<tr>
<td>No. of siblings</td>
<td>emotional stability</td>
</tr>
<tr>
<td></td>
<td>maturity</td>
</tr>
<tr>
<td></td>
<td>hemispheric dominance</td>
</tr>
</tbody>
</table>

Social factors

**Creativity** AND

Personality factors

Academic factors

Scholastic achievement classroom environment subjectwise.

Factors related to student teachers or teachers

Classroom creativity Teaching aptitude Teaching skill Student response Teacher involvement Emphasis on reflective thinking Values

**FIGURE 14 : Correlates of Creativity**

**2.22(a) : Creativity and Social factors**

When the researcher studied the relationship between social factors and creativity it is found that there is no consistency in the results. Following tables will explain it.
Creativity correlates: Social factors:

**Gender** - The relationship between creativity and gender in case of school students and student teachers both is given in Table 8.

### TABLE 8

**Creativity and gender**

<table>
<thead>
<tr>
<th>Boys more creative than girls</th>
<th>Girls more creative than boys</th>
<th>No difference in creativity on the basis of sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ganeja (1972)*</td>
<td>Hussain (1974)*</td>
<td>Vora (1975)*</td>
</tr>
<tr>
<td>Chandrakant (1987)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimurthy (1987)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhogayata (1986)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sumangala (1990)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andal K. (1996)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kumar, N. (1990)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


**SES** - Socio-economic Status in case of school students and student teachers both. The relationship between creativity and SES is given in Table 9.
TABLE 9
Creativity and SES

<table>
<thead>
<tr>
<th>SES positively correlated with creativity</th>
<th>SES negatively correlated with creativity</th>
<th>No relation between SES and creativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandit &amp; Katiyar (1976)*</td>
<td>--</td>
<td>Badrinath and Satyanarayan (1979)*</td>
</tr>
<tr>
<td>Awasthy (1979)*</td>
<td></td>
<td>Seetharam Vedanayagam (1979)*</td>
</tr>
<tr>
<td>Jarilal (1979)*</td>
<td>Trimurthy (1987)</td>
<td></td>
</tr>
</tbody>
</table>


Bhargava, S. (1992) found that the socio-cultural deprivation plays a significant role in creativity in case of adolescents.

Locale / Locality: The relationship between locale and creativity from various researches is given in table 10.

TABLE 10
Creativity and Locale

<table>
<thead>
<tr>
<th>Rural students more creative than urban</th>
<th>Urban students more creative than rural</th>
<th>No difference on the basis of rural and urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharma (1972)*</td>
<td>Shrivastav (1978)*</td>
<td>Joshi (1982)*</td>
</tr>
</tbody>
</table>

**Caste**: Table 11 gives research findings about effect of caste on creativity.

**TABLE 11**

<table>
<thead>
<tr>
<th>Creativity and Caste</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No caste effect on creativity</strong></td>
</tr>
</tbody>
</table>
high caste students were superior to scheduled tribes in case of creativity. |
SC students found low on creative thinking in comparison with forward caste students. |

**Religion**: Table 12 gives the relationship between religion and its effect on creativity.

**TABLE 12**: Creativity and Religion

<table>
<thead>
<tr>
<th>No religion effect on creativity</th>
<th>Religion affects creativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singh, R. (1977)</td>
<td>Muslims more creative than Hindus</td>
</tr>
</tbody>
</table>

**Birth order**: Table 13 gives relationship between creativity and birth order.

**TABLE 13**: Creativity and birth order

<table>
<thead>
<tr>
<th>First born more creative than later born</th>
<th>No effect of birth order on creativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarilal (1979)</td>
<td>Badrinath &amp; Satyanarayan (1979)</td>
</tr>
</tbody>
</table>

2.22(b) : Area B : Correlates of Creativity (Study abroad)

**Gender** : Table 14 gives findings of researches relating to creativity and gender.

**TABLE 14**

Creativity and Gender (abroad study)

<table>
<thead>
<tr>
<th>Female more creative than male</th>
<th>Male more creative female</th>
<th>No difference in creativity on the basis of gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yammamoto (1960)</td>
<td>Klausmier (1965)</td>
<td>Olshin (1964)</td>
</tr>
<tr>
<td>Getzel &amp; Jackson (1962)</td>
<td>Kelly (1965)</td>
<td>Pogue (1964)</td>
</tr>
<tr>
<td>Newfield (1964)</td>
<td>Strauss and Strauss (1968)</td>
<td>Simscins and Eisenman (1968)</td>
</tr>
<tr>
<td>Ogletree (1968)</td>
<td></td>
<td>Kalt Sounis (1971)</td>
</tr>
<tr>
<td>Soloman (1968)</td>
<td></td>
<td>Philips and Torrance (1971)</td>
</tr>
<tr>
<td>Cacha (1971)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* referred from Reddy (2003). Creativity in college students. PP. 8-9

**SES and creativity (Study abroad)**

Table 15 gives research findings about creativity and SES.

**TABLE 15**

Creativity and SES (Study abroad)

<table>
<thead>
<tr>
<th>High SES, high creativity</th>
<th>(SES negatively correlated with creativity) low SES high creativity</th>
<th>No relation between SES and creativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muttel (1971)*</td>
<td>Torrance (1978, 79)*</td>
<td>Dent (1971)*</td>
</tr>
<tr>
<td>Mc Daniel (1974)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cantey (1974)*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* referred from Reddy (2003). Creativity in college students. PP. 24
Birth order and creativity (study abroad)

Table 16 gives relationship between birth order and creativity.

**TABLE 16**

<table>
<thead>
<tr>
<th>Birth order and creativity (study abroad)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st born more creative</td>
</tr>
<tr>
<td>Eiduson (1962)*</td>
</tr>
<tr>
<td>Comeau (1980)*</td>
</tr>
</tbody>
</table>

* referred from Reddy (2003). Creativity in college students. P. 30

- Jenkins, Jeanne E. (1987) had investigated the relationship of creativity to single parent family structure. Total 116 third, fourth and fifth graders from seven rural public schools in central New York state was the sample. Half of them were from single parent family and half were intact families.

  Tests of group inventory for finding creative talent, family environment scale were applied. The findings did not support the hypothesis. However, children having single parent scored significantly higher on the variables originality, achievement orientation and intellectual-cultural orientation.

- Relationship among adolescent creativity, cognitive development, intelligence and age was studied by Edmunds, Alan J. (1990)

  The study of 218 adolescents found no significant differences in creativity subvariates between the developmental stages of concrete and formal operations.
Significant relationships were found between age and creativity. Figural flexibility, originality and elaboration decreased as age increased from 13 to 16 years.

It is evident from above tables and research abstracts that there are contradictory findings in case of each and every variable which comes under 'social factors' in case of Indian as well as abroad studies. The variation in findings may be because of diversity in Indian society i.e. the findings depend on the from where the sample is. i.e. when the sample is from Kerala, it is appropriate to find that female are more creative than male and the like. So these findings have the meaning in their context only. This has tended the researcher to think about a fundamental variable which is related to each and every social variable. Basically creativity is a function of number of variety experiences. In Indian society, opportunities for enrichment through varied experiences depend upon socio-economic status, family background, rural\urban upbringing, sex etc. i.e. on various social variables.

In other words, chance for enrichment through various experiences i.e. exposure is a core part of each and every social variable which has a relation to creativity.

Thus, the review of this part of area B have prompted the researcher to find the relationship between creativity in teaching and yet non tested variable i.e. exposure. (Operational definition of exposure on P.29)
2.23 : Creativity and Personality Factors

Personality factors that were related to creativity are intelligence, autonomy, dominance, endurance, anxiety, ego strength, self concept, emotional stability and so on.

Creativity and intelligence : Number of researches had been done to investigate the relationship between creativity and intelligence. Whether intelligence increases with creativity ? Whether they are negatively correlated ? Is it necessary to have minimum intelligence to be creative ? Are some questions yet to be answered satisfactorily.

The threshold theory regarding creativity and intelligence - An empirical test with gifted and non gifted children was studied by Runco, Mark A, Albert Rober (1986). According to the findings, results of divergent thinking tests (administered to 228 intermediate school students, of whom about 43% were gifted) and calculated correlations between creativity and intelligence measures did not support the threshold theory which posits that creativity and intelligence are related only upto an intelligence quotient about 120.

Marjori Banks, Kevin(1976) had examined the relationship between academic achievement, creativity and intelligence by a regression surface analysis. Findings indicate that for certain academic subjects creativity is related to achievement up to a threshold level of intelligence, but after the threshold has been reached creativity is not associated with further increments in achievements.

It seems that the correlation between creativity and intelligence is a disputed issue. The researcher is not intended to go deeper into it.
If the other personality factors are considered, Chauhan (1979), Kumar (1981), Srivastava (1978), Gulati (1979), Verma (1980) found that highly creative persons are introverts whereas Bhargava (1979) and Kumar (1981) concluded that highly creatives are extroverts.

Raina (1968), Verma (1973), Vasesi (1985) inferred that 'Autonomy' is highly correlated with creativity.

Verma (1973) and Jha (1975) have pointed out that 'openness of mind' is a characteristic of highly creative persons.


Anxiety Kumar (1981) and self-control Verma (1979) are found positively correlated with creativity. Bhargava (1979) found that, creativity was negatively and significantly related to anxiety, extroversion, and was positively and significantly related to independence.
Kaur (1980) found that creativity was positively and significantly related with positive self concept. Bhooldev Singh (1980, 86) found that biographical and personality factors affect the development of creativity.

Geeta Chaubey (1989) observed that creativity is positively correlated with self confidence, withdrawing tendencies and emotional stability.

- The relationship between emotional maturity intelligence and creativity in gifted children was found out by Landau, E. and Weissler, K. (1998).

This study examined the relationship among emotional maturity, intelligence and creativity in 221 gifted children at a special school in Israel. Emotional maturity was defined as strength and courage to actualize individual abilities within the frame of social demands. Highly intelligent and emotionally mature children were more creative than less emotionally gifted children.

**Personality factors related to student teachers and teachers**

- Asha and Patel (1985) found that teachers with high scores on creativity, intelligence and emotional maturity were more effective in teaching.

- Chaudhari, S. (1989) ascertained that highly creative teachers talk more at convergent, divergent and evaluative levels. He also found that pupil’s response in class is more and a creative teacher was found to give more emphasis on reflective questions rather than questions on factual level.

- Sumangala, N. (1990) inferred that teacher involvement was positively and significantly related to language creativity.

- Singh, D. (1991) found that teaching effectiveness was positively correlated with creativity.
• Jain (1992), Londhe (2003) found that there is a positive correlation between creativity and classroom creativity, teaching aptitude and teaching skills.

ED 446 483

HE 033 275

Author: de soura, Fernando Jose Vieira Cardoso

Title: Creativity and effectiveness in teaching. Perceptions of students and lecturers of the Lisbon Polytechnic Institute (IPL).

Pub date: 1999-10-00

Pb. type: Disserations/Theses. Doctoral Dissertations.

Abstract: This thesis presents research that compares the ways students and lecturers of the Lisbon Polytechnic Institute (IPL) perceive and value effectiveness and creativity in teaching. Creativity can be defined in several ways, in this context, it is related to the effectiveness of a teacher. The document discusses results in the light of IPL’s goals of production, acquisition, maintenance, and transfer of knowledge. In teaching, creativity and effective teaching are similar concepts. The research involved a survey questionnaire of 852 students and 245 lecturers to examine variations of lecturers and students’ perceptions of various aspects of creativity and effectiveness in teaching. Research results indicate that the importance of creativity and of creative teaching, may vary depending on the role of observer.
Seen as self perception by teachers, creativity appeared directed towards task improvement or effectiveness, while keeping the student as the main reference and acquiring the designation of creative teaching as a hetero-attribution, when succeeding in establishing a relationship with the students.

To verify whether lecturers and students perceived creativity and effectiveness in teaching in different ways, a survey questionnaire drawn out of Kelly's personal construct theory and the grid method was administered in each one of 7 schools of IPL. A sample of 852 students and 245 lecturers representing 8.068 students and 912 lecturers used, together with 26 interviews and 18 class observations out of a possible 62, of teachers who had been designated as examples of creative teaching.

Stoycheva, Katya (1996) had made in all four studies investigating personality traits of gifted secondary students, perception of Bulgarian teachers about 'ideal' pupil, teacher's free descriptions of children's behaviour, teacher's evaluation of students creativity.

**Study 1**: It investigated the personality traits of gifted secondary students with outstanding achievements in academic fields, high levels of performance in creative activities and acknowledged success in arts. Findings indicated that gifted students have self perceptions, values and motivations that differ from other students and that may cause problems in their search for peer acceptance.

**Study 2**: Examined how Bulgarian teachers perceive and describe the 'ideal' pupil. Findings indicated that teachers tended to devalue
independence in judgement and being emotional, two traits after associated with high creative potential.

**Study 3**: Examined teacher's free descriptions of children's behaviour in order to determine the characteristics they find most relevant for work in school; findings showed that creativity related traits ranked very low.

**Study 4**: Compares teachers evaluations of students creativity to student scores on creativity measures, disparities were found. Findings of the studies were used to create an instrument for teacher's evaluation of children's creative behaviour in primary school. Using this instrument, 100 pupil (50 boys and 50 girls) from 2nd and 3rd grade were evaluated by their teachers (n=4). Teacher's perception of creativity was centered around its intellectual aspects and problem solving processes.

Boys were significantly nominated more often than girls as being creative.

Investigators found primary teachers reluctant to nominate whatever child as non original. Both under and over estimation of creativity hinder teacher's evaluative behaviour and attitudes.

Through the study of researches in correlates of creativity in case of student teachers or teachers, the researcher realized the intimate association between creativity and teaching skills, creativity and teacher-qualities. So this has become helpful for her while preparing a programme of 'enhancement of creativity in teaching'.
In case of emotional aspects, the results of previous studies do not provide a definite direction. The contradiction in findings has created an ambiguity. This ambiguity has prompted the researcher to find out the relationship between creativity and such a variable which includes the variables such as emotional stability, self concept, focus of control etc. 'Emotional intelligence' is that variable whose domains are -

1. Self awareness  
2. Managing emotions  
3. Motivating oneself  
4. Recognizing emotions in others; and  
5. Handling relationships.

Previous studies reveal that though a single constituent of emotional intelligence is correlated with creativity, there was not an attempt to correlate creativity with emotional intelligence.

To fill the gap, the researcher was interested to undertake this task. Taking into consideration the practical difficulties, it was decided that instead of collecting the data of EQ from all the B. Ed. colleges during the survey, it should be confined to experimental group and both the control groups.

2.24 : Academic Factors

Table 17 gives the relationship between creativity and scholastic achievement.

**TABLE 17**

Creativity and scholastic achievement

<table>
<thead>
<tr>
<th>High creativity, high scholastic achievement</th>
<th>Low creativity high scholastic achievement</th>
<th>No relation between creativity and scholastic achievement</th>
</tr>
</thead>
</table>

* Adapted from Reddy (2003). Creativity in college students PP. 34-35

It can be said that creativity in abroad study, there are some researches whose findings show that creativity has no relation with scholastic achievement. This may have the relation with aims and objectives of formal education system.

- **Subjectwise relationship with creativity:**
  - Ranjana Pandit and Katiyar (1976) observed that science students were significantly better than arts students in fluency, flexibility and originality.
  - Jayaswal (1977) found that male teacher trainees in science were significantly higher in creative ability than trainees in arts.
  - Rawat and Garg (1977) found no significant difference between the verbal creativity scores of arts and science students.
  - Awasthy (1979) reported that science students were significantly higher than arts students in fluency and flexibility areas of creativity.
Sansanwal and Jarilal (1979) observed that arts and commerce students did not differ significantly on any of the components of creativity.

Kundu, D. (1984) found that science students were more creative than arts students.

### 2.25 : Area C - Measurement of Creativity

- **Total no. of reviewed studies :** 14
- **Duration :** 1970-1991
- **Sample range :** 300 to 2000.

The tests prepared for measurement of creativity are:

1. Creativity testing at primary and middle school age - Bager Mehdi (1970)
2. Creativity test (verbal and non-verbal form) - Passi (1972)
4. Creativity test for children at school leaving age - Ramchandrachar (1975)
5. A test for literary creativity in Marathi - Kundley (1977)
6. A creativity test for high school students of South Gujarat - Gilitwala (1978)
8. Verbal creativity in Marathi language - Joshi (1981)
9. Creativity in Mathematics - Parasnis (1985)
11. A test of creativity (verbal and non-verbal, for students of grades VIII and
Out of 13, seven tests of creativity are subject specific whereas others are generic.

General (not subject specific) creativity tests measure mainly four factors:
1. consequences
2. unusual uses
3. similarity findings
4. product improvement

TTCT (Torrance Test of Creative Thinking) also measures the above mentioned factors. The factors show that every one had adopted Guilford's structure of intellectual model.

If subject specific tests are considered, same model is accepted but the test variables are different than the general tests consist of. For example in case of literary creativity, poetry writing, story writing, imagery formation, completion, story completion, emotional writing, dialogue writing, sentence and verbal fluency are the test variables.

Whereas in case of creativity in Mathematics, visualization, reorganisation, judgement, number fluency and divergent production are the variables that are tested.

- Miyan, Mahammad (1991) had reviewed the existing tests of creativity developed by Indians.
His findings were:

1. Almost all Indian creativity tests have been patterned on the lines of Guilford's structure of Intellect model.

2. Torrance tests of creativity follow the cognitive approach to assess creativity.

3. The various dimensions scored by almost all tests included fluency, flexibility, originality and elaboration.

4. The items in almost all the tests represent a heavy intake from foreign tests.

He further pointed out that 'Though the items are adapted to Indian situations, the rationale for their inclusion can not be justified.

Whereas Raina, M. K. in a trend report called 'Research in creative functioning' has said that 'In case of certain tests, Indian workers have included in their tests, items based on the tests of Torrance and Guilford and that of Wallach and Kogan. This seems to be quite inappropriate as the three tests are based on different theoretical assumptions. There need be no hesitation in asserting that some of these creativity tests can easily be characterised as tests of achievement.

On the background of above discussion, the researcher wants to point out, that in case of general creativity test, the test items are based on general or day today experiences. Whereas in case of subject specific creativity, the test items are in the context of a particular school subject. To answer these items, some previous knowledge becomes an essential part.
In other words, lack of or presence of previous knowledge may affect the validity of test.

Further nobody had tried to establish any relationship or hierarchy between the factors of creativity. It is evident that all these factors are not isolated, but interrelated. Then the process of formation of a particular test item with a specific factor need to be highlighted.

The researcher has mentioned in an operational definition that creativity in teaching is comprised of fluency, flexibility, originality, elaboration openness, sensitivity to problem, redefinition and resourcefulness.

According to the researcher, thinking for teaching happens either traditionally or creatively.

Creative thinking results into fluency, flexibility, originality and elaboration which can be treated as products. Usually these were measured by the test. But the process aspects of creative thinking i.e. sensitivity to the problem, redefinition and resourcefulness were not found measured through any test. To initiate Creative thinking, 'openness' is a fundamental personality characteristic. Hence the researcher had decided to measure all these 8 factors through various roles of a teacher. If a teacher while performing his roles can think creatively, it is sure that while teaching a particular subject he will think creatively. Here assumption is roles reflect the habits, thoughts and attitudes of a teacher as a person.
Through an extensive web search it was realised that there was not a test of 'creativity in teaching' as such. So the researcher had decided to construct a test of 'creativity in teaching'.

2.26(a) : Area D - Development of creativity

- Total no. of studies available: 25
- Duration: 1977 (1) and rest are between 1984-2004
- Method used: experimental
- Sample range: 12 to 575
- Samples from Std IV to std. X: 27
  - D. Ed. students: 1

Information about researches in Development of creativity in various subjects is in the table 18.

**TABLE 18**

*Researches of Development of Creativity*

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Researcher/ers</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>English</td>
<td>Ludbe (2002)</td>
</tr>
</tbody>
</table>
specific)  
Gupta (1985)  
Patel, J. (1987)  
Gakhar (1991)  
Mandal (1992)  
Nagarkar (1996)  
Virkar (1997) (on development of thinking)  
Kotwal (1997)  
Mukadam (2002)

- Programmes prepared by the researchers of their own = 21
- Programmes prepared by some other and used by the researcher = 04
- Accepting the assumption that 'creativity is trainable', number of experiments have been done and found effective.

Information indicates the trend of these experimental studies. Majority of the studies are of fostering of creativity in general whereas there are few attempts to develop creativity in scholastic subjects.

The attempts of development of creativity were mainly focused on school students. Development of creativity in case of student teachers is a rare one. (in case of D. Ed. students)

### 2.26(b) : Development of Creativity - Study abroad

- Meyer (1970) attempted to encourage mathematical creativity in first grades by using of fifteen 20 minute lesson, each consisting of open ended geometry problems (triangles) with moderate among structures. No
significant difference was found between the experimental and control
groups children.

- Macaranas, Natividal (1982) had used an innovative teaching method
  used in a theories of personality class at Eastern New Mexico University is
described.

  The objectives of this method were to foster growth in creativity
among students by involving them in creative activities or experiential
sessions and to test for improvement in student activity scores. Creative
thinking and problem solving method consists of following techniques:
Activities, creative diagrams, presentation of theories, films and one page
reactions, outlines and alternative constructs presentations of creative
productions and developing and presenting the student's own theories of
personality. It was a pretest–post test control group design.

  On TTCT (Torrance Test of Creative Thinking) it was found that a
change in originality occurred for the students, but flexibility and fluency
measures did not change.

  Objectives of fostering and experiencing creativity were met.

  By getting acquainted with 'creativity development programme'
prepared by investigators, the researcher found that programme mainly
consisted of brain storming, problem-solving, transformation techniques.

  Almost all programmes were based on Guilford's model of intellect.
These programmes had attempted to improve the product aspects i.e.
fluency, flexibility, originality and elaboration.
The programmes are of 'Give as many as', 'Suggest as many as responses to ----' type. Conditioning was found in some programme contents also.

2.26(c) : Development of creativity in teachers and prospective teachers

- Baur (1970) has compared conventional classes in Mathematics for teachers with more open-ended creativity oriented classes. He reported that the performance of prospective teachers on mathematical creativity test can be improved by an appropriate training programme.

- Gibb (1970) developed modules such as application of deferred judgement, recognising the real problems and developing the solutions for teaching creative problem solving to potential mathematics teachers. Prospective teachers were given practice in brainstorming, problem redefining, generating and evaluating solutions and overcoming mental sets. The result indicates some success in teaching creative problem solving by this approach.

- In an experiment Main Ville (1972) compared two groups of prospective elementary teachers in terms of their scores on a test of mathematical creativity. Group first received lecture-text book presentation in a preservice mathematics courses, whereas with group second mathematics activity materials were also used. The mean gains of two groups were not significantly different, although both the groups increased from pre-test to post-test scores on the criterion.
• Shigaki, Irene, S. (1970) had found out the effects of teacher strength and sensitivity and pupil intelligence and creativity on production of divergent responses. The research investigated the effects of teacher attributes of strength and sensitivity on pupils attributes of intelligence and creativity.

32 pupils from 4th, 5th and 6th grade private schools were divided into high IQ- high creative, average IQ- high creative, high IQ-low creative and average IQ-low creative.

16 student teachers were also divided into four categories strong-sensitive, weak-sensitive, strong insensitive, weak-insensitive. All the pupils were taught by all 4 types of teachers on a rotation basis. A 4 factor analysis of variance was used to evaluate the data.

The results strongly support the impact of pupil attributes of creativity and intelligence on divergent production and the greater salience of creativity is exhibited in the significant trend analysis. The findings suggest that achievement may be too inclusive a term and identification of discrete differences in performance between groups of varying cognitive styles would be of value.

• Rookey, Jerome T., Rechardon, Francis J. (1972) had tried to improve pupil creativity via teacher training. It was a pre-post test control group design. One half of the teachers from a school participated in the programme for a year, while one half did not.

Sample group was composed of all fifth and sixth grade students and their teachers in Harrisburgh school district. The fifth grade contained 39
teachers and 945 pupils where as 6th grade also contained 39 teachers and 887 pupils.

The Pennsylvania Dept. of Education designed nine 90 minute workshop programme in 3 parts as an —

a) Introduction to psychological issues involved in pupil creativity.

b) A review of factors of pupil creativity which are under the teacher's control.

c) The presentation of practical alternatives which are available to teachers.

Teachers and pupils were tested in the fall of 1970 again in the spring of 1971. The inservice programme was well received by the teachers. All but one teacher involved in the programme, experimented with the ideas and material presented.

• Mack, Richard Wayne (1985) had undertaken an interesting study. The problems was "Are methods of enhancing creativity being taught in teacher education programmes as perceived by teacher educators and student teachers?"

A study tested the general proposition that, although professors of education, courses possesses knowledge concerning the concepts of creativity, little of that knowledge is passed on to undergraduate students. Ten colleges and universities in Washington and Idaho with teacher education programmes were selected for the study. A total of 62 teacher educators and 338 student teachers were polled by questionnaires. Results indicated that both teachers educators and student teachers thought that
enhancing creativity in children was an important topic to include in teacher education programmes. However, both the groups felt that it was not being taught to any great extent in the programme. Although many of the teacher educators rated their own teaching styles as being more divergent than convergent in nature, many of the student teachers indicated that no classes they had taken had been taught in a creative manner.

- Cheng Vivian (2001) had undertaken a preliminary study attempting creativity enhancement of elementary science teachers, in Hong Kong Institute of education.

A programme for developing the creativity of designing hands-on science activities with the use of everyday resources, was prepared. The programme aimed at fostering the creative attitudes (confidence, interests and values) and the divergent thinking abilities (i.e. fluency, flexibility, originality and elaboration) of teachers. This programme was conducted to about 80 in-service teachers. The results are positive indicating that part of the objectives of the programme is achieved.

- Ming (2003) has discussed the problems and issues of the teaching and learning of creativity in Hong Kong schools.

- The Curriculum development Institute of Hong Kong had identified nine generic skills to be acquired by students, placing a premium on creativity and the development of creative thinking skills.

Hence training of teachers about creativity went on. As a teacher educator Hui was actively involved in this training programme. As an
exploratory study, he had undertaken school visits, classroom observations, informal interviews with teachers, students and focused group discussions.

In this paper he had highlighted the critical problems and issues in implementing a creativity development programme. According to him, the four fundamental problems were disciplinary, theoretical, cultural and managerial. They were discussed in detail. There are knowledge based suggestions, theory driven solutions as well as research, professional and policy implications.

As mentioned in Chapter One, Korean Educational Development Institute (2003) had identified 0.28% of the entire, middle and high school student population, including both public and private schools in Korea as gifted and were served by the gifted programme.

A study of finding out 'Korean Science Teacher's understanding of creativity in Gifted Education' was undertaken by Hae-Ae Seo and Kung Hee Kim (2005). The researchers were interested in find out the understanding of creativity of 60 science teachers of the above mentioned gifted students. An open ended questionnaire was employed. The data was analysed based on Urban's (1995) three components of creativity. The findings indicated that these science teachers had a thorough understanding of the cognitive component, showing less awareness of the personal and environmental components of creativity.

- From these studies, the researcher came to know that there is not a particular programme which will increase 'creativity in teaching'. So the researcher had decided to prepare it and to test its effectiveness. To
avoid the conditioned responses, the researcher decided to prefer a
constructivist approach while designing a programme.

2.27 : Area 'E' : Factors related to student teachers/teachers

In this area, a review of some studies in the field of teacher education
in order to improve its quality is taken.

- Jain, R. (1977) found that creativity components were positively
correlated to teaching proficiency.
- Mathur, S. (1988) concluded that age, sex, teaching experience and
academic discipline did not tend to affect the attitude of teachers
towards creative learning and creative teaching.
- Martis, A. (1990) had tried to develop a making the strange familiar
(MSF) competency through synectics model of teaching in graduate
student teachers. She found that –
  1. The training in MSF, comprising theory, discussion, demonstration
and practice, significantly developed the verbal fluency and verbal
originality of trainees, non-verbal fluency, flexibility and originality,
scientific fluency, flexibility and originality among experimental group
teacher trainees.
  2. These achievements of the training given to the teacher trainees in
MSF were observed in the development of general creativity and
scientific creativity in school students taught by the traditional method.
1. Singh, D. (1991) found that in case of secondary school teachers, creativity and intelligence were jointly considered as predictors of teaching effectiveness.

2. Sohoni (1992) had investigated experimentally the development of problem solving skills in student teachers of B. Ed. college through a special training programme.
   1. She found that programme for development of problem solving skill was effective significantly.
   2. There was no difference in mean scores according to the facilities of student teachers.

3. Rao Ganesware (1995) found that there were significant relations between teacher effectiveness, creativity and interpersonal relationships.

   1. Creative teacher is likely to facilitate, nurture, stimulate creativity more among pupils as compared to less creative or non-creative teacher or the attitude favouring facilitate skills will also help the teachers to some extent to be creative.
   2. There is no significant difference between male and female science teachers as far as their creativity is concerned.

The above studies revealed that teacher effectiveness, teaching proficiency are some quality factors which are correlated with creativity.

So any attempt of fostering this independent variable i.e. creativity will definitely increase teacher effectiveness and proficiency in a way will improve quality of educational system.
Bhor (2004) had studied the expectations of B. Ed. students from their teacher-educators. He found the expectations as –

1. Teacher educator should stress on the methods apart from lecture method.
2. Teacher educators should adopt some new innovative techniques like brainstorming, seminars etc.
3. Teacher educators should give recent information through internet.

Through the above findings and then the expectations from student teachers, the researcher had decided to prepare a programme of development of creativity in teaching and to use the methods and techniques which will help initiate creative thinking in student teachers.

2.28: An overview of review of related literature:

The review of previous studies indicated that although a number of research studies were conducted on various aspects of creativity in India and abroad, no study regarding 'creativity in teaching' for B. Ed. student teachers was conducted.

The researcher is aware that present review is not much exhaustive. But it is helpful to have an idea of general trends of study in the field of creativity and their findings.

From the number of studies reviewed, it is evident that the major thrust is on finding the correlation of creativity with social, personality variables. But nobody had tried to find the relationship between exposure
and creativity and between emotional intelligence and creativity also. This was a research gap.

Further there were many creativity development programmes applied to experimental groups and found out their effectiveness. But majority of these programmes were implemented on school students. The researcher could not find any evidence of a programme of 'creativity in teaching' particularly for B. Ed. students. Hence the researcher decided to fill this gap by preparing and conducting a programme of 'creativity of Teaching'.

In addition to that, the present study is related to one more area of creativity i.e. Testing and measurement in creativity. There are tests measuring creativity either verbal and non-verbal. Tests measuring subject specific creativity are also available. But these tests do not go beyond the 4 (product) factors of creativity i.e. Fluency, flexibility, originality and elaboration. This non-availability of test in 'creativity in teaching' had prompted the researcher to prepare a test on 'creativity in teaching'.

Thus the review had helped the researcher to select broad areas of creativity for her research and to decide the method of investigation accordingly.

Summary:

The purpose of review of literature was to get an insight into the methodology, tools, approaches used by other researchers and to study the contribution of the researchers. It has helped the researcher to decide on the procedure and tools that need to be used for the present study.
The review of related literature and researches have helped to develop the conceptual frame work for the study as well as understanding the various issues related to the problem. The researcher was able to make decisions on preparation of creativity in teaching as well as training programme to improve creativity in teaching.

"The mind of man is more intuitive than logical."

– Vauvenargues

(as cited in Khandwala, 2003, P.57)
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Chapter Three

Procedure

"We have to remember that what we observe is not nature in itself but nature exposed to our method questioning."

— Werher Heisenberg

(as cited in Moncur, 1995-2005)
3.01 : Introduction

This chapter deals with the process of selection of research methods, selection of tools for data collection, development of the questionnaire, its finalisation process, classification of data and method of data collection.

3.02 : Selection of method

The statement of the problem was –

"A survey of status of student teachers of University of Pune regarding their creativity in teaching with a view to improving the same through a training programme and testing its effectiveness with special reference to College of Education, Sangamner from Ahmednagar district."

As mentioned in the statement, the researcher was interested in getting acquainted with the status of creativity in teaching of student teachers'. So it was essential to get the present day representative picture of student teachers' creativity in teaching of B. Ed. colleges affiliated to University of Pune. For that a survey method was found proper.

The statement itself also indicates that 'to improve/develop creativity in teaching through a training programme' is a core part of the research. It meant, studying the change in the existing performance of CIT due to some new programme was essential. Hence the experimental method had become a mandatory part of this study. Thus this study was based on survey and experimental method. This chapter deals mainly with a procedure of survey in detail. The discussion about the experiment is given in Chapter Five.

The actual survey included following decisions and followed by necessary actions –
1. Preparation of tools
2. Try out and finalisation of tools.
3. Marking scheme
4. Time of survey
5. Selection of sample
6. Administration of the Test of Creativity in Teaching (TCIT)
7. Analysis and interpretation of data and data collection

3.03 : Tool Preparation

Initially a search for standardized test of creativity in teaching was undertaken. But the researcher could not find any such test. From a teacher educator, working in a college of Education in Pune, the researcher received a verbal form of Torrance test of creative thinking (Marathi version). (Appendix C). Torrance’s test measures only four factors as pointed out in Chapter Two. They are fluency, flexibility, originality and elaboration. Also it is generic.

In an operational definition of creativity in teaching, it was mentioned that, "There is a presence of creativity in teaching; when a teacher makes use of his competencies such as openness, sensitivity to the problem, fluency, flexibility, originality, elaboration, redefinition and resourcefulness, while discharging his duties as a facilitator of learning process. So the researcher decided to construct a paper pencil test which would measure all the competencies mentioned in the operational definition of creativity in teaching.

The researcher was interested in measuring emotional intelligence of experimental and control groups. Hence a web search of the test measuring emotional intelligence was undertaken. The researcher got a test of EQ
prepared by Goleman and others. It was downloaded and translated into Marathi. Both are given in Appendix D.

3.04 : Development of Test of Creativity in Teaching (TCIT)

The steps included in development of TCIT are as depicted in the flow chart:

FLOW CHART 3 : Development of Test of Creativity in Teaching (TCIT)

3.05 : Process of tool preparation and Pre-pilot

Initially, it was decided that before measuring creativity in teaching of student teachers, a measurement of creativity in teaching in case of secondary school teachers (in service teachers) may become helpful as a benchmarking. The idea of where the secondary school teachers are on a scale of creativity in teaching would become useful to construct the test items properly for B. Ed. student teachers.
Two decisions were taken before the constructions of test items:

1. The context should be 'teaching-learning process'.
2. The questions should be of open ended type. Hence no fixed time to answer. Time should be as per requirement.

The test was divided into four parts. First three parts were common to all whereas the last part was subject specific. As usual, the first part consisted of questions seeking general information. The second part was related to professional development. Through the third part, i.e. through 18 questions (rather stimulus) eight factors of creativity in teaching were measured. In addition to this there was the fourth part measuring the same factors in the context of their teaching subjects. (Appendix E)

The reason behind was, though creativity is subject neutral, it should be measured in two parts. Part three would test all the factors of creativity in teaching in general and the fourth part would test all the factors of TCIT but in the context of a particular teaching subject. So there would be a counter checking also.

This test was shown for consultation to some experienced high school teachers, teacher educators, school head masters, who themselves were innovative (List of experts - Appendix F). According to their suggestions, some questions were modified. Initially it was decided that this should be treated as pilot testing. But after the feedback it was decided as a pre-pilot. The modified test was given to 37 high school teachers from Sangamner. Head master of each school gave the researcher the names of teachers whom they considered as creative.
3.06 : Feedback from Pre-pilot

When the responses were read and analysed, the researcher learnt the followings things:

1. The researcher realised that every question measures more than one factor of creativity in teaching. Fluency, flexibility (and hence originality) were the factors that were measured by almost every question. This caused difficulties in assessing.

2. Every teacher took at least five days to write it fully because it consisted of 30-35 questions included in two parts besides general and professional information. It was thought that it might become lengthy for B. Ed. students to ask them to fill the questionnaire in two or three hours.

3. The basic assumption was creativity is subject neutral. Hence process aspects of it should be focused. The process of creative thinking plays key role in teaching creatively. If this was so, separate questions on each subject were of no worth.

4. The most important thing the researcher realised is the need of resolving each factor into its dimensions and also to find out the acute differences in them.

3.07 : Actions taken according to feedback of Pre-pilot

Initially the researcher tried to establish the interrelationship between factors of creativity in teaching (Figure 11). It is given in Chapter Two on Page No. 76.
These factors are then resolved into number of dimensions to get clarity of each factor. It is given in Chapter II/Section I. (Page No. PP.72-75)

Then referring to the above mentioned dimensions, the test measuring 'creativity in teaching' was prepared. It was made up of two parts. All the questions were kept open ended.

3.08 : The final version of Test of Creativity in Teaching (TCIT)
This test was made up of 3 parts. This final version of TCIT is given in Appendix G with its English translation.

Part I : General profile of students.
Part II : Information related to their exposure.
Part III : Items of creativity in teaching.

Part I i.e. general profile consists of name, age, sex, educational qualifications, computer literacy, teaching experience, upbringing and education of parents.

Part II - creativity being a function of exposure to various experiences, questions seeking the information, related to hobbies, participation in various social activities etc. were included.

Part III - There are in all 22 questions based on various factors of creativity in teaching as mentioned in operational definition.

Questions of Part III were framed to measure a particular dimension of creativity in the context of teaching.
While framing the questions, emphasis was given on 'process' aspect since the researcher needed to measure 'divergent thinking', all the questions were kept open-ended.

3.09 : Pilot Testing

This test was given to 29 D. Ed. (Sr.) students. It took 2 and ½ hours to write all the answers. No time limit was set before the students. The test was given on 5th July 2004. It was observed that students liked to answer such kind of questions. Most of them responded in detail.

Most of them were found open minded and keen to answer. On the next day i.e. on 6th July 2004, the researcher gave them 'Torrance Test of Creative Thinking' (TTCT) verbal form. Students responded well to these questions also.

3.10 : Reliability and validity of data :

TCIT was developed with great care and by following the procedure of development of an effective tool. It was checked by experts. It was finalised by two tryouts and after discussion with experts. This ensured the content validity of the data. Validity was established by computing the correlation between the total creativity scores obtained by D.Ed. student teachers on TTCT and the creativity test constructed by the investigator. It was found to be, $r = 0.51$.

Reliability of a test as calculated by split half method is $r = 0.81$. 
Same set of instruction was consistently given. There was no difficulty for student teachers in answering TCIT. As expected, some respondents raised doubt about ‘Teacher resource center’. As discussed with experts, the Marathi word for it was given to student teachers. There was a question No.2.10 related to social activities. It was thought that it was not based on the experiences of school and college days directly. Hence this question was excluded from scoring.

Thus the random sampling method, care taken while administering TCIT, helped the researcher to obtain a valid and reliable data for further analysis. The researcher had decided to approach the colleges of education affiliated to University of Pune which were existing in June 2004 i.e. at the start of academic year 2004. In academic year 2004-05, upto October 2004, some 5-6 new colleges have opened. So the researcher approached to the colleges and all the colleges responded positively.

However, the researcher tried to collect data from two newly opened colleges of Education also. The researcher surveyed in all fifteen B. Ed. colleges. Sample selected was a random sample consisting of 25% of the population.

3.11 : Time of Survey

Survey was conducted in the Colleges of Education affiliated to University of Pune. It was decided that survey should be conducted in the first half of academic year so that during the second half experiment could be conducted. But in academic year 2004-05, the admission process was delayed and it finished in the last week of August (and first week of
September in some colleges). Hence, actual survey was conducted from 23rd Aug. 2004 to 30th Oct. 2004 and again in Dec. 2004. The details are enlisted in Appendix H.

Selection of Sample: The population consisted of students doing B. Ed. course in colleges of Education, affiliated to University of Pune through Marathi medium in year 2004-05. The researcher decided to get a random sample of 25% of student teachers from every college of education.

3.12: Administration of questionnaire

All the colleges of Education affiliated to University of Pune were contacted. Principals of the colleges were requested to co-operate with the work. Prior permission for the administration of the questionnaire was obtained and dates were fixed.

As mentioned in 3.11, the major part of the survey was carried out during 23rd Aug. 2004 to 30th Oct. 2004 and rest of the work was carried out in Dec. 2004.

Test of CIT was given in a single session. It was not a time test. So students were informed to take as much time as they wanted. It was observed that normally students used 90 to 150 minutes to respond to the test. In the design, one more control group from B. Ed. College, Shrirampur was decided. So in addition to TCIT, test of emotional intelligence and of Torrance were administered at Shrirampur and Sangamner also.

3.13: Experiences in data collection
When the researcher visited various B. Ed. colleges for data collection, almost all colleges co-operated well. Student teachers in each and every college responded well. Tendency of skipping the last questions or copying of answers or not attempting seriously was found very rarely.

Four experienced student teachers found this test very 'essential' for 'would be teachers'. The student teachers were found eager to know about the scoring and further action after the survey. One student teacher from a college was not selected in a random sample. But he was interested in attempting a test. He was allowed to respond. But it was not included in the data of 429. One student teacher gave her residential address and asked the researcher to inform her score after the checking of answers. The researcher found that twelve student teachers from the sample who were not known the meaning of a phrase ‘पारावार न उरणे’. The shocking fact was that out of these twelve student teachers seven were from Marathi method. Some student teachers liked the last passage of Neils Bohr and they asked it for personal collection. All this reflects student teacher's positive attitude. But it was not reflected in administration aspect of colleges. Before the visit to college, the dates and timings were fixed. But in case of more than 50% colleges of education, the researcher found that because of either communication gap or weak planning there was a delay of one or two hours to start the test. Once it started, everywhere ample time was provided.

It was also found that from these 15 colleges hardly one or two staff members had shown curiosity about the test, about the research study.
The researcher got a chance to visit about 75% B. Ed. colleges of University of Pune, either grantable or of no grant basis; either having a long tradition or newly opened. The researcher observed library, time table, lesson notes of demonstration lessons displayed on the notice boards. She got a chance to witness the interaction of teacher educators with students, interaction among teacher educators in a staff room also.

More or less, the conservative, authoritarian atmosphere was found everywhere supporting the present status of teacher education as mentioned in Chapter One.

Summary:

In this chapter, the researcher has described the procedure of the survey and development of tools of the survey. It has presented the details of the survey, development of the tools and their validation. It described the pilot testing of the tools for the survey and the process of implementation of the survey. Qualitative and quantitative analysis of data collected during the survey is given in Chapter IV.

"Not everything that can be counted counts; and not everything that counts can be counted."

– Einstein (as cited in Taylor, 2006)

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Chapter Four
Profile of Student Teachers

"The important thing in research is not so much to obtain new facts as to discover new ways of thinking about them."

— William Bragg

4.00 : Introduction

This chapter deals with an analysis of profile of student teachers. It also attempts to find out the interrelation between the variables included in the profile and also with creativity in teaching and exposure score.

This chapter is made up of two sections:

Section I - It deals with general profile of student teachers.
Section II - It consists of testing the significance of relationship between profile variables.

4.01 : Survey of B. Ed. colleges

The researcher visited in all 16 B. Ed. colleges affiliated to University of Pune. The researcher randomly selected 25% of the student teachers from total number of Marathi medium student teachers present on the day of data collection in each college.

During the first term of the academic year 2004-05, six B. Ed. colleges were opened newly. The researcher had decided to include only those colleges which were existing in June 2004. So the researcher surveyed all
such fourteen colleges where Marathi medium B. Ed. students were learning. However, the researcher also surveyed two of the newly opened colleges. One of them was College of Education, Kopergaon. The college authorities of Kopergaon co-operated well for data collection, whereas the college authorities of Yeola (another newly opened college) could provide only 30-35 minutes to the student teachers to fill the questionnaire. Normally it was found that student teachers required 90 to 150 minutes to fill up the whole questionnaire. In 30-35 minutes, student teachers could fill only 25-30% part of the whole questionnaire, so it was of no worth. Hence the incomplete data from Yeola was excluded from analysis.

College of Education, Sonai (a newly opened college) could not fix the time for this job because of their busy schedule and late admissions.

So considering the problems of newly opened colleges related to time management and late admissions, the researcher had decided to confine her survey to the above mentioned fifteen colleges only.

The data gathered was of 429 student teachers. It was formed from data on TCIT test collected from 15 colleges. 25% student teachers were randomly selected from each college. The total number of student teachers turned out to be 429. A point to be noted is, College of Sangamner and Shrirampur had each batch of 80 students. These all students were given TCIT. From them in 429, only 25% student teachers selected randomly from Sangamner and Shrirampur were included.
4.02 : General Profile of student teachers

As mentioned in the previous chapter, Part I of the test consisted of items related to general profile of student teachers.

Profile - meaning an 'outline' or overall idea, the items included in general profile helped to have an overall and representative picture of student teachers of University of Pune. The general profile consisted of items regarding age, sex, academic background, previous teaching experience, locale of high school education, academic background of parents and ability to use information communication technology.

The objectives of profile analysis were:

1) To get acquainted with identity of student teachers.
2) To identify the variations or the range in case of various profile variables.
3) To get acquainted with the homogeneity of group in case of creativity in teaching and in case of exposure.
4) To find out the inter-relation among various profile variables.
5) To find out inter-relation among various profile variables and exposure and among various profile variables and creativity in teaching.

The data used for profile analysis is given in Appendix I.

4.03 : Overall Picture at a glance

The Pie Chart 1 shows the break up of student teachers in the light of a particular single aspect. These nine aspects are termed as a, b, c, .... upto I.
PIE CHART
4.03(a) Description (A) - Genderwise distribution:

TABLE 19

<table>
<thead>
<tr>
<th>Females</th>
<th>Males</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>215</td>
<td>214</td>
</tr>
<tr>
<td>%</td>
<td>50.12%</td>
<td>49.88%</td>
</tr>
</tbody>
</table>

The table above shows that there were 215 (50.12%) female and 214 (49.88%) male student teachers from total sample of 429 student teachers. The number and percentage of male and female student teachers show that they were almost equal.

4.03(b) : Localitywise break-up

TABLE 20

<table>
<thead>
<tr>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>253</td>
<td>176</td>
</tr>
<tr>
<td>%</td>
<td>58.97%</td>
<td>41.03%</td>
</tr>
</tbody>
</table>

The table above indicates that rural student teachers (253 i.e. 58.97%) were more than urban student teachers (176 i.e. 41.03%). This maybe due to more career options available in urban area as compared to rural area.

4.03(c) : Facultywise distribution

TABLE 21

<table>
<thead>
<tr>
<th>Arts</th>
<th>Commerce</th>
<th>Science</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>275</td>
<td>12</td>
<td>142</td>
</tr>
<tr>
<td>%</td>
<td>64.10%</td>
<td>2.8%</td>
<td>33.10%</td>
</tr>
</tbody>
</table>
The table 21 shows that more than half (275 i.e. 64.10%) student teachers belonged to Arts faculty. Then 142 (33.10%) were from science faculty. Very few i.e. 12 (2.8%) were from commerce stream. In every college, student teachers were selected through random sampling. The considerable difference in number of student teachers belonging to Arts, Science and Commerce faculty lies in facultywise distribution mentioned in the admissions guidelines by Govt. of Maharashtra (Appendix J).

Student teachers from 'Arts' faculty are graduates of either languages (Marathi, Hindi or English) or social science (History, Geography) or other non-school subjects like Psychology, Philosophy, Politics, Economics etc. So it is obvious/natural that they were more in number in the sample.

Student teachers from 'Science' faculty were graduates of either life sciences or physical sciences and Mathematics or Statistics. So they have occupied the second position.

Since commerce not being a secondary school subject, only 5% seats are allotted to them in every B. Ed. college in Maharashtra. So the number of commerce student teachers was very less in the sample.

4.03(d) : **Number of graduate and post-graduate student teachers**

<table>
<thead>
<tr>
<th></th>
<th>Graduate</th>
<th>Post Graduate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>213</td>
<td>216</td>
<td>429</td>
</tr>
<tr>
<td>%</td>
<td>49.65%</td>
<td>50.35%</td>
<td>100%</td>
</tr>
</tbody>
</table>
The table 22 indicates that the total number of graduate (213 i.e. 49.65%) and post graduate (216 i.e. 50.35%) student teachers was almost equal.

4.03(e) : Age group wise distribution

**TABLE 23**

Age group wise distribution of the sample

<table>
<thead>
<tr>
<th></th>
<th>Age range 20-22 yrs.</th>
<th>Age range 23-25 yrs.</th>
<th>Above 25 yrs.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>130</td>
<td>230</td>
<td>69</td>
<td>429</td>
</tr>
<tr>
<td>%</td>
<td>30.30%</td>
<td>53.61%</td>
<td>16.09%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The table 23 shows that larger part i.e. more than 50% (53.61%) of student teachers belonged to age group 23-25 years.

Below that there were student teachers from age group 20-22 (30.30%). Very few student teachers (16.09%) were above the age of 25 years.

4.03(f) : About computer literacy

**TABLE 24**

Computer literacy of the sample

<table>
<thead>
<tr>
<th></th>
<th>Computer literacy</th>
<th>Computer illiteracy</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>300</td>
<td>129</td>
<td>429</td>
</tr>
<tr>
<td>%</td>
<td>69.93%</td>
<td>30.07%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Computer literacy of a student teacher was considered as 'A person is said to be computer literate when he performs at least the basic operations using computer.' Basic operations consist of opening and saving a file, word processing and tabulating the data.
The table 24 given indicates that upto two third (300 i.e. 69.93%) of total number of student teachers (429) were computer literate.

The range of their computer literacy varies from MS-CIT qualified to diplomas in Advanced computing, hardware, computer applications etc.

4.03(g) : Use of Internet

<table>
<thead>
<tr>
<th>Use of Internet</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasional</td>
<td>429</td>
</tr>
<tr>
<td>Regular</td>
<td>37</td>
</tr>
<tr>
<td>No use</td>
<td>321</td>
</tr>
</tbody>
</table>

The table 25 shows that very few student teachers (37 i.e. 8.62%) make use of internet regularly. Seventy one (16.55%) student teachers make occasional use of internet whereas upto two third (321 i.e. 74.83%) of total 429 student teachers do not use internet.

The reason may be more number of student teachers were from rural area and they may not have this facility at their place. The another possibility may be they may not have acquainted with 'Net surfing' either or may not have realized the strength of this technology.

4.03(h) : Experience of teaching in case of student teachers

<table>
<thead>
<tr>
<th>Experience</th>
<th>No experience</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>150</td>
<td>429</td>
</tr>
<tr>
<td>%</td>
<td>34.97%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>279</td>
<td></td>
</tr>
</tbody>
</table>
The table 26 shows that student teachers having no experience of teaching (279 i.e. 65.03%) were far more than the student teachers having experience (150 i.e. 34.97%).

From 150 experienced student teachers, most of the student teachers were having an experience of teaching in private tuition classes.

4.03(i) : Parent's academic background

**TABLE 27**

**Student teachers' parents' academic background**

<table>
<thead>
<tr>
<th></th>
<th>Both illiterate</th>
<th>Mother illiterate</th>
<th>Both educated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>60</td>
<td>152</td>
<td>217</td>
<td>429</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>13.99%</td>
<td>35.43%</td>
<td>50.58%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The table 27 indicates that about half of the parents (217 i.e. 50.58%) of student teachers were educated. There is a considerable amount of illiteracy of mothers (152 i.e. 35.43%). A number 60 (13.99%) of both mother and father illiterate indicates that 13.99% student teachers were from first generation learners of their family.

A break up of parental education may become helpful to have an idea about parent's academic background. It is as follows:

**TABLE 28**

**Break-up of parental education**

<table>
<thead>
<tr>
<th>Both illiterate</th>
<th>Mother illiterate</th>
<th>Primary (upto 4th std.)</th>
<th>Secondary upto S.S.C.</th>
<th>Above S.S.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>M</strong></td>
<td><strong>F</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td>60</td>
<td>152</td>
<td>26</td>
<td>31</td>
<td>115</td>
</tr>
<tr>
<td>13.99%</td>
<td>35.43%</td>
<td>6.06%</td>
<td>7.22%</td>
<td>26.81%</td>
</tr>
</tbody>
</table>

M - Mother       F - Father
The table 28 shows that number of mothers (115) educated upto secondary level was more whereas above 50% (i.e. 54.08%) fathers got higher education. No case like mother educated but father illiterate was found.

The above analysis may help to have a primary guess about student teachers.

A student teacher ..... 

a) is mostly having rural upbringing.

b) is mostly computer literate but not using internet.

c) majority represents 'Arts' faculty or science faculty but rarely commerce faculty.

d) mostly having educated parents or at least a single parent educated.

e) mostly do not have previous teaching experience.

f) may be a graduate or post-graduate.

g) mostly represents an age group of 23-25 years.

But this should be treated as a primary estimate.

A more deep look may give a clear idea about student-teachers. For that a combined picture of more than two variables and its analysis is necessary. A classification based on more than one criterion is necessary for that. It is possible to classify all 429 students on these nine aspects at a time. But it may become complicated to present and to interpret also.

So the basic aspects of any general information i.e. gender, faculty, age group and locale were treated as a core part of the profile. In addition to this core part, one aspect was considered at a time and analysis was made.
4.04 : In depth Analysis  
a) Classification on the basis of core part
RF - Rural Female,  RM - Rural Male,  UM - Urban Male,  UF - Urban Female

TABLE 29
Classification of Arts student teachers

<table>
<thead>
<tr>
<th>Arts student teachers - 275 (64.10%)</th>
<th>age group 20 - 22 years</th>
<th>23 - 25 years</th>
<th>above 25 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 (30.91%)</td>
<td>149 (54.18%)</td>
<td>41 (14.91%)</td>
<td></td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
<td>UF</td>
<td>UM</td>
</tr>
<tr>
<td>27</td>
<td>22</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>9.82%</td>
<td>8%</td>
<td>10.91%</td>
<td>2.18%</td>
</tr>
</tbody>
</table>

TABLE 30
Classification of Science student teachers

<table>
<thead>
<tr>
<th>Science student teachers - 142 (33.10%)</th>
<th>age group 20 - 22 years</th>
<th>23 - 25 years</th>
<th>above 25 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>42 (29.58%)</td>
<td>74 (52.11%)</td>
<td>26 (18.31%)</td>
<td></td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
<td>UF</td>
<td>UM</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>10.56%</td>
<td>4.23%</td>
<td>9.15%</td>
<td>5.63%</td>
</tr>
</tbody>
</table>

TABLE 31
Classification of Commerce student teachers

<table>
<thead>
<tr>
<th>Commerce student teachers - 12 (2.8%)</th>
<th>age group 20 - 22 years</th>
<th>23 - 25 years</th>
<th>above 25 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 (33.33%)</td>
<td>6 (50%)</td>
<td>2 (16.67%)</td>
<td></td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
<td>UF</td>
<td>UM</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>33.33%</td>
<td>-</td>
</tr>
</tbody>
</table>
Observations and analysis:

If table Nos. 29, 30 & 31 are considered combinedly it reveals that rural male student teachers were highest in number, (160 i.e. 37.30%) followed by urban female student teachers (121 i.e. 28.21%). Urban male student teachers were the least in number (55 i.e. 12.82%). This may be due to more career options available in urban area compared to rural area. But these options seems to have failed to attract urban female student teachers. The reason behind might be the tendency of female graduates to choose a secured job option than any challenging or more demanding career options.

All the three tables show that for each faculty, maximum number of student teachers were from age group 23-25 years. Since the number of commerce students was too small; it was not included in further analysis and discussion.

If the age group of 20-22 years for both arts and science faculties is considered, it can be seen that sum of rural and urban female student teachers was more (or twice) than rural and urban male student teachers. The reason may be that instead of further post graduate education, female student teachers get admitted to B. Ed. course.

In age group of 23-25, the situation gets reversed i.e. total of rural and urban male student teachers was greater than the total of rural and urban female student teachers. For the student teachers of age group of 23-25, there is a possibility of completion of their post graduate courses before admitting to B. Ed. course. This opportunity is denied in many cases to female student teachers, because of some social reasons.
If an age group of 'above 25' years is considered, rural males are more in number in case of Arts faculty whereas urban females are more in case of science faculty.

b) Classification - core part + G/PG

**TABLE 32**

Classification of Arts Graduate student teachers

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
<th>Graduate - 111 (40.36%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group 20-22 (56) (20.37%)</td>
<td>age group 23-25 (49) (17.82%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
</tr>
<tr>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>6.91%</td>
<td>5.45%</td>
</tr>
</tbody>
</table>

**TABLE 33**

Classification of Arts Post Graduate student teachers

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
<th>Post graduate 164 (59.64%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group 20-22 (29) (10.55%)</td>
<td>age group 23-25 (100) (36.36%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>2.90%</td>
<td>3.27%</td>
</tr>
</tbody>
</table>

**TABLE 34**

Classification of Science Graduate student teachers

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
<th>Graduate 97 (68.31%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group 20-22 (45) (31.69%)</td>
<td>age group 23-25 (46) (10.72%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>9.86%</td>
<td>3.52%</td>
</tr>
</tbody>
</table>
TABLE 35
Classification of Science Post Graduate student teachers

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post graduate 45 (31.69%)</td>
</tr>
<tr>
<td>age group 20-22 (7) (4.93%)</td>
</tr>
<tr>
<td>RF</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0.7%</td>
</tr>
</tbody>
</table>

The table Nos. 32, 33, 34 & 35 indicate that for both the faculties, graduate student teachers were more from age group 20-22 years where as post graduate student teachers were greater in number in case of age group 23-25 years and it is obvious.

If the graduate student teachers from both the faculties is considered, it reveals that rural student teachers (128) were more in number than urban student teachers (80). The same thing can be observed in case of post graduate arts student teachers. (rural student teachers - 100, urban student teacher - 62). But the case was reversed in case of post graduate science students -teachers. Rural post graduate science student teachers were 20 where as urban post graduate science student teachers were 25. The reason behind may be there are more facilities of post graduation in 'Arts' than science in rural area.
### TABLE 36

**Classification of experienced-Arts student teachers**

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Having experience of teaching (94) (34.18%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>age group 20-22 yrs.</strong></td>
<td><strong>age group 23-25 yrs.</strong></td>
<td><strong>above 25 yrs.</strong></td>
</tr>
<tr>
<td>25 (9.09%)</td>
<td>50 (18.18%)</td>
<td>19 (6.91%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
<td>UF</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>1.82%</td>
<td>1.45%</td>
<td>4.73%</td>
</tr>
</tbody>
</table>

### TABLE 37

**Classification of non-experienced Arts student teachers**

<table>
<thead>
<tr>
<th>ARTS 275</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No Teaching Experience (181) (65.82%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>age group 20-22 yrs.</strong></td>
<td><strong>age group 23-25 yrs.</strong></td>
<td><strong>above 25 yrs.</strong></td>
</tr>
<tr>
<td>60 (21.82%)</td>
<td>99 (36%)</td>
<td>22 (8%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
<td>UF</td>
</tr>
<tr>
<td>22</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>8%</td>
<td>6.55%</td>
<td>6.18%</td>
</tr>
</tbody>
</table>

### TABLE 38

**Classification of experienced-Science student teachers**

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Having experience of teaching (54) (38.03%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>age group 20-22 yrs.</strong></td>
<td><strong>age group 23-25 yrs.</strong></td>
<td><strong>above 25 yrs.</strong></td>
</tr>
<tr>
<td>8 (5.63%)</td>
<td>31 (21.83%)</td>
<td>15 (10.56%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
<td>UF</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>1.41%</td>
<td>0.7%</td>
<td>2.82%</td>
</tr>
</tbody>
</table>
TABLE 39

Classification of non-experienced Science student teachers

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Teaching Experience (88) (61.97%)</td>
</tr>
<tr>
<td>age group 20-22 yrs.</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>34 (23.94%)</td>
</tr>
<tr>
<td>RF 13</td>
</tr>
<tr>
<td>9.15%</td>
</tr>
<tr>
<td>RM 6</td>
</tr>
<tr>
<td>4.23%</td>
</tr>
<tr>
<td>RM 1</td>
</tr>
<tr>
<td>0.7%</td>
</tr>
<tr>
<td>UF 19</td>
</tr>
<tr>
<td>9.15%</td>
</tr>
<tr>
<td>RF 7</td>
</tr>
<tr>
<td>4.93%</td>
</tr>
<tr>
<td>RM 5</td>
</tr>
<tr>
<td>0.7%</td>
</tr>
</tbody>
</table>

It is prominent from the above tables that experienced student teachers in both the faculties were in majority from age group of 23-25 years. Same is the trend in case of inexperienced student teachers.

Rural experienced student teachers from arts (54) were more in number than urban experienced student teachers (40) from the same faculty whereas urban experienced student teachers from Science (30) were more in number than rural experienced student teachers (24) of the same faculty.

TABLE 40

Classification of computer literate Arts student teachers

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer literate (172) (62.55)</td>
</tr>
<tr>
<td>age group 20-22 yrs.</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>54 (19.64%)</td>
</tr>
<tr>
<td>RF 17</td>
</tr>
<tr>
<td>6.18%</td>
</tr>
<tr>
<td>RM 12</td>
</tr>
<tr>
<td>4.36%</td>
</tr>
<tr>
<td>RM 18</td>
</tr>
<tr>
<td>6.55%</td>
</tr>
<tr>
<td>UF 9</td>
</tr>
<tr>
<td>4.32%</td>
</tr>
<tr>
<td>UM 6</td>
</tr>
<tr>
<td>1.82%</td>
</tr>
</tbody>
</table>
### TABLE 41
Classification of computer illiterate Arts student teachers

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Computer literate (103) (37.45%)</td>
</tr>
<tr>
<td>age group 20-22 yrs.</td>
</tr>
<tr>
<td>31 (11.27%)</td>
</tr>
<tr>
<td>RF</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>3.64%</td>
</tr>
</tbody>
</table>

### TABLE 42
Classification of computer literate Science student teachers

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer literate (117) (82.39%)</td>
</tr>
<tr>
<td>age group 20-22 yrs.</td>
</tr>
<tr>
<td>35 (24.65%)</td>
</tr>
<tr>
<td>RF</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>7.75%</td>
</tr>
</tbody>
</table>

### TABLE 43
Classification of computer illiterate Science student teachers

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Computer literate (25) (17.61%)</td>
</tr>
<tr>
<td>age group 20-22 yrs.</td>
</tr>
<tr>
<td>7 (4.93%)</td>
</tr>
<tr>
<td>RF</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>2.82%</td>
</tr>
</tbody>
</table>
From the above tables, it is clear that computer literacy is more in case of science student teachers than arts student teachers.

Total computer literate rural student teachers (from both the faculties) were 157 (62.05% of total rural student teachers) whereas total computer literate urban student teachers (from both the faculties) were 132. (75% of total urban student teachers). This shows that total urban student teachers from both the faculties were more in number than total rural student teachers of both the faculties.

There is slight difference in computer literacy of female and male student teachers belonging to both faculties (66.82% of male student teachers and 67.9% of female student teachers were found computer literate).

<table>
<thead>
<tr>
<th>TABLE 44</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasional net users - Arts student teachers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasional use of Internet (37) (13.45%)</td>
</tr>
<tr>
<td>age group 20-22 yrs</td>
</tr>
<tr>
<td>10 (3.64%)</td>
</tr>
<tr>
<td>RF</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>0.73%</td>
</tr>
</tbody>
</table>
### TABLE 45

**Regular net users - Arts student teachers**

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
<th>Regular use of Internet (15) (5.45%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group 20-22 yrs.</td>
<td>age group 23-25 yrs.</td>
</tr>
<tr>
<td>5 (1.82%)</td>
<td>7 (2.55%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1.45%</td>
<td>0.73%</td>
</tr>
</tbody>
</table>

### TABLE 46

**Arts student teachers - not using net**

<table>
<thead>
<tr>
<th>ARTS student teachers - 275</th>
<th>No use of Internet 223 (81.09%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group 20-22 yrs.</td>
<td>age group 23-25 yrs.</td>
</tr>
<tr>
<td>70 (25.45%)</td>
<td>119 (43.27%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
</tr>
<tr>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>8.72%</td>
<td>5.8%</td>
</tr>
</tbody>
</table>

### TABLE 47

**Occasional net users - Science student teachers**

<table>
<thead>
<tr>
<th>SCIENCE student teachers - 142</th>
<th>Occasional use of Internet (30) (21.13%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group 20-22 yrs.</td>
<td>age group 23-25 yrs.</td>
</tr>
<tr>
<td>6 (4.23%)</td>
<td>17 (11.97%)</td>
</tr>
<tr>
<td>RF</td>
<td>RM</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>1.4%</td>
<td>-</td>
</tr>
</tbody>
</table>
TABLE 48

Regular net users - Science student teachers

<table>
<thead>
<tr>
<th>Age Group</th>
<th>No.</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-22 yrs.</td>
<td>5</td>
<td>3.52%</td>
</tr>
<tr>
<td>23-25 yrs.</td>
<td>11</td>
<td>7.75%</td>
</tr>
<tr>
<td>Above 25 yrs.</td>
<td>6</td>
<td>4.23%</td>
</tr>
</tbody>
</table>

The data in the above tables show that occasional users of internet were more in number in case of science student teachers (21.13%) of total science student teachers) as compared to arts student teachers (13.45% of total arts student teachers)

Similarly regular users of internet were also more in number in case of science student teachers (15.49% of total science student teachers) as compared to arts student teachers (5.45% of total arts student teachers).

TABLE 49

Science student teachers - not using net

<table>
<thead>
<tr>
<th>Age Group</th>
<th>No.</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-22 yrs.</td>
<td>31</td>
<td>21.83%</td>
</tr>
<tr>
<td>23-25 yrs.</td>
<td>46</td>
<td>32.39%</td>
</tr>
<tr>
<td>Above 25 yrs.</td>
<td>13</td>
<td>9.15%</td>
</tr>
</tbody>
</table>

The data in the above tables show that occasional users of internet were more in number in case of science student teachers (21.13%) of total science student teachers) as compared to arts student teachers (13.45% of total arts student teachers)
It was found that occasional users of internet from both the faculties were more in case of rural student teachers (37) as compared to urban student teachers (30).

This situation is reversed when the number of regular internet users from both rural and urban areas was found. Regular users of internet from both the faculties were more in case of urban teachers (22) as compared to rural student teachers (15).

It was also found that in any case and in both the faculties, i.e. either regular, occasional or no use, the number of student teachers in the age group (23-25) was equal to or greater than the sum of numbers of student teachers from age groups 20-22 years and above 25 years.

4.05 : The sample of student teachers had following characteristics :

1. Rural male student teachers were highest in number. Below that were the urban female student teachers.

2. Arts faculty had more rural student teachers than science faculty.

3. Percentage of post graduation in case of arts students teachers was more than percentage of post graduation in case of science student teachers.

4. Percentage of computer literacy and use of internet is more in case of science student teachers as compared to arts student teachers.
SECTION – II

4.06 : Variables of general profile

As mentioned in previous section sex, age, place of upbringing, academic background, parents education, previous experience and competency in handling ICT were some basic variables on which a primary introduction of student teachers can be made. All these are variables beyond the control of teacher education institution. These variables are inter-related and it was explained in Section I to some extent.

4.07 : Rationale behind hypothesis testing

One of the objectives of this study as stated in Chapter First was to find out the relationship between exposure and creativity in teaching. Two research questions related to the faculty and gender of student teacher and their creativity in teaching were also raised in Chapter First. To answer these questions, hypothesis testing was undertaken in this section.

As mentioned in Chapter Two, the relationship between creativity and various social factors is established through previous researches. Through this survey the researcher has tried to find out the relationship of creativity in teaching with the core factors from general profile of student teachers i.e.

\[ \begin{align*}
\text{Rural / urban upbringing} & \quad \text{Creativity in teaching (CIT)} \quad \text{Sex} \\
\text{Locale} & \quad \text{creation in teaching (CIT)}
\end{align*} \]

FIGURE 15 : Core factors and CIT
In Chapter Two, the researcher had introduced a factor- ‘exposure’ assuming that exposure is a function of social variables (Ref. operational definition of exposure on P. 29), it ultimately influences individual's creativity in teaching.

i.e.

\[ \text{Creativity in teaching (CIT)} \rightarrow \text{exposure} \rightarrow \text{Sex} \]
\[ \downarrow \]
\[ \text{Locale} \]
\[ \downarrow \]
\[ \text{Faculty} \]

**FIGURE 16 : Exposure with core factors and CIT**

Further, it was guessed by the researcher, considering the relationship between factors of creativity in teaching as mentioned in Chapter Two; that creativity in teaching would have a positive correlation with exposure. If it is so, the consequent guess was creativity in teaching and exposure both have same kind of relationship with core factors. Through hypothesis testing the researcher had verified the anticipated relationship.

The data for survey hypothesis testing is given in Appendix K.

**4.08 : About exposure and creativity in teaching**

Following table gives the mean and S.D. of scores on exposure and scores on creativity in teaching.

**TABLE 50**

<table>
<thead>
<tr>
<th>Statistical measures</th>
<th>Mean</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure</td>
<td>30.47</td>
<td>9.41</td>
</tr>
<tr>
<td>CTI score</td>
<td>29.82</td>
<td>10.43</td>
</tr>
</tbody>
</table>
The chart of means of exposure and creativity in teaching computed collegewise is attached in Appendix L.

- Lowest mean of exposure score was 22.88 whereas highest mean of exposure score was 36.15 and its standard deviation is 9.41. This shows that the means of exposure varies between $-0.81\sigma$ to $+0.61\sigma$. Hence it can be said that sample was homogenous as far as their exposure is considered.

- The lowest mean of creativity in teaching was 23.86 and the highest mean was 38.65 having standard deviation as 10.43. This shows that means of creativity in teaching varies between $-0.58\sigma$ to $+0.84\sigma$. Hence it can be said that sample was homogenous in case of creativity in teaching.

4.09 : Relationship between exposure and creativity in teaching

Exposure to various kinds of experiences leads to individual's enrichment. When the stock of experiences goes on increasing, the possibility of potential connections between them also increases. Further these vast experiences help to perceive and comprehend the situation more easily. It helps the individual to think of alternative solutions to the problem. In other words, it increases openness and hence flexibility of an individual.

The close association between exposure and creativity is found valid when a correlation between them was found out. $\gamma$ between exposure score $(X)$ and CIT $(Y)$. The data summary is
### TABLE 51

Data summary for 'r' between exposure and CIT

<table>
<thead>
<tr>
<th>Exposure score (X)</th>
<th>CIT score (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>30.46</td>
</tr>
<tr>
<td>Variance</td>
<td>88.63</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>9.41</td>
</tr>
<tr>
<td>Std. error</td>
<td>0.45</td>
</tr>
</tbody>
</table>

\[
\sum X = 13071 \quad \sum XY = 409797 \\
\sum Y = 12824 \quad \sum X^2 = 436198 \\
\sum y^2 = 429912 \quad N = 429 \\
\]

\[r = 0.45\] (for df = 427)

as mentioned in Garrett (1981) P.201 \(r\) for df 500 = 0.115 at 0.01 level.

Hence it can be said that there is significant and positive correlation between exposure and creativity in teaching.

### 4.10 : Relationship between exposure and openness

It was found that exposure is significantly correlated with creativity in teaching. Openness is decided as a factor of creativity in teaching. Since there is positive relationship between exposure and creativity in teaching it is inherent that exposure is also positively related to openness. When the correlation between both of them was computed it was found that -
Correlation between exposure (Y) and openness (X) score

The data summary is

**TABEL 52**

Data summary for Y between openness and exposure

<table>
<thead>
<tr>
<th></th>
<th>Openness score (X)</th>
<th>Exposure score (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>10.04</td>
<td>30.47</td>
</tr>
<tr>
<td>Variance</td>
<td>6.63</td>
<td>88.63</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>2.57</td>
<td>9.41</td>
</tr>
<tr>
<td>Std. error</td>
<td>0.12</td>
<td>0.45</td>
</tr>
</tbody>
</table>

\[ \sum X = 4307 \quad \sum X^2 = 46077 \]
\[ \sum Y = 13071 \quad \sum X^2 = 436189 \]
\[ \sum XY = 135819, \quad N = 429. \]

\[ r = 0.44 \quad \text{(for df = 427)} \]

as mentioned in Garrett (1981) P.201 r for df 500 = 0.115 at 0.01 level.

It can be concluded from the above result that there is a significant and positive correlation between openness and exposure.

4.11 : Testing of hypotheses

Having known the interrelations among the profile variables and also the relationship between exposure and creativity in teaching, the researcher was interested in knowing the relationship between the (a) profile variables and exposure and (b) profile variables and creativity in teaching and to test the significance.
Considering the number of variables of profile, several hypotheses can be stated. But the researcher had confined mainly to 'core part' variables.

These hypotheses were divided into two groups:

Group 1 hypotheses deal with core part variables and exposure whereas
Group 2 hypotheses deal with core part variables and creativity in teaching.

4.12 : Group One hypotheses

a$_1$) There is no significant difference in average exposure of rural and urban student teachers.

\[ i.e. \ H_0 = M_r = M_u \quad - - \text{Null hypothesis} \]

\[ H_1 = M_r \neq M_u \quad - - \text{Alternate hypothesis} \]

\[ M_r = \text{mean exposure of rural student teachers} \]

\[ M_u = \text{mean exposure of urban student teachers} \]

\[ P = 0.01 \quad t_{500} = 2.59 \]

The table 53 shows that the 't' value is not significant. It implies that there is no significant difference in means of exposure of rural and urban students. Hence the null hypothesis was retained.
b) There is a significant difference in average exposure of male and female student teachers.

The null hypothesis is \( H_0 = M_m = M_f \)

and alternate hypothesis is \( H_1 = M_m \neq M_f \)

\( M_m \) = mean exposure score of male student teachers

\( M_f \) = mean exposure of female student teachers.

<p>| TABLE 54 |
| Comparison of exposure of male and female student teachers |</p>
<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male student teachers</td>
<td>215</td>
<td>32.09</td>
<td>9.90</td>
<td>427</td>
<td>3.63</td>
</tr>
<tr>
<td>Female student teachers</td>
<td>214</td>
<td>28.84</td>
<td>8.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( P = 0.01 \quad t_{500} = 2.59 \)

The table 54 indicates that 't' value is significant. Therefore it can be said that there was significant difference in average exposure score of male and female student teachers i.e. average exposure score of male student teachers was greater than female student teachers.

Hence the null hypothesis was rejected and an alternative hypothesis was accepted.

c) There is a significant difference between mean exposure of arts, commerce and science students.

\( H_0 = M_a = M_s = M_c \) - - Null hypothesis

\( H_1 = M_a \neq M_s \neq M_c \) - - Alternate hypothesis
\[ M_a = \text{average exposure score of arts student teachers.} \]
\[ M_s = \text{mean exposure score of science student teachers.} \]
\[ M_c = \text{mean exposure score of commerce student teachers.} \]

To test this hypothesis, 't' test was applied in the following way.

**Exposure difference between Arts and Science faculty**

**TABLE 55**

Comparison of exposure of Arts and Science student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student teachers from Arts faculty</td>
<td>275</td>
<td>30.91</td>
<td>9.59</td>
<td>415</td>
<td>1.01</td>
</tr>
<tr>
<td>Student teachers from Science faculty</td>
<td>142</td>
<td>29.92</td>
<td>9.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ P = 0.01 \quad t_{500} = 2.59 \]

**Exposure difference between Arts and Commerce faculty**

**TABLE 56**

Comparison of exposure of Arts and Commerce student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student teachers from Arts faculty</td>
<td>275</td>
<td>30.91</td>
<td>9.59</td>
<td>285</td>
<td>1.43</td>
</tr>
<tr>
<td>Student teachers from Commerce faculty</td>
<td>12</td>
<td>26.92</td>
<td>6.17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ P = 0.01 \quad t_{300} = 2.59 \]
Exposure difference between Science and Commerce faculty

TABLE 57

Comparison of exposure of Science and Commerce student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student teachers from Science faculty</td>
<td>142</td>
<td>29.92</td>
<td>9.25</td>
<td>152</td>
<td>1.10</td>
</tr>
<tr>
<td>Student teachers from Commerce faculty</td>
<td>12</td>
<td>26.92</td>
<td>6.17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above tables show that none of the 't' value is significant. Hence it can be concluded that there was no significant difference among the mean of exposure scores of arts, commerce and science student teachers. Hence the null hypothesis was accepted and alternate hypothesis was rejected.

There is no significant difference between average exposure of rural male student teachers and urban female student teachers.

\[ H_0 = M_{rm} = M_{uf} \] - Null hypothesis

\[ H_1 = M_{rm} \neq M_{uf} \] - Alternate hypothesis

\[ M_{rm} = \text{mean of exposure of rural male student teachers.} \]

\[ M_{uf} = \text{mean of exposure of urban female student teachers.} \]
The above table shows that 't' value is significant at 0.05 level. Hence it can be inferred that there was significant difference between average exposure of rural male and urban female student teachers.

Hence the null hypothesis was rejected and alternate hypothesis was accepted.

e1) There is significant difference between average exposure of rural female and urban male student teachers.

\[ H_0 = M_{um} = M_{rf} \quad \text{- - Null hypothesis} \]
\[ H_1 = M_{um} \neq M_{rf} \quad \text{- - Alternate hypothesis} \]

\[ M_{um} = \text{mean of exposure of urban male} \]
\[ M_{rf} = \text{mean of exposure of rural female} \]

**TABLE 59**

**Comparison of exposure of RF and UM student teachers**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural female student teachers (RF)</td>
<td>93</td>
<td>27.86</td>
<td>7.66</td>
<td>146</td>
<td>2.87</td>
</tr>
<tr>
<td>Urban male student teachers (UM)</td>
<td>55</td>
<td>31.79</td>
<td>8.60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ P = 0.01 \quad t_{150} = 2.61 \]

The above table indicates that \( t = 2.87 \) is significant. Hence it can be concluded that mean of exposure score of urban male student teachers was greater than mean of exposure score of rural female student teachers.

Hence the null hypothesis was rejected and an alternative hypothesis was accepted.
f1) There is significant difference between average exposure of rural male and rural female student teachers.

\[ H_0 = M_{rm} = M_{rf} \]  - - Null hypothesis
\[ H_1 = M_{rm} \neq M_{rf} \]  - - Alternate hypothesis

\( M_{rm} \) = Mean of exposure of rural male student teachers.

\( M_{rf} \) = Mean of exposure of urban female student teachers.

TABLE 60

Comparison of exposure of RM and RF student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural male student teachers</td>
<td>160</td>
<td>32.2</td>
<td>10.33</td>
<td>251</td>
<td>3.53</td>
</tr>
<tr>
<td>Rural female student teachers</td>
<td>93</td>
<td>27.86</td>
<td>7.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( P = 0.01 \)  \( t_{300} = 2.60 \)

The above table indicates that \( t = 3.53 \) is significant. Hence it can be inferred that mean of exposure of rural male student teachers' was greater than mean of exposure of rural female student teachers.

Hence null hypothesis was rejected and an alternate hypothesis was accepted.

g1) There is significant difference between average exposure of urban male and urban female student teachers.

\[ H_0 = M_{um} = M_{uf} \]  - - Null hypothesis
\[ H_1 = M_{um} \neq M_{uf} \]  - - Alternate hypothesis

\( M_{um} \) = Mean of exposure of urban male student teachers.
\( M_{uf} = \) Mean of exposure of urban female student teachers.

**TABLE 61**

Comparison of exposure of UM and UF student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban male student teachers (UM)</td>
<td>55</td>
<td>31.78</td>
<td>8.60</td>
<td>174</td>
<td>1.49</td>
</tr>
<tr>
<td>Urban female student teachers (UF)</td>
<td>121</td>
<td>29.59</td>
<td>9.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( P = 0.01 \quad t_{200} = 2.60 \)

The above table shows that 't' value is not significant i.e. mean of exposure score of urban male and urban female student teachers did not have any significant difference. Therefore null hypothesis was retained.

\( H_0 \) There is significant difference between average exposure of urban male and rural male student teachers.

\( H_0 = M_{um} = M_{rm} \quad - \) Null hypothesis

\( H_1 = M_{um} \neq M_{rm} \quad - \) Alternate hypothesis

\( M_{um} = \) Mean of exposure of urban male student teachers.

\( M_{rm} = \) Mean of exposure of rural male student teachers.

**TABLE 62**

Comparison of exposure of UM and RM student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban male student teachers (UM)</td>
<td>55</td>
<td>31.79</td>
<td>8.60</td>
<td>213</td>
<td>0.27</td>
</tr>
<tr>
<td>Rural male student teachers (UF)</td>
<td>160</td>
<td>32.2</td>
<td>10.33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( P = 0.01 \quad t_{300} = 2.59 \)
The table 62 shows that 't' value is not significant i.e. mean of exposure score of urban male and rural male student teachers did not have any significant difference. Therefore null hypothesis was retained.

i) There is significant difference between average exposure of rural female and urban female student teachers.

\[
H_0 = M_{rf} = M_{uf} \quad \text{- - Null hypothesis}
\]

\[
H_1 = M_{rf} \neq M_{uf} \quad \text{- - Alternate hypothesis}
\]

\[
M_{rf} = \text{Mean of exposure of rural female student teachers.}
\]

\[
M_{uf} = \text{Mean of exposure of urban female student teachers.}
\]

**TABLE 63**

Comparison of exposure of RF and UF student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean expo.</th>
<th>S.D. expo</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural female student teachers (RF)</td>
<td>93</td>
<td>27.86</td>
<td>7.66</td>
<td>212</td>
<td>1.46</td>
</tr>
<tr>
<td>Urban female student teachers (UF)</td>
<td>121</td>
<td>29.59</td>
<td>9.25</td>
<td>30</td>
<td>2.59</td>
</tr>
</tbody>
</table>

The table 63 shows that 't' value is not significant i.e. mean of exposure score of rural female and urban female student teachers did not have any significant difference. Therefore null hypothesis was retained.

4.13 Group two hypotheses

(a) There is no significant difference in average score of creativity in teaching of rural and urban student teachers.

\[
H_0 = M_u = M_r \quad \text{- - Null hypothesis}
\]

\[
H_1 = M_u \neq M_r \quad \text{- - Alternate hypothesis}
\]
$M_u = \text{mean CIT score of urban student teachers}$

$M_r = \text{mean CIT score of rural student teachers}$

**TABLE 64**

Comparison of CIT of rural and urban student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural student teachers</td>
<td>253</td>
<td>29.27</td>
<td>10.11</td>
<td>427</td>
<td>1.48</td>
</tr>
<tr>
<td>Urban student teachers</td>
<td>30.78</td>
<td>30.78</td>
<td>9.67</td>
<td>50</td>
<td>2.59</td>
</tr>
</tbody>
</table>

$P = 0.01 \quad t_{500} = 2.59$

The table 64 indicates that the 't' value is not significant. Hence, it can be said that mean CIT scores of rural and urban student teachers were same. Hence, the null hypothesis was accepted.

(b) There is a significant difference in average score of creativity in teaching of male and female student teachers.

$H_0 = M_f = M_m$ \quad - - Null hypothesis

$H_1 = M_f \neq M_m$ \quad - - Alternate hypothesis

$M_f = \text{mean CIT score of female student teachers}$

$M_m = \text{mean CIT score of male student teachers}$

**TABLE 65**

Comparison of CIT of male and female student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male student teachers</td>
<td>215</td>
<td>29.89</td>
<td>9.90</td>
<td>427</td>
<td>0.71</td>
</tr>
<tr>
<td>Female student teachers</td>
<td>214</td>
<td>30.25</td>
<td>10.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$P = 0.01 \quad t_{500} = 2.59$
The table 65 indicates that the 't' value is not significant i.e. mean CIT score of male and female student teachers do not have any significant difference. Hence, the null hypothesis was accepted and alternative hypothesis was rejected.

(c2) There is a significant difference between average score of creativity in teaching of Arts, Commerce and Science student teachers.

\[ H_0 = M_s = M_a = M_c \quad - \quad \text{- Null hypothesis} \]
\[ H_1 = M_s \neq M_a \neq M_c \quad - \quad \text{- Alternate hypothesis} \]

\( M_s = \text{mean CIT score of science student teachers} \)
\( M_a = \text{mean CIT score of arts student teachers.} \)
\( M_c = \text{mean CIT score of commerce student teachers.} \)

**TABLE 66**

<table>
<thead>
<tr>
<th>Comparison of CIT of Arts and Science student teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Student teachers from Arts faculty</td>
</tr>
<tr>
<td>Student teachers from Science faculty</td>
</tr>
</tbody>
</table>

\( P = 0.01 \quad t_{500} = 2.59 \)

**TABLE 67**

<table>
<thead>
<tr>
<th>Comparison of CIT of Arts and Commerce student teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Student teachers from Arts faculty</td>
</tr>
<tr>
<td>Student teachers from Commerce faculty</td>
</tr>
</tbody>
</table>

\( P = 0.01 \quad t_{300} = 2.59 \)
TABLE 68

Comparison of CIT of Science and Commerce student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student teachers from Science faculty</td>
<td>142</td>
<td>30.13</td>
<td>10.14</td>
<td>152</td>
<td>0.54</td>
</tr>
<tr>
<td>Student teachers from Commerce faculty</td>
<td>12</td>
<td>27.72</td>
<td>7.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P = 0.01  \( t_{200} = 2.60 \)

The values from tables 66, 67 & 68 indicates that none of the 't' value is significant i.e. there was no considerable difference in mean scores of CIT of arts, commerce and science student teachers. Hence the null hypothesis was accepted and alternate hypothesis was rejected.

\( d_2 \) There is no significant difference between average score of creativity in teaching of rural male and urban female student teachers.

\[
H_0 = M_{uf} = M_{rm} \quad \text{- - Null hypothesis}
\]

\[
H_1 = M_{uf} \neq M_{rm} \quad \text{- - Alternate hypothesis}
\]

\( M_{uf} \) = mean CIT score of urban female student teachers

\( M_{rm} \) = mean CIT score of rural male student teachers.

TABLE 69

Comparison of CIT of RM and UF student teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural male student teachers (RM)</td>
<td>160</td>
<td>30.65</td>
<td>10.51</td>
<td>279</td>
<td>1.29</td>
</tr>
<tr>
<td>Urban female student teachers (UF)</td>
<td>121</td>
<td>30.19</td>
<td>10.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P = 0.01  \( t_{300} = 2.59 \)
The table 69 indicates that the 't' value is not significant i.e. there was no significant difference between mean of CIT scores of urban female and rural male student teachers. Hence, the null hypothesis was accepted and alternative hypothesis was rejected.

(e2) There is a significant difference between average score of creativity in teaching of rural female and urban male student teachers.

\[
\begin{align*}
H_0 &= \mu_{um} = \mu_{rf} & \text{- - Null hypothesis} \\
H_1 &= \mu_{um} \neq \mu_{rf} & \text{- - Alternate hypothesis}
\end{align*}
\]

\[
\begin{align*}
\mu_{um} &= \text{mean CIT score of urban male student teachers} \\
\mu_{rf} &= \text{mean CIT score of rural female student teachers.}
\end{align*}
\]

**TABLE 70**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural female student teachers (RF)</td>
<td>93</td>
<td>28.70</td>
<td>9.29</td>
<td>146</td>
<td>0.74</td>
</tr>
<tr>
<td>Urban male student teachers (UM)</td>
<td>55</td>
<td>31.27</td>
<td>8.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
P = 0.01 \quad t_{200} = 2.60
\]

The table 70 shows that the 't' value is not significant i.e. there was no significant difference in mean of CIT in case of urban male and rural female student teachers. Hence, the null hypothesis was accepted and alternative hypothesis was rejected.
There is significant difference between average CIT score of rural male and rural female student teachers.

\[ H_0 = M_{rm} = M_{rf} \quad \text{- Null hypothesis} \]

\[ H_1 = M_{rm} \neq M_{rf} \quad \text{- Alternate hypothesis} \]

\( M_{rm} \) = Mean of CIT score of rural male student teachers.

\( M_{rf} \) = Mean of CIT score of rural female student teachers.

**TABLE 71**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural male student teachers (RM)</td>
<td>160</td>
<td>29.11</td>
<td>10.51</td>
<td>251</td>
<td>0.32</td>
</tr>
<tr>
<td>Rural female student teachers (RF)</td>
<td>93</td>
<td>29.55</td>
<td>9.29</td>
<td>30</td>
<td>0.32</td>
</tr>
</tbody>
</table>

\( P = 0.01 \)

\( t_{300} = 2.59 \)

The table 71 indicates that \( t = 0.32 \) is not significant.

Therefore it can be said that rural male and rural female student teachers did not differ significantly in case of their creativity in teaching. Hence null hypothesis was retained.

g2) There is significant difference between average CIT score of urban male and urban female student teachers.

\[ H_0 = M_{um} = M_{uf} \quad \text{- Null hypothesis} \]

\[ H_1 = M_{um} \neq M_{uf} \quad \text{- Alternate hypothesis} \]

\( M_{um} \) = Mean of CIT score of urban male student teachers.

\( M_{uf} \) = Mean of CIT score of urban female student teachers.
TABLE 72

**Comparison of CIT of UM and UF student teachers**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban male student teachers (UM)</td>
<td>55</td>
<td>30.76</td>
<td>8.21</td>
<td>174</td>
<td>0.02</td>
</tr>
<tr>
<td>Urban female student teachers (UF)</td>
<td>121</td>
<td>30.19</td>
<td>10.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ P = 0.01 \quad t_{200} = 2.60 \]

The table 72 shows that the value of \( t = 0.02 \) is not significant. Hence it can be said that there was no significant difference in the mean of CIT scores of urban male and urban female student teachers.

Thus the null hypothesis was accepted.

\( h_2 \) There is significant difference between average CIT scores of urban male and rural male student teachers.

- \( H_0 = M_{um} = M_{rm} \) - - Null hypothesis
- \( H_1 = M_{um} \neq M_{rm} \) - - Alternate hypothesis

\( M_{um} = \) Mean of CIT score of urban male student teachers.

\( M_{rm} = \) Mean of CIT score of rural male student teachers.

TABLE 73

**Comparison of CIT of UM and RM student teachers**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban male student teachers (UM)</td>
<td>55</td>
<td>31.27</td>
<td>8.21</td>
<td>213</td>
<td>1.07</td>
</tr>
<tr>
<td>Rural male student teachers (RM)</td>
<td>160</td>
<td>30.65</td>
<td>10.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ P = 0.01 \quad t_{200} = 2.60 \]
The table 73 shows that the value of $t = 1.07$ is not significant. Hence it can be said that there was no significant difference in the mean of CIT scores of urban male and rural male student teachers. Thus the null hypothesis was accepted.

12) There is significant difference between average CIT score of rural female and urban female student teachers.

$$H_0 = M_{rf} = M_{uf}$$  - - Null hypothesis

$$H_1 = M_{rf} \neq M_{uf}$$  - - Alternate hypothesis

$M_{rf} =$ Mean of CIT score of rural female student teachers.

$M_{uf} =$ Mean of CIT score of urban female student teachers.

**TABLE 74**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean CIT</th>
<th>S.D. CIT</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural female student teachers (RF)</td>
<td>93</td>
<td>28.70</td>
<td>9.29</td>
<td>212</td>
<td>0.82</td>
</tr>
<tr>
<td>Urban female student teachers (UF)</td>
<td>121</td>
<td>30.19</td>
<td>10.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$P = 0.01$  \  $t_{200} = 2.60$

The table 74 shows that the value of $t = 0.82$ is not significant. Hence it can be said that there was no significant difference in the mean of CIT scores of rural female and urban female student teachers. Thus the null hypothesis was accepted.
4.14 Findings of survey:

1. The sample was homogeneous in case of both exposure and creativity in teaching.

2. There was significant and positive correlation between exposure and creativity in teaching.

3. There was significant and positive correlation between openness and exposure.

4. There was no significant difference in average exposure of rural and urban student teachers.

5. There was a significant difference in average exposure of male and female student teachers.

6. There was no significant difference between mean exposure of arts, commerce and science students.

7. There was significant difference between average exposure of rural male student teachers and urban female student teachers.

8. There was significant difference between average exposure of rural female and urban male student teachers.

9. There was significant difference between average exposure of rural male and rural female student teachers.

10. There was no significant difference between average exposure of urban male and urban female student teachers.

11. There was no significant difference between average exposure of urban male and rural male student teachers.
12. There was no significant difference between average exposure of rural female and urban female student teachers.

13. There was no significant difference in average score of creativity in teaching of rural and urban student teachers.

14. There was no significant difference in average score of creativity in teaching of male and female student teachers.

15. There was no significant difference between average score of creativity in teaching of Arts, Commerce and Science student teachers.

16. There was no significant difference between average score of creativity in teaching of rural male and urban female student teachers.

17. There was no significant difference between average score of creativity in teaching of rural female and urban male student teachers.

18. There was no significant difference between average CIT score of rural male and rural female student teachers.

19. There was no significant difference between average CIT score of urban male and urban female student teachers.

20. There was no significant difference between average CIT scores of urban male and rural male student teachers.

21. There was no significant difference between average CIT score of rural female and urban female student teachers.

4.15 : Conclusions of Survey

1. There was significant and positive correlation between exposure and creativity in teaching.
2. Creativity in Teaching was not gender sensitive.
3. Place of upbrining had no effect on Creativity in Teaching.
4. There was no facultywise difference in Creativity in Teaching.

4.16 Discussion of survey results:

The findings from hypothesis testing are summarised as follows:

- It was found that exposure was gender sensitive whereas creativity in teaching was not.
- Exposure and creativity in teaching both were found independent of the effect of place of upbrining.
- Similarly both were found independent of student teachers’ faculty of graduation.
- When the locale and gender were considered combinedly it was found that creativity in teaching was not affected by combined effect of locale and gender.

But exposure was affected in some cases. It is given as below:

<table>
<thead>
<tr>
<th>TABLE 75</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Result summary of exposure and CIT in various groups</strong></td>
</tr>
<tr>
<td><strong>Group Difference</strong></td>
</tr>
<tr>
<td>Mean exposure</td>
</tr>
<tr>
<td>Mean CIT</td>
</tr>
</tbody>
</table>

N.S. - Not significant
Effect of locale and gender:

- Rural and urban student teachers were on-par in case of exposure.
- Male student teachers were superior than female student teachers in case of exposure.

Combined effect of locale and gender:

- It was found that RM & UM and RF & UF were on par in case of their exposure. Here in each case gender is same and exposure has no effect of locale.
- Now consider the cases of RM & UF, RM & RF and UM & RF.

In the above cases gender and locale both were different. Locale do not cause any effect. It means that the significant difference is due to gender and in every case i.e. either rural or urban, exposure of female student teachers were significantly low than male student teachers. The same should be applicable to the case of UM and UF.

But it was not as expected. It was found that UM and UF are on par in case of exposure. The guess about the reason behind this may be urban orientation received by urban male and urban female student teachers acted as a dominant factor than gender.

From the four P's of creativity, rural-urban upbringing or gender is more related to creativity as a 'Press'. In this study the researcher had decided to focus creativity as a 'Process' in teaching. This was reflected in tool formation and programme contents. This may be the reason behind the contradictory relationship between two positively correlated variables and core factors. It needs to probe further.
This survey and its findings were helpful for the researcher to have an idea of kind of exposure the student teachers possessed. This also was helpful to decide the programme contents and learning experiences.

Summary:

In this chapter, analysis of the data collected from survey was undertaken. Initially the profile variables were analysed and then the relationship between profile variables and exposure and profile variables and CIT was found out through hypothesis testing. These findings were helpful for the researcher in planning the programme.

The next chapter consists of details of the experiment conducted for enhancement of creativity in teaching.

"To those searching for truth - not the truth of dogma and darkness but the truth brought by reason, search, examination and inquiry, discipline is required."

Thomas Edison
(as cited in atheisme)
References:

Book:


Websites:


Chapter Five

The Experiment

"Argument is conclusive, but it does not remove doubt, so that the mind may rest in the sure knowledge of the truth, unless it finds it by the method of experiment."

— Roger Bacon
(as cited in brainyquote)

5.01 : Introduction

As stated in Chapter One, the researcher was interested in developing a training programme to increase the level of CIT (Creativity In Teaching) for B. Ed. Student teachers. The review of related literature revealed that a suitable training programme can improve creativity. Hence, the researcher decided to develop a training programme and test its effectiveness. This chapter discusses the experiment and is divided into two sections:

Section I – It describes decisions taken regarding the design of experiment, selection of college and selection of the tool.

Section II – It deals with the development of training programme and its implementation as well as interactions that occurred during the execution of the programme.
SECTION – I

5.02 : Decisions regarding experimental design

The main objective of the experimentation was to test the effectiveness of the training programme. So the programme prepared for raising the level of CIT was the independent variable. The dependent variable was ‘creativity in teaching’.

Different experimental designs were studied by the researcher and ‘Pretest-posttest control group design’ was selected as an experimental design.

It can be symbolically expressed as :

\[ R \quad O_1 \times O_2 \]
\[ R \quad O_3 \quad | \quad O_4 \]

\( O_1 \) & \( O_3 \) – Pretest, \( X \) – treatment
\( O_2 \) & \( O_4 \) – Posttest, \( R \) – randomization.

5.03 : Selection of the College

It was decided to implement a programme on student teachers of College of Education from Sangamner; studying through Marathi medium.

This was chosen not only for the ease of administration, but the researcher also believed that the data and the inferences based on the analysis of the same from Sangamner would give a representative picture of any taluka level place of Maharashtra.
5.04 : Formation of Experimental and Control Group

Experimental and control group, consisting of 40 student teacher in each; were formed from 80 student teachers studying in G.E.S. College of Education, Sangamner during the academic year 2004-2005.

To achieve a proper representation of all teaching methods in both the groups, 50% student teachers were selected randomly from each method group.

Further these two groups of 40 student teachers were treated randomly and thus experimental and control groups were formed.

To control the contamination, a provision of one more control group was made. This group was of 80 student teachers from S.S.B. College of Education, Shrirampur. Since colleges of Education in Sangamner and Shrirampur are similar in many respects; i.e. both are at Taluka level place from ‘Ahmednagar District’. Both are aided and were established in 1969-70. The annual results of both colleges were almost the same. Student teachers are admitted in the same way. Both belong to renowned parent educational institutions. Thus, student teachers from Shrirampur were treated as one more control group.

All the three groups were tested initially for their creativity in teaching. Since the researcher was interested in finding out the effect of independent variables like emotional intelligence, creative thinking on Torrance test these tests also were initially given to the three groups. The experimental group and control group from Sangamner were pre and post tested at the same
time; whereas the control group of Shrirampur was pre and post tested in the same week in which the Sangamner groups were tested.

Out of these three groups, experimental group received the ‘programme’ treatment. Another two groups treated as control groups did not receive any kind of ‘programme’ treatment apart from their regular B. Ed. Programme.

5.05 : Internal and external validity

The pretest-posttest control group design controls all the factors affecting internal validity. As mentioned by Best (2003) all the factors history, maturation, testing, instrumentation, regression, selection, mortality, and interaction of selection and maturation were properly controlled and hence internal validity was ensured.

There was a threat to external validity – testing effect or sensitization to the treatment that a subject might gain due to pretest. But because the researcher was interested in raising the level of creativity in teaching, the prime need was to know the existing level of creativity in teaching and so the pretest was essential for the experiment. The student teachers of all the three groups were pretested in September 2004 and were posttested in February 2005. Programme was conducted in January 2005. So there was an ample gap of 3 to 4 months between pretest and actual experiment. In a busy schedule of B. Ed. Course, the possibility to remember the test items and get sensitized to the treatment was very low. The same was reflected in posttesting exercise.
While submitting the filled test, the researcher interacted with some student teachers asking them about the questions asked in the test. The student teachers replied that some 2-3 questions were repeated. (The test of creativity in teaching; Part III consists of 22 questions). This had happened in all the three groups. Hence it can be said that though the testing effect was not controlled totally, there may not be any considerable effect of it on the results.

5.06: A step towards generalizability

The researcher was interested in testing the variable relationship of experimental setting in different situations. The programme prepared was initially executed on D. Ed. Student teachers. This was treated as a pilot study. After the experiment on B. Ed. student teachers was over, the same programme was implemented on some high school teachers of Sangamner. The effectiveness of the programme in different situations i.e. consistency was tested. It is discussed in the next chapter.

5.07: Decisions regarding the tool

The test measuring ‘creativity in teaching’ was used as a tool to measure the effectiveness of the programme.

In addition to this test as pretest, two more tests were given to all the three groups initially.

They were Torrance test of creative thinking and Test of emotional intelligence. (Both these tests are standardized in English. The researcher used Marathi version of both the tests.)
5.08 : Development of the Programme

The review of related literature showed that there was no specific programme for enhancement of creativity in teaching. So the researcher decided to prepare such a programme. The steps in designing a training programme are as given in flow chart.

FLOW CHART 4 : Steps in designing a training programme
The process of its development is given below:

1. Deciding the content of the programme
2. Deciding the role of the researcher.
3. Planning of learning experiences.
4. Tryout of the programme.
5. Methods of evaluating the programme.

**5.08(a) : Deciding the content of the programme**

The content was decided on the basis of the main objective of the programme and also by considering the guiding principles of curriculum construction of creativity mentioned in “Problems and issues of teaching and learning of creativity in Hong Kong schools” by Ming (2003).

These were –

1. Instead of mere discipline based approach, integration of knowledge and skills of creativity should be adopted.
2. One can not teach creativity out of context.
3. Rigidity in the classroom must be reduced.

The units decided broadly were –

- Concept of creativity
- Functions of L-R brain
- Characteristics of a creative person.
- Conducive and non-conducive factors to creativity.
- Factors of creativity in teaching and their interrelationship.
- Factors in the product aspect of creativity in teaching.
- Factors in the process aspect of creativity in teaching.
5.08(b) : Deciding the role of the researcher as a 'Programme co-ordinator'

This programme was to be implemented on B. Ed. student teachers i.e. 'adult learners'. According to Wodkowski and Knowles (1984), adults can be identified by two criteria; "an individual who performs roles associated by our culture with adults (worker, spouse, parent, soldier, responsible citizen) and an individual who perceives himself or herself to be responsible for his/her own life."

B. Ed. student teachers satisfy both the criteria. Hence 'Andragogic principles' (principles of adult learning) were to be followed in organising the programme of creativity in teaching.

In andragogic sessions, the role of instructor is to manage the processes and not to manage the content. Two way communication and feedback are critical. Instructor has to serve as a facilitator rather than a lecturer.

Once the andragogic principles were accepted, the acceptance of role of a teacher as facilitator accordingly was implicit.

Now the further question was "How these adults learn?" The appropriate learning theory obviously is 'constructivism'. Constructivism views learning as a 'process of knowledge construction' as mentioned by Von Glaserfeld (1995) (as cited in Catherine, 2005). The core part of constructivism is –

1. Building of conceptual structures through reflection and abstraction.
2. Construction of knowledge is highly related to the environment in which learning takes place.

3. Role of the teacher is significant. It is mentioned that teacher's role in constructivist approach is to provide multiple implications and applications of the concept in realistic, meaningful contexts and to make explicit the interconnections among knowledge components. The teacher should ask questions and listen carefully to student's interpretation of the data. The teacher should perceive errors as the results of the learner's conceptions for the moment.

This had helped the researcher to perceive clearly her role during the programme and to plan the learning experiences accordingly.

5.08(c) : Planning of learning experiences

The learning experiences were mostly based on following aspects :

1. Content and objectives of the programme.

2. Cultural context of student teachers.

3. Context of 'teaching-learning' process.


5. Availability of resources.

It was also decided that there should be maximum scope to interaction between participants and the researcher, participants and learning material and within participants.

5.08(d) : Try out of the Programme

As a pilot study, the researcher had conducted the 'Programme of Enhancement of Creativity in Teaching' (PECIT) on 43 student teachers of
D. Ed. College, Sangamner. It was conducted during 10/12/2004 to 27/12/2004 for fifteen days, one and half hour on each day. This was treated as a pilot study. The programme schedule is given in Appendix M.

5.08(e) : Lessons learnt from the pilot study

1. Accepting the importance of openness in the feedback, D. Ed. student teachers suggested that more time and more activities have to be provided to elaborate the concept of open-mindedness.

2. Student teacher's response to process aspect questions of a post test was not satisfactory. It showed that the process factors such as redefinition and resourcefulness have to be stressed more through various process orientations.

3. In general alternate and effective ways of explanation have to be thought of by the researcher.

   It was found that these D. Ed. student teachers co-operated well and participated enthusiastically. They found the topics of creativity in teaching totally new, interesting and important to them.

5.08(f) : Actions taken

   In the plan of programme, two days rather two sessions were allotted for each factor of process aspects of creativity in teaching. It was thought essential to provide one more day for each aspect and to plan the learning experiences accordingly.

   In order to give more stress on 'openness', a display of particular incidences of 'दहावी फ' 'Dahavi F' (See theme of ‘दहावी फ’ in Appendix N) through LCD projector and discussion on that was planned.
An extensive search on web and in library for creative puzzles and articles was undertaken to enrich the programme.

5.08(g) : Evaluation of the achievement of the training programme

Apart from the test of creativity in teaching, some more tools of evaluation were adopted.

In order to evaluate the daily process the extent of internalized knowledge, a 'Portfolio method' (concept of portfolio method in Appendix O) was decided to adopt. In that student teachers were asked 'What have I learned today?' 'How can I apply it while teaching?'

Besides this, some reflective questions, self assessment assignments were also given to have an idea of attitudinal change and process of introspection.

At the end of the programme, a feedback was also taken throwing light on teacher behaviour, classroom environment, methods adopted etc.

5.09 : Implementation of the Programme

The programme was executed on experimental group of 40 student teachers of G.E.S. College of Education, Sangamner. It was conducted during 3/1/2005 to 1/2/2005 (Appendix P). The timing was 2.30 pm to 4 pm. The total duration of the programme was 22 days and 35 hours (excluding Sunday, holidays of Makar Sankranti and Republic day). While implementing the programme, following precautions were taken.

1. Student teachers from experimental group were requested not to share the experiences obtained while participating in the programme with
others who were not in experimental group. Teacher educators of the college were also requested to keep themselves away from inquisition about the programme or to provide some inputs regarding the programme. In addition to this an arrangement of one more control group was made to control the contamination effect.

2. While implementing the programme, the questions of pretest were not referred, so that the experimenter bias can be avoided. All the discussions and inputs were irrespective of the pretest. Processes were focused and not the content of the pretest.

3. The researcher, though working in G.E.S. College of Education, Sangamner, was relieved from her duty from 1st Dec. 2004 due to fellowship for this study, from U.G.C. Hence she was not concerned with any day to day activities of student-teachers from Dec. 2004. Since the researcher was not related to any kind of internal evaluation of B. Ed. programme, a free and fair classroom environment was created easily. This has helped to reduce experimenter bias.

The Principal of the college permitted to conduct the experiment. Student teachers co-operated very well. There was no major difficulty during the execution of the programme. There was no experimental mortality in the conduct of the experiment.

The day to day happening details of the programme are enclosed in Appendix Q.
5.10: Observations by the researcher

On 17 days out of 22, the attendance was 90% and above. (The student teachers were present in the range of 36-40).

In the remaining 5 days, the attendance was between 80-90% (32-35 student teachers were present). It was due to the holiday of 'Makar Sankranti', students resided nearby Sangamner, went to their native place before one day and came after one day of Makar Sankranti. Also after the Republic day, the same thing happened. There were some financial reasons behind that absence. They could save their expenses on food.

- Students were found eager to know about what everyday's session was about.
- The formation of groups was done through cards. Normally a group of five students was made. Forty cards were prepared. Each card was having any number from one to eight. Hence there were 5 cards of one, 5 cards of two…….. and so on. This set of cards was shuffled. While entering in the classroom, one card was allotted to each and was asked to take a seat in a corresponding group. On each day the cards got reshuffled. Hence the members of the groups were also changed every time and this helped to add freshness in interactions within the group. Due to this each student teacher got a better chance to interact with more number of participants.
- The classroom atmosphere was free and fair. Everybody was free to ask questions, to criticize, to share his views in the group and in the class also.
• The pictures, puzzles and methods used during the programme helped open them more and more.

• The discussions were very lively. If on a day, any article or passage was not given to read and analyse, or if a puzzle was not given, the student teachers used to remind the researcher about that. After a few days they started coming before time or waited after the session to discuss about any problem or a situation that they faced during their practice lessons. They started sharing the puzzles they had and discussing about the process of solving it. They started using the terminological words like open-minded or close-minded, changing of focus, use your right brain, you also are creative while talking with others.

One incidence would be helpful to see that students had started constructing their own knowledge of creativity. In a local newspaper (‘Sarvamat’ on 10 Jan. 2005), a speech of a socialist thinker and writer Raosaheb Kasabe was given. He had elaborated the process of creative writing and emphasized the importance of being open to experiences. After reading this, some student teachers brought that paper in the programme and they shared it among other student teachers also.

They had realized the importance of openness intensely. It was observed by the researcher that the student teachers who were some what egotistic, aggressive and having some biases, started introspecting during the session, they gradually became quiet in the session. It was found that in the self analysis assignment of that day, they have mentioned the reality -the change in self.
However, everything was not so smooth as mentioned earlier. There were some instances where the researcher had to manage the process in proper direction. Since in a B. Ed. course, classroom teaching generally takes place through lecture method, most of the student teachers were not familiar with the group work, group discussion etc. So some critical instances had occurred in some groups, where the researcher intervened to stop the persona allegations, reminding the principles of openness. But these incidences also had enriched the researcher and the participants a lot.

5.11 Analysis of Portfolio Cards

Every day at the end of the session, a card sheet of size 11 inch × 7 inch was given. It was divided into two sections in the length. Student teachers were asked to write 'What is learnt today?' in the left section and ‘How will I apply it while teaching?’ in the right section. In every next day they used to submit this card with their answers. As a whole it can be said that 85-90% student teachers submitted it regularly.

While analyzing these cards were grouped topic wise, instead of daily analysis. There were some topics which continued for 2-3 days. So it became helpful to find out the learning outcome of a ‘topic’.

**Topic 1 : Left-right brain functions :**

Student teachers had mainly responded that –

1. They would ask more open-ended questions in the class than the fixed response questions.
2. They would provide more scope to draw pictures and to imagine.
3. While setting the question papers, they would take the precaution that there would be a balance of questions for left and right hemispheres of brain.

**Topic 2 : Conducive and non-conducive factors to creativity**

Overall trend of responses of student teachers was –

1. They would behave friendly with students.
2. They would give enough space for each student to express.
3. They would keep democratic atmosphere in the classroom.
4. They would encourage their students to participate in various activities.
5. They would appreciate the performance of their students.
6. They would strictly avoid any bias among the students.

**Topic 3 : Product factors (Fluency, flexibility, originality, elaboration) of creativity in teaching**

1. They would motivate students to read more and would make due provision.
2. They would try to provide variety of experiences while teaching.
3. They would create opportunities to think through extrapolation.
4. They would try to add more and more details while explaining and would create such opportunities for their students also.
5. They would find out fluency, flexibility and hence originality of their students.
6. They would think of alternate ways of making introduction of a topic.

**Topic 4 : Open-mindedness**

The majority student teachers responded like this –
1. I myself would try to be more and more open-minded.
2. I would not keep any bias while interacting with students.
3. I would examine my value system thoroughly.
4. I would accept openly my mistakes if any and even if they were pointed out by my students also.
5. While teaching, checking of answer papers; I would not keep any kind of prejudice.
6. I would always try to maintain democratic atmosphere in the class.
7. I could now easily identify open-minded persons.
8. I would always keep in mind that differences should be for the opinions or views and not for the person.

**Topic 5 : Sensitivity to the problem**

The trend of the student teachers responses were –

1. They would develop a habit of keen observation among their students.
2. They would try to be a good listener.
3. While dealing with a problem, they would try to find out the variable relationship and would decide the variables beyond and within control.
4. They would keep themselves aware of the changes in the field and also future changes going to happen in the field.

**Topic 6 : Redefinition**

The majority of responses were –

1. They would change the frame of reference of thinking.
2. They would re-organise the teaching points considering various sequences.
3. They would redefine their ways to motivate students.

4. They would use SCAMPER (Substitution, Combination, Adaptation, Magnification/Minimization, Put to other use, Elimination, Reversal) technique for various jobs that a teacher has to do.

They were –

a) To think about the new pattern of question papers.

b) To combine the strengths of various teaching methods and develop an effective method.

c) To prepare teaching as well as learning material.

d) To think about the new ways of various cultural activities in the school.

e) To suggest the reforms in examination system.

**Topic 7 : Resourcefulness**

The overall trend of responses was as under –

1. They would try to find out effective methods of teaching.

2. They would think collectively about the nature of the problem and related factors in the circumstances to find out the solution.

3. They would use brainstorming method to decide:

   a) The subjects for essay, elocution competitions.

   b) To sort out the problem of indiscipline.

   c) To prepare various educational games.

   d) To think about ways to improve school results.
4. They would use this technique (brainstorming) during the planning of learning experiences, the framing of question papers for their internship programme.

These responses show that student teachers found the programme useful. They had thought of using the programme content - either knowledge, principles or methods and techniques in their teaching practice. The programme content was related by them to teacher behaviour, classroom interaction, teaching methods, evaluation, extracurricular activities and problems in this field, at an application level.

Besides this portfolio method, some points for self analysis were also provided. To have an idea about their integrity, some are mentioned here. During the sessions, one self analysis exercise was:

Out of the characteristics of creative person

I have ..........

I should acquire .............

I should change .............

The responses were :-

Student teachers mentioned that they possessed interest in many fields, curiosity confidence and perseverance. According to them, they should acquire openness, mental preparation to accept and stand firm for their unusual, different opinion, the skills to handle effectively the ambiguous mental situations, a positive/assertive mindset and risk-taking mentality. They mentioned that there should be changes in their 'over aggressiveness, over confidence, autocratic attitude, carelessness, whimsicalness.
Further while noting the conducive and non-conducive factors to creativity that they received during their school days, it was mentioned –

**a) Factors conducive to creativity from school - majority responses for these factors were:**

1. Effective teaching
2. Motivation
3. Variety of experiences

**b) Factors non-conducive to creativity from school -**

1. Prejudices
2. Curt behaviour with students.
5. Various restrictions in school.

**c) Factors conducive to creativity in home -**

1. Motivation
2. Mental support
3. Love and faith
4. Forgiveness to mistakes
5. Role model

**d) Factors non-conducive to creativity in home -**

1. Strong criticism
2. Comparison
3. Lack of faith
4. Narrow-mindedness
5. More and more restrictions
6. No freedom to choose subjects or plan career.

It was found that the student teachers had introspected honestly, even mentioning the incidences from their school and home also. This exercise might had helped them to synthesize their personal experiences with the programme content and to construct a healthy outlook towards their behaviour as a teacher.

5.12 : Analysis of Participants' (student teachers') feedback

A sheet for mentioning their feedback was provided and points were suggested. All the 40 student teachers gave their feedback. A feedback form is attached in the Appendix R.

**Points suggested for the feedback were :** Learning experiences, methods adopted, classroom atmosphere, openness of the researcher, classwork and home work, enrichment if any, suggestions for the improvement of the programme.

- **About the learning experiences :** Twenty nine students mentioned that there was variety of and relevant in learning experiences. Five of them described them as of high quality. Three of them termed them as motivating and very effective.

- Classroom atmosphere according to thirty three student teachers was free and hence healthy and effective interactions took place. Five of
them mentioned that there was a live and enthusiastic atmosphere in the class. Whereas five students mentioned that though the atmosphere was free, there were some controversial incidences. They need to be avoided.

- Thirty eight participants admitted that the researcher was open-minded and this helped create conducive atmosphere in class whereas two student teachers noted that the researcher was open only to some extent.

- While opining on the class work and home work, they mentioned that the topics for class work were interesting, thought provoking and to work in a group was a fun. Whereas homework was some what revisory type (2), reinforcing and on application level (17) and also thought provoking (5) according to them. (But the only difference was home work was to be done individually.)

- Expressing about their enrichment due to this programme, twenty eight participants mentioned that there was a substantial addition in their knowledge about creativity. The most thrilling thing according to a four of them was the realization that they themselves also were creative and could improve upon it.

  Seventeen student teachers mentioned that their thinking process had improved. Instead of thinking about the routine answer, they started to think of alternate solutions. They experienced that their thinking and decision-making process got accelerated.
Most of them (33) identified that due to this programme there was an increase in confidence, in boldness significantly. Seven student teachers mentioned that a strong willing to be a creative teacher was developed. Few of them (2) started to locate themselves on the continuum of openness and creative personality. Majority of them (35) noticed an improvement in their personality without mentioning any specific aspect.

A complete shift in attitude was observed by sixteen participants. They started thinking without considering any prejudice or bias. An assertive or positive attitude was adopted by some participants giving up their cynical mindset.

While noting the things new to them fifteen student teachers were mentioned that everything was new to them. According to eight of them seating arrangement was new, whereas the passages, articles were new for almost all (37) of them. The SCAMPER, attribute listing, brainstorming techniques were new to majority (34) of them. The pictures, cartoons displayed on transparencies, the puzzles, games the use of LCD, the interactive CDs of creativity, meaningful title to portfolio cards, a relevant thought as an advanced organizer were mentioned by the student teachers as new to them.

Out of 40 participants, eighteen participants gave their suggestions. They were –

1. The programme duration should be more. (2)

2. There should be more exercises for homework. (2)
3. Instead of appealing to students to participate in the discussion, it should be made compulsory.

4. There should be no homework. (2)

5. In a session of one and a half hour there should be a break of 5-10 minutes. (1)

6. There should not be any controversial incidence. (2)

7. Instead of mixed groups, there should be separate groups of male and female student teachers. (1)

8. This programme should be conducted in the morning. (1)

9. There should be less homework. (1)

10. The discussion should be recorded. (1)

11. The thoughts should be in Marathi. (1)

12. There should be use of simple language. (1)

13. Instead of classroom, this programme should be conducted in a garden or under a tree. (1)

14. Think always from participants’ point of view. (1)

(Numbers in brackets indicate the number of participants)

As a whole, from the analysis of portfolio cards and feedback, it can be said that the fruitful learning of creativity in teaching had taken place.

The statistical analysis of the data of pre and post test would provide an evidence to the inference. It is given in the next chapter.

Before that, some qualitative data regarding the Application of the programme content by the participants in their internship programme would support the above inference.
5.13 : Application of 'Programme' in internship

The experiment concluded on 1\textsuperscript{st} Feb. 2005. The student teachers were post tested on 2\textsuperscript{nd} Feb. 2005. Their internship programme of B. Ed. course started from 7\textsuperscript{th} Feb. 2005.

The researcher could contact 20-22 student teachers of experimental group, 10-12 days after the commencement of internship programme. She asked them whether they had applied the things that were learnt in the programme. (PECIT) It was found that almost all of them had used the puzzles and games in the class when they were asked to conduct a class as an 'off-period'.

Besides that, some (8-10) student teachers shared their experiences about their adaptation of openness and its effect on improvement in classroom interactions. "Without shouting, taunting, threatening it became possible to control the class, because we have started listening to their problems, we have started to think from their point of view" said a group of 3 student teachers.

One student teacher had confessed that before the programme, "I was never interested in listening to the students and was expecting that they should listen to me. I even asked them to take their seat after the half part of the answer is over. But now I have started to listen carefully to the students and I found that students also are co-operating with me." Being a post-graduate in English, one student teacher had never accepted the class below standard VIII for his practice lessons. But before internship he thought "Why not? This is also challenging. Let me have this experience also." He
admitted that this change was only due to the programme. One student teacher had pointed out the change by saying, "Practice lessons were merely mechanical to me. I never paid attention to all the students. My focus was on the front seaters only. But now (i.e. after the programme) I have started to go near the students who were not answering, not doing what is asked to do or doing anything else. I have started asking them whether they had understood properly or not; if not, I have tried to explain going beyond the planning." One student teacher had tried successfully a method of 'Group discussion' for teaching 'Natural resources' on VIIIth class.

Some (4-5) student teachers had noticed that 'elaboration' of a term was increased. Extrapolation was also tried. "What would have happened if there was no Shivaji?" was a question posed by a student teacher on 8th History class. 5-6 student teachers had noted that more open-ended questions were being asked now, while planning lessons, variety in questions of evaluation, various learning situations were came to mind while thinking and that too very spontaneously.

2 student teachers had noted an interesting attitudinal change. One of them read ‘अनिधिक्ष’ (Agnipankh by APJ Abdul Kalam) and 'I dare' by Kiran Bedi, after the experiment. And the other watched two movies, they were ‘रचदेस’ (Swadesh) and ‘दहावी फ’ (Dahavi F) (again).

They told that due to this programme, their understanding and appreciation of these books and movies was increased. They identified the factors of sensitivity to the problem, openness........ etc. in many instances.
It seems that, the factors of creativity in teaching had provided them a new vision to interprete. As a whole, it can be said that the programme was internalized in both cognitive as well as affective domains. The methods, techniques, principles were applied in lesson planning, in evaluation, in classroom teaching etc. and a new perspective was gained.

5.14 : Time Analysis of the Programme

The programme was run for 22 days and on an average one and half hour each i.e. for thirty five clock hours.

The time spent on various items was recorded in a diary. It shows that –

**TABLE 76**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Time spent in minutes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Explanation/Lecture by the researcher</td>
<td>330</td>
<td>15.71%</td>
</tr>
<tr>
<td>2.</td>
<td>Group work (including group discussion)</td>
<td>345</td>
<td>16.43%</td>
</tr>
<tr>
<td>3.</td>
<td>Presentation of group work and discussion on that</td>
<td>360</td>
<td>17.14%</td>
</tr>
<tr>
<td>4.</td>
<td>Reading of article/passage and its analysis and discussion</td>
<td>255</td>
<td>12.14%</td>
</tr>
<tr>
<td>5.</td>
<td>Discussion in a whole class</td>
<td>220</td>
<td>10.48%</td>
</tr>
<tr>
<td>6.</td>
<td>Watching CDs</td>
<td>120</td>
<td>5.71%</td>
</tr>
<tr>
<td>7.</td>
<td>Observation of pictures</td>
<td>55</td>
<td>2.62%</td>
</tr>
<tr>
<td>8.</td>
<td>Role play</td>
<td>60</td>
<td>2.86%</td>
</tr>
<tr>
<td>9.</td>
<td>Enquiry training model</td>
<td>10</td>
<td>0.48%</td>
</tr>
<tr>
<td>10.</td>
<td>Jurisprudential enquiry model</td>
<td>15</td>
<td>0.71%</td>
</tr>
<tr>
<td>11.</td>
<td>Queries and question answers</td>
<td>130</td>
<td>6.91%</td>
</tr>
<tr>
<td>12.</td>
<td>H. W. (distribution, collection)</td>
<td>105</td>
<td>5%</td>
</tr>
<tr>
<td>13.</td>
<td>Miscellaneous (Distribution of reading material, group arrangement etc.)</td>
<td>95</td>
<td>4.52%</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>2100 min.</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

i.e. 35 hours.
The above table indicates that, more than 50% time (item No. 2, 3, 4, 5 combinedly) was spent on student centered activities. Where as compared to above, only 15% was gone to the account of teachers' lecture.

A pie chart 2 would give a more clear idea easily.

PIE CHART 2 : Time analysis of programme

It can be said that the above data of time analysis supports that andragogic principles were followed during the programme and teacher mainly had performed the role of facilitator.

5.15 : Characteristic Features of the Programme

1. Selection of learning material from autobiographies of renowned literary artists, scientists, social scientists etc. It was context specific.
2. Divergence in learning experiences and adoption of interdisciplinary approach.

3. Multilevel flow of communication between and within group.

4. Use of advanced organizer on each day.

5. Facilitating approach, democratic attitude.

6. Open and conducive to learning atmosphere in class.

Summary:

In this chapter, the researcher has tried to inform about the design of experiment, selection of tool and details of programme implementation. The feedback from student teachers and their behaviour changes after the programme were also discussed in this chapter.

"The true method of knowledge is experiment."

— William Blake

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Chapter Six

Interpretation of experimental data

"The art of drawing conclusions from experiments and observations consists in evaluating probabilities and in estimating whether they are sufficiently great or numerous enough to constitute proofs. This kind of calculation is more complicated and more difficult that it is commonly thought to be....."

— Lavoisier, Antoni (cited in Quoteworld 2005)
6.00 : Introduction
This chapter gives the statistical procedures used to analyse and interpret the data collected through an experiment. It is followed by numerical outputs, their interpretation and testing of the hypotheses.

In all, the Programme of Enhancement of Creativity In Teaching (PECIT) was implemented three times.
1. As a pilot study on D. Ed. Student teachers.
3. As a replicability study on in-service secondary school teachers.

While dealing mainly with the analysis and interpretation of data collected from actual experiment; this chapter also provides the results in case of pilot and replicability study.

6.01 : Relationship between Emotional intelligence and creativity in teaching
As stated in Chapter Two, the data regarding emotional intelligence was collected from experimental and both the control groups. (The data for analysis is given in Appendix S.)

From previous studies it can be said that there is a correlation between creativity and single constituent of emotional intelligence. Hence to find out the relationship between emotional intelligence and creativity in teaching, correlation was used.

\[ \gamma \] between score of EQ (Emotional quotient) (X) and CIT (Y)
The data summary for EQ (X) and CIT (Y)

TABLE 77
Data summary for EQ (X) and CIT (Y)
<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>78.22</td>
<td>35.90</td>
</tr>
<tr>
<td>Variance</td>
<td>517.50</td>
<td>158.25</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>22.75</td>
<td>12.58</td>
</tr>
<tr>
<td>Std. error</td>
<td>1.88</td>
<td>1.04</td>
</tr>
</tbody>
</table>

\[ \sum X = 11420 \quad \sum Y = 5242 \]

\[ \sum XY = 419485, \quad \sum X^2 = 968300 \]

\[ \sum X^2 = 211156 \quad N = 146 \]

\[ r = 0.228 \quad df = 144 \]

From Garrett (1981, P.201)

\[ df = 150, 0.05 = 0.159 \]

\[ 0.01 = 0.208 \]

It shows that there was a positive and significant correlation between emotional intelligence and creativity in teaching.

**6.02 : On par-relationship among the groups**

The experimental design employed was pre-test post test control group design. Sizes of samples of experimental and control groups were as given in table 78.

**TABLE 78**

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental group</th>
<th>Control 1 group</th>
<th>Control 2 group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>40</td>
<td>40</td>
<td>66</td>
<td>146</td>
</tr>
</tbody>
</table>

(Out of 80 student teachers from control group 2 i.e. from S.S.B. College of Education, Shrirampur, 66 student teachers were present for both pre and post test.)
Table 79 indicates the use of tests before and after the experiment.

**TABLE 79**

Tests given before and after experiment

<table>
<thead>
<tr>
<th>Group</th>
<th>CIT as creativity in teaching</th>
<th>Test of emotional intelligence (Pretest)</th>
<th>TTCT (Pretest)</th>
<th>Exposure test (Pretest)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre test</td>
<td>Post test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental group (N = 40)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Control group 1 (N = 40)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Control group 2 (N = 66)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

The table shows that scores on emotional intelligence, exposure, Torrance Test of Creative Thinking (TTCT) are the independent variables whereas scores on ‘creativity in teaching’ (CIT) is a dependent variable.

The experimental and control groups were selected randomly. The samples for experimental and control group were also assigned randomly. This had ensured the probabilistic equivalence of the groups. But to check whether their difference in means was due to random selection or significant, ANOVA was used. The data for further analysis is available in Appendix T.

6.02 (a) : Testing of on-par relationship among the groups in case of pretest CIT scores (X)

The data summary for CIT (pretest) scores is

**TABLE 80**

Data summary of CIT (pretest) scores

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control Group 1</th>
<th>Control Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CIT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The ANOVA summary of CIT (Pretest) scores

**TABLE 81**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS&lt;sub&gt;(x)&lt;/sub&gt;</th>
<th>df</th>
<th>MS&lt;sub&gt;(x)&lt;/sub&gt;</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (among groups)</td>
<td>582.28</td>
<td>2</td>
<td>291.14</td>
<td>1.86</td>
<td>0.16</td>
</tr>
<tr>
<td>Error (within groups)</td>
<td>22364.37</td>
<td>143</td>
<td>156.39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From table, for df 2/143, Garrett (1981, P.466)

\[
F = 3.06 \text{ at } 0.05 \text{ level}
\]

\[
= 4.75 \text{ at } 0.01 \text{ level}
\]

From table 81, \( F = 1.86 \) is not significant.

It can be inferred that the differences in the means among three groups in case of creativity in teaching before the experiment were not significant but were occurred due to random error.

This shows that there was on par relationship among the groups when their initial creativity in teaching was considered.

6.02 (b) : Testing of On-Par relationship among the groups in case of their emotional intelligence

The data summary for scores of EQ is

**TABLE 82**

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>Control</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
<td>66</td>
</tr>
<tr>
<td>Mean</td>
<td>39.1</td>
<td>35.25</td>
<td>34.36</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>11.53</td>
<td>14.29</td>
<td>11.91</td>
</tr>
</tbody>
</table>
TABLE 83

The ANOVA summary of EQ

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (among groups)</td>
<td>1365.34</td>
<td>2</td>
<td>682.67</td>
<td>1.31</td>
<td>0.27</td>
</tr>
<tr>
<td>Error (within groups)</td>
<td>73671.64</td>
<td>143</td>
<td>515.19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table values from Garrett (1981, P. 466) for df 2/143 are as follows:

<table>
<thead>
<tr>
<th>Level</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>3.06</td>
</tr>
<tr>
<td>0.01</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Therefore from table 83, $F = 1.3131$ shows that it is not significant.

This indicates that there was on-par relationship among the groups when their emotional intelligence was considered.

6.02 (c) : Testing of On-Par relationship among the groups on the basis of their exposure scores.

The data summary for exposure scores is

TABLE 84

Data summary of exposure scores

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control Group1</th>
<th>Control Group2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
<td>66</td>
</tr>
<tr>
<td>Mean</td>
<td>35.98</td>
<td>31.4</td>
<td>34.80</td>
</tr>
</tbody>
</table>
The ANOVA summary for exposure score

**TABLE 85**

ANOVA summary for exposure score

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (among groups)</td>
<td>463.62</td>
<td>2</td>
<td>231.81</td>
<td>1.99</td>
<td>0.14</td>
</tr>
<tr>
<td>Error (within groups)</td>
<td>16633.01</td>
<td>143</td>
<td>116.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From table values Garrett (1981, P. 466) for df 2/143, are

<table>
<thead>
<tr>
<th>Level</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>3.06</td>
</tr>
<tr>
<td>0.01</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Therefore from table 85, $F = 1.9929$ was that it is not significant.

This indicates that the three groups did not have any difference when their exposure was considered.

6.02 (d) : Testing of On-Par relationship among the groups when the scores of TTCT (Torrance’s test of creative thinking) were considered:

Data summary for TTCT -

**TABLE 86**

Data summary for TTCT

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control Group1</th>
<th>Control Group2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
<td>66</td>
</tr>
<tr>
<td>Mean</td>
<td>51.93</td>
<td>50.25</td>
<td>32.39</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>16.85</td>
<td>18.28</td>
<td>13.09</td>
</tr>
</tbody>
</table>
The ANOVA summary for TTCT scores

**TABLE 87**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (among groups)</td>
<td>12693</td>
<td>2</td>
<td>6346.86</td>
<td>25.75</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Error (within groups)</td>
<td>35240.03</td>
<td>143</td>
<td>246.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The F-values from table for df - 2/143 are

<table>
<thead>
<tr>
<th>Level</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>3.06</td>
</tr>
<tr>
<td>0.01</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Therefore from table 87, F = 25.75 is quite significant.

**This can be inferred that there was no on-par relationship among the groups when the scores of TTCT were considered.**

It was found that there was on-par relationship among the groups on the basis of pretest CIT scores, exposure and emotional intelligence, but not in case of TTCT scores.

**6.03 : Decision of further analysis**

ANCOVA was selected as an appropriate statistical technique to test the hypotheses. The thought process behind this decision is reflected in the following flow chart:

```
Research Method and design

O/P - either parametric or non parametric?

If parametric,

The ANOVA summary for TTCT scores

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (among groups)</td>
<td>12693</td>
<td>2</td>
<td>6346.86</td>
<td>25.75</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Error (within groups)</td>
<td>35240.03</td>
<td>143</td>
<td>246.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

The F-values from table for df - 2/143 are

<table>
<thead>
<tr>
<th>Level</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>3.06</td>
</tr>
<tr>
<td>0.01</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Therefore from table 87, F = 25.75 is quite significant.

**This can be inferred that there was no on-par relationship among the groups when the scores of TTCT were considered.**

It was found that there was on-par relationship among the groups on the basis of pretest CIT scores, exposure and emotional intelligence, but not in case of TTCT scores.
Technique for statistical control on pre-experimental status of independent variables, in case of more than two groups groups.

ANCOVA

FLOW CHART 5 : Thought - process behind selecting ANCOVA

As mentioned by Best (2003), in ANCOVA, differences in the initial status of the groups can be removed statistically so that they can be compared as though their initial status have been equated.

6.04 : Testing of hypotheses

This study involve two hypotheses.

Hypothesis-1 : 'Programme prepared for the development of creativity in teaching is effective.'
In other words, the statistical hypothesis is mean of experimental group after the programme is significantly higher than the mean of experimental group before the programme.

**Testing of hypothesis 1.**

The null hypothesis was stated as -

There is no difference in the means of experimental group due to programme.

Thus,  

\[ H_0 = M_{pre} - M_{post} = 0 \]

and  

\[ H_i = M_{pre} - M_{post} \neq 0 \]

\( H_0 \) = null hypothesis

\( H_i \) = alternate hypothesis

\( M_{pre} \) = Mean of experimental group on TCIT (Test of Creativity In Teaching) before programme

\( M_{post} \) = Mean of experimental group on TCIT after programme.

**Effect of treatment on experimental group :**

Data summary of CIT scores (Post test)

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control Group1</th>
<th>Control Group2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
<td>66</td>
</tr>
<tr>
<td>Mean</td>
<td>66.65</td>
<td>38.13</td>
<td>31.833</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>23.32</td>
<td>14.49</td>
<td>9.7311</td>
</tr>
</tbody>
</table>

The ANCOVA results of CIT (Post Test) scorees
### TABLE 89

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted means</td>
<td>23861.47</td>
<td>2</td>
<td>11930.74</td>
<td>92.2</td>
<td>2E-26</td>
</tr>
<tr>
<td>Adjusted error</td>
<td>18357.77</td>
<td>142</td>
<td>129.28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table values for F at df 2/142 from Garrett (1981, P. 466) are

<table>
<thead>
<tr>
<th>Level</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>3.06</td>
</tr>
<tr>
<td>0.01</td>
<td>4.75</td>
</tr>
</tbody>
</table>

From table 89, $F = 92.29$ shows that it was far beyond the 0.01 level.

Hence the value of $F = 92.29$ was highly significant.

The table 90 gives the values of observed and adjusted means in case of post CIT scores.

### TABLE 90

<table>
<thead>
<tr>
<th>Mean</th>
<th>CV observed Pretest</th>
<th>DV Post test mean observed</th>
<th>DV Post test mean adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>39.10</td>
<td>66.35</td>
<td>63.85</td>
</tr>
<tr>
<td>Control group 1</td>
<td>35.25</td>
<td>38.13</td>
<td>38.7</td>
</tr>
<tr>
<td>Control group 2</td>
<td>34.36</td>
<td>31.83</td>
<td>33.18</td>
</tr>
</tbody>
</table>

The table 90 shows that the adjusted mean of experimental group was more than the mean of the same group before the experiment.

It can be concluded that when initial differences were allowed for programme of enhancement of creativity in teaching made significant changes in the final score in case of experimental group.

Thus the null hypothesis $H_0 = M_{pre} = M_{post}$ was rejected.
There was a significance difference between pre and post test means of experimental group.

Hence the alternate hypothesis as stated above.

\[ H_i = M_{\text{pre}} - M_{\text{post}} \neq 0 \]

was accepted and hence the substantial hypothesis as stated above was also accepted.

**Hypothesis-2** : It was stated as "Average performance of experimental group of student teachers in case of creativity in teaching will be more than the control group."

The null hypothesis was - Average performance of student teachers in case of creativity in teaching is same for experimental and control groups.

\[ H_0 = M_1 = M_2 = M_3 \]

where

\[ M_1 = \text{average performance of creativity in teaching of experimental group.} \]

\[ M_2 = \text{average performance of creativity in teaching of control group 1.} \]

\[ M_3 = \text{average performance of creativity in teaching of control group 2} \]

and alternative hypothesis was

\[ H_i = M_1 \neq M_2 \neq M_3 \]

To test the significance of difference between adjusted means of experimental and control groups, 't' test was used.

The results are given in table 91.

**TABLE 91**

<table>
<thead>
<tr>
<th></th>
<th><strong>Effect of treatment on experimental and control groups</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference between adjusted means</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Experimental and Control 1</td>
</tr>
<tr>
<td>2.</td>
<td>Experimental and Control 2</td>
</tr>
</tbody>
</table>
It can be concluded from the above table that,

1. The mean of experimental group was significantly higher than Control group 1.
2. The mean of experimental group was also significantly higher than Control group 2.

Hence the null hypothesis was rejected and alternate hypothesis was accepted. Hence the substantial hypothesis:

"Average performance of experimental group of student teachers in case of creativity in teaching is more than control groups" as retained.

6.04(a) Effect of Contamination: The 't' value between adjusted means of Control group 1 and Control group 2 was 2.08 and was significant at 0.05 level. Hence it can be concluded that significantly higher mean of control group 1 than mean of control group 2 indicated the contamination or diffusion of programme contents between experimental and control group 1.

6.05: Comparison of achievement of experimental and control groups
a) Ogive of Pre-test scores:

The Graph 1 of ogive of pre-test scores of experimental and both control groups is given. The graph is from table 92.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Pre Test: Experimental Group</th>
<th>Pre Test: Control Group 1</th>
<th>Pre Test: Control Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>14</td>
<td>0.83%</td>
<td>5.00%</td>
<td>2.53%</td>
</tr>
<tr>
<td>18</td>
<td>3.33%</td>
<td>13.33%</td>
<td>7.58%</td>
</tr>
<tr>
<td>22</td>
<td>7.50%</td>
<td>23.33%</td>
<td>14.65%</td>
</tr>
<tr>
<td>26</td>
<td>15.83%</td>
<td>30.83%</td>
<td>25.76%</td>
</tr>
<tr>
<td>30</td>
<td>27.50%</td>
<td>37.50%</td>
<td>39.39%</td>
</tr>
<tr>
<td>34</td>
<td>39.17%</td>
<td>45.83%</td>
<td>56.06%</td>
</tr>
<tr>
<td>38</td>
<td>50.00%</td>
<td>60.83%</td>
<td>69.19%</td>
</tr>
<tr>
<td>Interval</td>
<td>Pre Test : Experimental Group</td>
<td>Pre Test : Control Group 1</td>
<td>Pre Test : Control Group 2</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>42</td>
<td>58.33%</td>
<td>72.50%</td>
<td>78.79%</td>
</tr>
<tr>
<td>46</td>
<td>69.17%</td>
<td>83.33%</td>
<td>83.84%</td>
</tr>
<tr>
<td>50</td>
<td>80.00%</td>
<td>87.50%</td>
<td>89.39%</td>
</tr>
<tr>
<td>54</td>
<td>89.17%</td>
<td>91.67%</td>
<td>93.43%</td>
</tr>
<tr>
<td>58</td>
<td>95.00%</td>
<td>94.17%</td>
<td>96.46%</td>
</tr>
<tr>
<td>62</td>
<td>97.50%</td>
<td>95.83%</td>
<td>97.47%</td>
</tr>
<tr>
<td>66</td>
<td>99.17%</td>
<td>97.50%</td>
<td>97.98%</td>
</tr>
<tr>
<td>70</td>
<td>100.00%</td>
<td>97.50%</td>
<td>98.99%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GRAPH 1 : Ogive of CIT (Pretest) scores**

Graph 1 shows that 70% part of curve of experimental group is slightly to the right side of both the curves of control groups. However, in case of upper 3-4 intervals, the curve of control group 1 is to the right side of remaining both curves. Whereas it is at extreme left as compared to rest two curves when lower 2-3 intervals are considered. Between the points of Q₁ and Q₃, there is very slight separation among the three curves.
This slight separation may be due to sampling error. This was supported statistically when it was found that F value of ANOVA of pretest CIT scores was not significant (Page No.....)

b) Ogive of Posttest scores :

Table 93 gives the data of Posttest CIT scores.

**Post test CIT scores**

<table>
<thead>
<tr>
<th>TABLE 93</th>
<th>Smooth % frequency data of CIT (Post test) scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class Interval</strong></td>
<td><strong>Smoothed % cf (expt)</strong></td>
</tr>
<tr>
<td>3--14</td>
<td>0</td>
</tr>
<tr>
<td>15-26</td>
<td>0.83</td>
</tr>
<tr>
<td>27-38</td>
<td>12.5</td>
</tr>
<tr>
<td>39-50</td>
<td>28.33</td>
</tr>
<tr>
<td>51-62</td>
<td>50</td>
</tr>
<tr>
<td>63-74</td>
<td>65</td>
</tr>
<tr>
<td>75-86</td>
<td>79.17</td>
</tr>
<tr>
<td>87-98</td>
<td>88.33</td>
</tr>
<tr>
<td>99-110</td>
<td>94.17</td>
</tr>
<tr>
<td>111-122</td>
<td>97.5</td>
</tr>
<tr>
<td>123-134</td>
<td>99.17</td>
</tr>
<tr>
<td>135-146</td>
<td>100</td>
</tr>
</tbody>
</table>
GRAPH 2: Ogive of CIT (Post test) scores

It can be seen from the graph 2 that the ogive curve of experimental group lies to the right at a considerable distance from the ogive curves of control 1 and 2 groups. For the entire range it is predominantly towards right to rest of the other curves. Differences in the achievement between experimental group and both the control groups are shown by the distance separating the curves at various levels.

It can be seen that at the extreme low score students, there is not much difference. But it goes on increasing. The separation between ogive of experimental group and control 1 as well as control 2 group at $Q_2$ ($P_{50}$) is more than at $Q_1$. Also the separation at $Q_3$ is more than that at $Q_2$. It goes on increasing towards right extreme intervals.

When a perpendicular on X-axis, passing through the median point (B) of ogive of experimental group is drawn, it is found that it cuts the ogive
of control 1 at 92% (point M) and of control 2 at 98% (point N). It means that only 8% of the subjects of control group 1 and only 2% of the subjects of control group 2 exceed the median of experimental group; in case of creativity in teaching.

Hence the ogive for experimental group graph showed the shift of the curve to the right and clearly indicated training programme could improve creativity in teaching.

6.06(a) : Comparison of experimental group with itself

The table 94 gives classification of frequencies of experimental group before and after the experiment.

<table>
<thead>
<tr>
<th>Class Intervals</th>
<th>Frequency Pretest (CIT)</th>
<th>Frequency Post test (CIT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 - 22</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>23-30</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>31-38</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>39-46</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>47-54</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>55-62</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>63-70</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>71-78</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>79-86</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>87-94</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>95-102</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>103-110</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>111-118</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>119-126</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>127-134</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
The smoothed frequency curve based on the above data is:

**GRAPH 3 : Comparison of performance of experimental group**

The graph 3 shows that initially, lower extreme scores of CIT were in the class interval 15-22 whereas after the experiment, the lower extreme scores were in the class interval 31-38. The upper extreme scores before the experiment were in the class interval 53-70 whereas the upper extreme scores after the experiment were in the class interval 127-134.

The maximum no. of student teachers (10) belong to the class interval 47-54, whereas maximum no. of student teachers (9) after experiment were from class interval 39-46.

In short it can be stated that the post test frequency curve of experimental group is shifted towards right compared to its pre-test scores curve.
6.06(b) : Comparison of control group 1 with itself

The table 95 gives classification of frequencies of control group 1 before and after the experiment.

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Pretest (f) (CIT)</th>
<th>Post-test (f) (CIT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>16-21</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>22-27</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>28-33</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>34-39</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>40-45</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>46-51</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>52-57</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>58-63</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>64-69</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>70-75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>76-81</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>82-87</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

The smooth frequency based on the above data is

GRAPH 4 : Comparison of performance of control group 1
The graph 4 indicates that there is slight differences in frequencies of class intervals before and after the experiment. The frequencies in class intervals 28-33, 34-39 increased by four and two respectively. In case of post test, in the control group 1, there was a shift of two respondents in the upper interval of 82-87.

6.06(c) : Comparison of control group 2 with itself

Table 96 gives classification of frequencies of control group 2 before and after the experiment.

<table>
<thead>
<tr>
<th>TABLE 96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data of CIT (Pre and Posttest) control group 2</td>
</tr>
<tr>
<td>Class interval</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>10-14</td>
</tr>
<tr>
<td>15-19</td>
</tr>
<tr>
<td>20-24</td>
</tr>
<tr>
<td>25-29</td>
</tr>
<tr>
<td>30-34</td>
</tr>
<tr>
<td>35-39</td>
</tr>
<tr>
<td>40-44</td>
</tr>
<tr>
<td>45-49</td>
</tr>
<tr>
<td>50-54</td>
</tr>
<tr>
<td>55-59</td>
</tr>
<tr>
<td>60-64</td>
</tr>
<tr>
<td>65-69</td>
</tr>
<tr>
<td>70-74</td>
</tr>
</tbody>
</table>
The smoothed frequency curve based on above data is:

GRAPH 5: Comparison of performance of control group 2

The graph shows that there were minor changes in frequencies of class intervals before and after the experiment in case of control 2. The only prominent change was the frequency of class interval 25-29. It changed from 11 to 21. But this increase was compensated by decreasing frequencies of upper intervals.

6.06(d): Comparison of these three groups on the basis of after experiment Part I and Part II CIT scores

As it is said earlier, Part I CIT scores were nothing but the composite score of scores of fluency, flexibility, originality and elaboration. (i.e. Total score of product aspects of creativity in teaching) whereas Part II CIT score was nothing but the composite score of scores of openness, sensitivity to the
problem, redefinition and resourcefulness (i.e. total score of process aspects of creativity in teaching).

Table 97 gives the frequency distribution of Part I scores of these three groups.

**Part I scores from Post CIT scores**

**TABLE 97**

<table>
<thead>
<tr>
<th>Class interval</th>
<th>Frequency Part I Experimental group</th>
<th>Frequency Part I Control 1</th>
<th>Frequency Part I Control 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>0</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>10-19</td>
<td>12</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>20-29</td>
<td>8</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>30-39</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>40-49</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50-59</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>60-69</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>70-79</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>80-89</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The graph below shows performance in case of Part I scores (from Post CIT test).

**GRAPH 6 : Part I performance after the experiment**
The graph 6 shows that experimental group is far ahead from both control groups in case of Part 1 scores.

The medians of both the control groups are in the interval of 10-19. The highest value of Part 1 score lies in between 80-89 whereas the highest values lie in the interval 60-69 and 30-39 in case of control 1 and control 2 respectively. It can be concluded that the experimental group is benefited because of the programme as far as part 1 scores were considered.

6.06(e) : Comparison of these three groups on the basis of after experiment Part II scores

Table 98 gives frequency distribution of (Post CIT) Part II scores of these three groups.

<table>
<thead>
<tr>
<th>Class interval</th>
<th>Experimental group Frequency Part II</th>
<th>Control 1 Part II frequency</th>
<th>Control 2 Part II frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-11</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12-17</td>
<td>0</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>18-23</td>
<td>6</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>24-29</td>
<td>14</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>30-35</td>
<td>12</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>36-41</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>42-47</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Comparison of Part II after expt.

Experimental group Part II frequency
Control 1 Part II, frequency
Control 2 Part II frequency

GRAPH 7 : Performance of Part II after experiment

The graph 7 shows the performance of these three groups in case of Part II scores (after experiment).

It can be seen that upper intervals do not have any frequency in case of control groups and lower two intervals do not have any frequency in case of experimental group.

It can be said that the experimental group was benefited due to programme.

6.07 : Main effects

As stated previously, all the student teachers (from experimental and control groups) were tested for their emotional intelligence, exposure and creative thinking apart from TCIT. These were independent variables. The effect of these individual variables on the dependent variable was found out separately. As stated by Kerlinger (1995) "Separate independent variable
effects are called as Main effects”. Hence following main effects were computed.

1. Effect of emotional intelligence on dependent variable (CIT post-test scores)
2. Effect of exposure on dependent variable.
3. Effect of creative thinking (tested by TTCT) on dependent variable.

**6.07(a) : Main effect of emotional intelligence**

Data summary for EQ

**TABLE 99**

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control group 1</th>
<th>Control group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
<td>66</td>
</tr>
<tr>
<td>Mean</td>
<td>77.88</td>
<td>73.75</td>
<td>81.14</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>20.53</td>
<td>23.45</td>
<td>22.75</td>
</tr>
</tbody>
</table>

ANCOVA result for EQ (X) and dependent variable CIT (Y)

**TABLE 100**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>$S_{y,x}$</th>
<th>$MS_{y,x}$</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjusted among means</td>
<td>2</td>
<td>32187.54</td>
<td>16108.54</td>
<td>69.85</td>
<td>8E-22</td>
</tr>
<tr>
<td>adjusted error within groups</td>
<td>142</td>
<td>32716.88</td>
<td>230.40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table values for Garrett (1981, P. 466) df 2/142 are

<table>
<thead>
<tr>
<th>Level</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 level</td>
<td>3.06</td>
</tr>
<tr>
<td>0.01 level</td>
<td>4.75</td>
</tr>
</tbody>
</table>
From table 100, $F = 69.85$ shows that it is significant. The observed and adjusted means of three groups of EQ were

**TABLE 101**

<table>
<thead>
<tr>
<th>Mean</th>
<th>observed EQ</th>
<th>DV (CIT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>observed</td>
<td>adjusted</td>
</tr>
<tr>
<td>Expt.</td>
<td>77.88</td>
<td>66.65</td>
</tr>
<tr>
<td>Control 1</td>
<td>73.75</td>
<td>38.13</td>
</tr>
<tr>
<td>Cont. 2</td>
<td>81.14</td>
<td>31.83</td>
</tr>
</tbody>
</table>

The table 101 indicates that the adjusted mean of experimental group is quite higher than the adjusted means of both the control groups.

It can be inferred that when the initial differences in EQ of three groups were controlled statistically, the effect of dependent variable was significant.

6.07(b) : Main effect 2 - Effect of exposure on dependent variable

**ANCOVA result for exposure (X) and dependent variable (Y)**

**TABLE 102**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>$S_{yx}$</th>
<th>$MS_{yx}$</th>
<th>$F$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>among adjusted means</td>
<td>2</td>
<td>29576.96</td>
<td>14788.48</td>
<td>69.08</td>
<td>1E - 21</td>
</tr>
<tr>
<td>within adjusted means (adjusted error)</td>
<td>142</td>
<td>30397.72</td>
<td>214.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Referring to the table values of $F$, the present value of from table 102, $F = 69.08$ was significant at 0.01 level.
Table 103 gives the adjusted means of dependent variable of all the groups -

**TABLE 103**

**Observed and adjusted means in case of exposure**

<table>
<thead>
<tr>
<th>Means</th>
<th>observed Exposure</th>
<th>DV (CIT)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>66.65</td>
<td>65.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expt. group</td>
<td>35.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group 1</td>
<td>31.40</td>
<td>38.13</td>
<td>39.68</td>
<td></td>
</tr>
<tr>
<td>Control group 2</td>
<td>34.80</td>
<td>31.83</td>
<td>31.49</td>
<td></td>
</tr>
</tbody>
</table>

The table values of adjusted means show that adjusted mean of dependent variable of experimental group is quite higher than the means of control groups.

It can be concluded that when the differences in means of exposure are controlled statistically, the effect of dependent variable (i.e. effect of programme) is significant.

**6.07(c) : Main effect 3 :** Effect of TTCT (Torrance test of creative thinking) on dependent variable -

**ANCOVA results of TTCT (X) and CIT (Y)**

**TABLE 104**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>$S_{y,x}$</th>
<th>$MS_{y,x}$</th>
<th>$F$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjusted among means</td>
<td>2</td>
<td>19943.00</td>
<td>9971.50</td>
<td>46.64</td>
<td>3E-16</td>
</tr>
<tr>
<td>adjusted within means</td>
<td>142</td>
<td>30360.70</td>
<td>213.81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Referring to table values of $F$ for df $2/142$, $F = 46.64$ is significant.
Table 105 gives observed and adjusted means of dependent variable.

**TABLE 105**

<table>
<thead>
<tr>
<th>Means</th>
<th>observed TTCT</th>
<th>DV (CIT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>observed</td>
<td>adjusted</td>
</tr>
<tr>
<td>Expt. group</td>
<td>51.93</td>
<td>66.65</td>
</tr>
<tr>
<td>Control group 1</td>
<td>50.25</td>
<td>38.13</td>
</tr>
<tr>
<td>Control group 2</td>
<td>32.39</td>
<td>31.83</td>
</tr>
</tbody>
</table>

The adjusted mean values of dependent variable of experimental group is more than the means of control groups.

It can be inferred that, when the initial differences in means of TTCT scores were controlled statistically, the effect of experiment on dependent variable is significant.

**6.08 : Interaction effect**

While explaining the interaction effect of independent variables, Kerlinger (1995) has stated that "Interaction can occur in the absence of any separate effects of the independent variables. Interaction can also be absent when one or more independent variables have significant separate effects. Here the main effects of independent variables (or separate effects) were not found significant from ANCOVA analysis.

Hence referring to the above mentioned statement, it can be said that there is high possibility of interaction of independent variables. To test this multiple regression analysis was decided to use.

**Multiple regression analysis**

No. of independent variables - 3
No. of dependent variable - 1
Observations per variable - 146

Correlation Matrix

**TABLE 106**

Correlation matrix of three independent and one dependent variable

<table>
<thead>
<tr>
<th></th>
<th>EQ</th>
<th>Exp.</th>
<th>TTCT</th>
<th>Post CIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>X₁</td>
<td>1.0</td>
<td>0.078</td>
<td>-0.024</td>
<td>0.181</td>
</tr>
<tr>
<td>X₂</td>
<td>0.078</td>
<td>1.0</td>
<td>0.2210</td>
<td>0.3260</td>
</tr>
<tr>
<td>X₃</td>
<td>-0.024</td>
<td>0.2210</td>
<td>1.0</td>
<td>0.50</td>
</tr>
<tr>
<td>Y</td>
<td>0.1810</td>
<td>0.326</td>
<td>0.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Multiple $R^2 = 0.3299 = 0.33$

Adjusted multiple $R^2 = 0.32$

ANOVA Table for interaction

**TABLE 107**

ANOVA table for interaction

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>22139.43</td>
<td>3</td>
<td>7379.81</td>
<td>23.3</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Residual</td>
<td>44967.22</td>
<td>142</td>
<td>316.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>67106.65</td>
<td>145</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$R^2 = 0.3299 = 32.99\%$ change in dependent variable can be explained by the change in 3 independent variables accounted by change in interaction of these 3 variables.
R = product moment correlation between actual - criterion and predicted - predictor Y scores.

Or in other words, ~ 33% of the change in Y scores can be predicted on the basis of (X₁, X₂, X₃) scores.

Conversely, it can be stated that 67% of the changes in Y scores cannot be predicted on the basis of (x₁, x₂, x₃.....)

This 1 - R² = 0.67 is error in prediction.

From table 107, F = 23.3 suggest that the amount of variance (R²) predicted through regression equation is significant.

Interaction occurred but did not hold significant effect on programme.

6.09 : Results of Pilot Study

A pilot experiment was conducted on 43 D. Ed. student teachers. It was like a single group design. (Appendix U)

Hence 't' test was applied to compute the results.

<table>
<thead>
<tr>
<th>TABLE 108</th>
</tr>
</thead>
</table>

Effect of treatment - Pilot study

<table>
<thead>
<tr>
<th>(Post test) X_a</th>
<th>(Pretest) X_b</th>
</tr>
</thead>
</table>
| N
| 43             | 43           |
| Mean
| 33.84          | 16.84        |
| Std. deviation
| 10.77          | 6.19         |

<table>
<thead>
<tr>
<th>TABLE 109</th>
</tr>
</thead>
</table>

Effect of treatment

<table>
<thead>
<tr>
<th>Mean_a - Mean_b</th>
<th>t</th>
<th>df</th>
<th>Table value of t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.01</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>10.97</td>
<td>42</td>
<td>2.69</td>
</tr>
</tbody>
</table>
From Garrett (1981, P. 461) \( t_{42} = 2.69 \) at 0.01 level

Hence, from table 109,

\[ t = 10.97 \] is significant at 0.01 level.

\[ \rightarrow \] The programme of enhancement of creativity in teaching is effective.

6.10 : Result of replicability study

The programme of enhancement of creativity in teaching was implemented on in-service secondary school teachers. (Appendix V)

The results are -

**TABLE 110**

<table>
<thead>
<tr>
<th></th>
<th>(Post test)</th>
<th>(Pre-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( X_1 )</td>
<td>( X_b )</td>
</tr>
<tr>
<td>( n )</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Sum</td>
<td>358</td>
<td>223</td>
</tr>
<tr>
<td>Mean</td>
<td>51.14</td>
<td>31.86</td>
</tr>
<tr>
<td>Std. deviation</td>
<td>16.03</td>
<td>10.95</td>
</tr>
</tbody>
</table>

**TABLE 111**

<table>
<thead>
<tr>
<th>( \text{Mean}_a - \text{Mean}_b )</th>
<th>( t )</th>
<th>( df )</th>
<th>table ‘t’ value one tailed test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.05 level</td>
</tr>
<tr>
<td>19.28</td>
<td>5.66</td>
<td>6</td>
<td>2.45</td>
</tr>
</tbody>
</table>

From Garrett (1981, P. 461) \( t_{42} = 2.69 \) at 0.01 level

From table 111,

\[ \therefore t = 5.66 \] is significant at 0.01 level.
6.11 : About the Hypotheses

From the above analysis, it can be concluded that both the hypotheses as stated below were accepted.

\( H_1 \rightarrow \) Programme prepared for the development of creativity in teaching is effective.

\( H_2 \rightarrow \) Average performance of experimental group of student teachers in case of creativity in teaching is more than the control group.

Since both the hypotheses were accepted it was not necessary to make alternate hypotheses and to restate the problem.

6.12 : Discussion of results

Statistical analysis of data gathered from experiment shows that there is a positive and significant gain in creativity in teaching of experimental group. This shows that the programme prepared for the enhancement of creativity in teaching is effective. There is an improvement in part I and part II scores of CIT as well.

This programme was used for D. Ed. student teachers as a pilot study and for in-service teachers as a replicability study. Their results also showed that the programme was effective for them also. However, it was conducted only on seven secondary school teachers. There should a large group to generalize the study.

In this experimental model, three independent variables were considered. Their separate effects were found non-significant. To find out their interaction effect, multiple regression analysis was used. It was found
that \( R^2 = 0.3299 \) i.e. about 33\% changes in the predictor variable were due to the changes in independent variables.

All kind of precautions to control the internal and extraneous variables were taken. The programme was effective not only because the hypotheses were accepted but the analysis of soft data i.e. portfolio cards and application of the programme content in internship programme also supported it as mentioned earlier.

6.13 : Conclusions of the experiment

1. A suitable training programme can improve creativity in teaching of student teachers of B. Ed. course.
2. Both the hypotheses stated earlier were accepted.
3. Interaction of independent variables had occurred. But it was not that effective to overcome the effect of programme on dependent variable.
4. There was a significant and positive correlation between emotional intelligence and creativity in teaching.

Summary :

In this chapter, statistical analysis of the experimental data was provided. It also consisted of the findings and conclusions drawn from the analysis. Next chapter deals with summary of each chapter and implications of the entire study.

"The grand aim of all scientific research is to cover the greatest number of empirical facts by logical deduction from the smallest number of hypothesis or axioms."

— Einstein (as cited in Taylor, 2006)
References:

Books:


Prentice Hall of India. PP. 413-415


Vakils, Feffer and Simons Ltd. P. 466

ibid P.201

ibid P. 461


A Prism India edition P.

Websites:


Chapter Seven

Summary and Conclusions

"All science is concerned with the relationship of cause and effect. Each scientific discovery increases man's ability to predict the consequences of his actions and thus his abilities to control future events."

— Lawrence, Peter

(as cited in quotations archive)

7.01 : Introduction

This chapter summarises each chapter and enlists the implications of the study.

It is divided into two sections. Section one consists of summary of each chapter whereas section two gives implications of present study and problems for further study.

SECTION I - CHAPTERWISE SUMMARY

Chapter I - The Problem

7.02 : Need of the Study

Usually teacher education programmes in India are described as irrelevant, rigid, having a wide gap between theory and practice etc. Various researches assessing the effectiveness of teacher education programmes from various states of India basically supported the above mentioned portrayal of teacher education programmes.
The deficiencies in teacher education system cause ill effects on present day school education i.e. ultimately the future of next generation as Teacher Education provides the human resources to run the schools.

Hence, educational reforms need to be initiated from reforms in teacher education institutions.

If India wants her schools free from rote learning, the undue importance to the limitations imposed on students and authoritarian culture, their teachers' mind set needs be changed.

Being a teacher educator, the researcher found that the prospective teachers (B. Ed. student teachers) were weak in higher order mental processes specifically in divergent thinking. Being not competent in thinking, they adopted only a follower approach and gradually became conformist and rigid. The autocratic atmosphere in teacher education institutions adds to worsen the situation.

Therefore the researcher decided to focus on the competency building of student teachers through this study. When related literature was reviewed, it was found that in all over the world, there is a growing importance attached to creative thinking, not only in the field of education but in business also.

Various education commissions, policy makers thinkers on future trends in education emphasised the importance of inclusion of creativity in education.

Therefore if our students from schools are expected to think creatively, it is essential that their teachers have to think creatively. Since
professional preparation of teachers takes place in teacher education institutions, it is the responsibility of them to provide an input of creative thinking. This may further help add some flexibility and liveliness in teacher education programmes.

Thus the researcher decided to study the effect of programme of enhancement of creativity in teaching on student teachers from B. Ed. colleges.

7.03 : Statement of the problem

"A survey of status of student teachers of University of Pune regarding their creativity in teaching with a view to improving the same through a training programme and testing its effectiveness with special reference to College of Education, Sangamner from Ahmednagar district.

7.04 : Operational definitions

The researcher had used some words with their specific meanings.

Operational definitions of those words were as follows :

1. Student teacher : A student who is studying in College of Education under the jurisdiction of University of Pune for B. Ed. course, studying through 'Marathi medium' in the year 2004-05.

2. Creativity in teaching : There is a presence of creativity in teaching when a teacher makes use of his competencies such as openness, sensitivity to the problem, fluency, flexibility, originality, elaboration, redefinition and resourcefulness while discharging his duties as a facilitator
of learning process. In other words, it is the result/total score of the test which measures the creativity in teaching of student teachers made by the researcher herself.

3. Exposure: It is the score on the researcher made tool which measures the extent of opportunities of variety of experiences made accessible to the student teachers at their school and college level.

4. Emotional quotient: It is the total score on a test which measures emotional intelligence of any individual. "Emotional intelligence" refers to the capacity for recognizing our own feelings and those of others, for motivating ourselves and for managing emotions well in ourselves and in our relationships.

5. Programme: It is a series of learning experiences designed to achieve certain specific instructional objectives within a specified period of time.

6. Rural student teacher: A student teacher who has passed his/her secondary school examination from a school in rural area is called as Rural student teachers. Rural area is a place not having municipality, corporation, cantonment board or notified town area committee as mentioned in the census of India 2001.

7. Urban student teacher: A student teacher who has passed his/her secondary school examination from a school in urban area is called as Urban Student teacher. Urban area is a place having municipality, corporation, cantonment board or notified town area committee as mentioned in the census of India 2001.
7.05 : Objectives

Following were the objectives of the study.

1. To find out the present status of Creativity in Teaching of student teachers from B. Ed. colleges of University of Pune.
2. To prepare a programme for enhancement of Creativity in Teaching.
3. To assess the effectiveness of the programme prepared for improving Creativity in Teaching.
4. To study the relationship between exposure and creativity in teaching.

7.06 : Delimitations

1. The present study covered student teachers studying through Marathi medium only in all colleges of Education affiliated to University of Pune. The experiment was conducted on Marathi medium students of College of Education, Sangamner. Since admissions are centralised and other norms being the same, observations and findings may hold good for any B. Ed. college (having ‘Marathi’ as a medium of instruction) from University of Pune and also for any B. Ed. College from any other University in Maharashtra having similar conditions.
2. The researcher herself implemented the programme. Hence the investigator and experimenter were the same.
3. The tool for measuring Creativity in Teaching was not a standardized tool but was prepared by the researcher and was used after testing and ascertaining its validity and reliability. It was prepared by following all the process part in preparing a standardized test.
7.07 : Significance of the study

The study undertaken is significant in following respects.

1. This study is not only as a remedial one, to be used to lessen the deficiencies of student teachers from a particular college, but it has a strength to bring out the 'change' recommended by various education policy makers and an apex body of teacher education, NCTE. Hence this research can be treated as a primary step of adding new dimensions to teacher education programme as regards 'Creativity in Teaching.'

2. This research also provides a test for measurement of Creativity in Teaching.

3. This study gives a technique of thinking creatively while teaching for conventional B. Ed. course, inservice training and D. Ed. course also.

7.08 : Chapter II - Review of related literature

This chapter was made up of two sections. Section I dealt with theoretical aspects of creativity whereas Section II consisted of researches related to creativity.

Though there are enormous definitions of creativity, creativity could be perceived through four broad areas. They were described by Rhodes. These areas were - creativity as a process, creativity as a product, creativity as a person and creativity as a press. To perceive creativity as a whole all these areas should be taken into consideration. This is an eclectic approach and it was decided as an appropriate approach (by the researcher) to design a programme. However, process aspects were more emphasized. There are
many theories which have tried to answer 'why' and 'how' behind the creative act. Out of them Guilford model of intelligence from a cognitive theory was accepted by the researcher as a base. The factors of creativity in teaching were decided accordingly. The factors of creativity in teaching accepted for this study were fluency, flexibility, originality, elaboration, openness, sensitivity to the problem, redefinition and resourcefulness. Out of these, openness and resourcefulness were not mentioned by Guilford. But when personality traits of creative people noted by many psychologists were analysed, 'openness' was found as a common one. When core common characteristics of creative teachers were studied by Hobelman, Barkan and Wessel (as mentioned in Torrance, 1962) resourcefulness was found to be a common characteristic. Therefore openness and resourcefulness were added. The description of each factor (P. 72-75) and the diagram showing the interrelationship among the factors of creativity in teaching would be available on Page 76.

Environment played a very important role in creative thinking. The factors of environment that help to accelerate the process of creative thinking were -

1. less criticism
2. availability of a creative role model
3. decrease in oppression and exclusion.

One more aspect was the motivation. Amabile (1983) noted that motivation rather intrinsic motivation was a necessary thing. All these aspects were taken into consideration while planning the programme.
Initially the researches related to creativity were gathered. They were classified into following broad areas -

1. Nature of creativity
2. Correlates of creativity
3. Measurement of creativity
4. Development of creativity and
5. Quality improvement measures in case of teacher education programme.

The studies collected by the researcher are given on page no.80.

The major trend in creativity research was to study the correlates of creativity. These correlates were either from sociological or psychological or academic point of view. Sociological factors with which creativity was found associated were mainly sex, age, birth order, caste, religion, rural-urban upbringing and socio-economic status. The findings were contradictory and hence confusing. Therefore, the researcher decided to find out the relationship between exposure (operational definition on P.29) and Creativity in Teaching, as sociological factors basically decided the 'exposure' of an individual.

In case of psychological factors, there were some studies in which relationship between locus of control, emotional stability, autonomy and creativity was found out. Individually these factors were found highly correlated with creativity. Hence the researcher decided to find out the relation between their combined effect i.e. emotional intelligence with Creativity in Teaching.
The researcher found the studies reporting preparation of test measuring creativity in general or in case of a particular school subject. It was found that the factors measured mainly were fluency, flexibility, originality and elaboration. In case of studies from abroad creativity was measured on the basis of personality factors. These factors were the perceptions of a respondent about creativity.

When an effort to find out the studies regarding development of 'creativity', was made number of studies could be located. Majority of them were for school children. One was for D. Ed. student teachers whereas no study was found for the development of creativity in teaching for B. Ed. student teachers.

Thus, review of related literature helped the researcher to finalize the factors of creativity in teaching and relationship between them. It became helpful to have an insight for preparation of test measuring creativity in teaching and also in preparation of programme of development of creativity in teaching.

7.09: Chapter III - Procedure

This chapter mainly dealt with the method of tool finalization. It had made a reference to selection of research methodology and related decisions.

The researcher could not get any standardized test regarding creativity in teaching. Therefore a test measuring creativity in teaching was prepared by the researcher.
The process of preparation of final draft of test consisted of following steps. They could be mentioned here in brief.

1. Test items measuring factors of creativity in teaching were prepared and a first draft of test was formed.
2. This draft test was shown to the experts in the field i.e. teacher educators and experienced school teachers and was modified in the light of their suggestions.
3. It was given to 37 secondary school teachers from and nearby Sangamner and their responses were analysed.
4. While analysing, the need of resolution of the factors of creativity in teaching was felt, to overcome the difficulties in scoring. It was modified accordingly.
5. A manual for scoring was prepared.
6. The test was given to 29 D. Ed. student teachers as a pilot study.
7. A standardized test of creativity thinking i.e. Torrance Test of Creative thinking (TTCT) (Marathi version) was also given to D. Ed. students. The validity and reliability was tested.

   The reliability of test (through split half method) was $\gamma = 0.81467$

   Its coefficient of correlation with TTCT (standardized test) was $\gamma = 0.5118$ and was significant.

   for df = 25, $\gamma = 0.381$ at 0.05 level
   $\gamma = 0.487$ at 0.01 level.

It could be said that the researcher made test of creativity in teaching is valid.
8. This tool was used for survey following the same instructions everywhere.

9. The researcher used one more test. It was of 'emotional intelligence', prepared by Goleman and others. The researcher got it on a website. She downloaded it and translated it into Marathi for use. (Appendix B)

7.10 : Chapter IV - Analysis of Student teacher's profile

This basically was an experimental study; however, a survey of B. Ed. colleges of University of Pune was conducted for understanding the present status of Creativity in Teaching of student teachers.

One more objective behind this survey was of studying the relationship between creativity in teaching and social factors and, also between creativity and innate factors.

The survey was conducted in an academic year 2004-05. Total 16 Colleges of Education from University of Pune were surveyed. Randomly selected 25% student teachers from Marathi medium were asked to respond to the test. The findings of this survey are:

1. The sample was homogeneous in case of both exposure and creativity in teaching.

2. There was significant and positive correlation between exposure and creativity in teaching.

3. There was significant and positive correlation between openness and exposure.
4. There was no significant difference in average exposure of rural and urban student teachers.

5. There was a significant difference in average exposure of male and female student teachers.

6. There was no significant difference between mean exposure of arts, commerce and science students.

7. There was significant difference between average exposure of rural male student teachers and urban female student teachers.

8. There was significant difference between average exposure of rural female and urban male student teachers.

9. There was significant difference between average exposure of rural male and rural female student teachers.

10. There was no significant difference between average exposure of urban male and urban female student teachers.

11. There was no significant difference between average exposure of urban male and rural male student teachers.

12. There was no significant difference between average exposure of rural female and urban female student teachers.

13. There was no significant difference in average score of creativity in teaching of rural and urban student teachers.

14. There was no significant difference in average score of creativity in teaching of male and female student teachers.

15. There was no significant difference between average score of creativity in teaching of Arts, Commerce and Science student teachers.
16. There was no significant difference between average score of creativity in teaching of rural male and urban female student teachers.

17. There was no significant difference between average score of creativity in teaching of rural female and urban male student teachers.

18. There was no significant difference between average CIT score of rural male and rural female student teachers.

19. There was no significant difference between average CIT score of urban male and urban female student teachers.

20. There was no significant difference between average CIT scores of urban male and rural male student teachers.

21. There was no significant difference between average CIT score of rural female and urban female student teachers.

7.11 : Chapter V - The Experiment

The experimental design selected for the study was 'Pretest-Posttest control group' design. The experiment was conducted at College of Education, Sangamner in Jan. 2005. From 80 student teachers of College of Education, Sangamner, of academic year 2004-05, two groups of 40 student teachers in each were formed by random selection and were randomly selected further as an experimental and control group. There was one more control group of 80 student teachers from S.S.B. College of Education, Shrirampur, having similar conditions. This was arranged to check the contamination. The programme was an independent variable and Creativity in Teaching was a dependent variable. There were some more independent
variables such as exposure, emotional intelligence which would affect the dependent variable.

The internal and external validity of this design was discussed in detail on Page No.200-201

A programme of enhancement of Creativity in Teaching was conducted on the experimental group in Jan. 2005. It was conducted for 22 days and for 35 clock hours.

The eight factors of creativity in teaching were dealt with in this programme. The principles of andragogy and constructivism were followed during the programme. Some in-built factors for creative thinking were group work, democratic classroom atmosphere, adequate scope to discussion and analysis, effective use of audio-visual aids, relevance of learning material.

The effectiveness of the programme was found out by post test. But their day to day learning was evaluated by a portfolio method, day to day assignments, and some self analysing exercises. A feedback about the programme was also collected and analysed.

A follow-up was also kept. After the programme, the student teachers went to various schools for their internship programme. It was found that they applied the programme contents i.e. the process developing creativity in the school. The record of their responses gave the glimpse of change in their cognitive as well as affective domain.

The prepared programme was conducted initially on 43 D. Ed. student teachers as a pilot study. After the experiment it was conducted on seven secondary school teachers as a replicability study.
7.12 : Chapter VI - Results

The experimental group and both the control groups were pre and post-tested for their 'Creativity in Teaching'.

In order to find out the effectiveness of the programme the data was analysed using ANCOVA.

Initially on-par relationship in all the three groups regarding creativity in teaching, emotional intelligence, exposure, Torrance test of creative thinking (TTCT) was checked by using ANOVA. It was found that all the three groups were equal regarding their creativity in teaching, emotional intelligence, exposure and on Torrance test of creative thinking, before the experiment. The difference in their scores was not significant and was due to random error.

When ANCOVA was used, it was found that $F = 92.29$, that there is a significant gain in Creativity in Teaching of experimental group. When the significance of difference between the adjusted means of 'CIT' of the three groups was computed, through 't' test, it showed that experimental group mean was significantly higher than the means of both the control groups.

Therefore both the hypotheses stated initially were accepted. They are:

1. Programme prepared for the development of creativity in teaching is found effective.
2. Average performance of experimental group of student teachers in case of creativity in teaching is significantly higher than control group.
The separate effects of the independent variables such as exposure, emotional intelligence, TTCT on the dependent variable were computed and were not found significant.

Hence to find out the effectiveness of their interaction, multiple regression analysis was used. It was found that the interaction of independent variables could predict only 32.7% of the dependent variable significantly.

Therefore it can be said that the interaction effect is not significant to overcome the effect of the programme. It meant that the programme was effective and caused the change in the Creativity in Teaching among student teachers of experimental group.

SECTION – II

7.13 : Implications of the study

The findings of the present study showed that creativity in teaching could be developed in case of student teachers by following certain principles using some techniques, appropriate learning material and creating specific classroom atmosphere.

The results have implications for -

- Policy makers
- Practitioners
- Professionals and for any individual.
They are as follows:

1) Teacher education programmes need such kind of input of creativity in teaching. At present such an input of Creativity in Teaching is not found in a syllabus of B. Ed. course of University of Pune and in the D. Ed. syllabus of July 2005 in Maharashtra. Syllabus Committees of Teacher Education in universities need to have orientation programme for exposing them to the benefits of Creativity in Teaching. The change in the future teachers due to their participation in programme needs to be highlighted in Teacher Educators' meet. NCTE has mentioned in the guidelines that the present teacher should be creative. Now it has to go one step further to introduce such programmes that would lead to Creativity in Teaching. It can also be used for teacher education programme through distance mode by preparing self instructional material.

2. Since teacher educators play a key-role in teacher education institutions, training programme of creativity in teaching need be arranged for them as a refresher course. Through such a course it may become possible to control the factors that inhibit creative expression of student teachers and to remove the unnecessary restrictions on student teachers in the teacher education institutions. (In short, the programme has to initiate the process of creating openness in the atmosphere and in the teacher educators too).

3. The study has demonstrated that student teachers can start thinking creatively. Their classroom behaviour can be changed. Instead of
following the same routine, they may practice alternate ways, may undertake some innovative projects, and can generate new information/knowledge which school children will learn for their future in a meaningful way.

4. This programme can be used as an inservice training programme for secondary as well as primary teachers with some relevant changes in learning experiences. It can be made applicable to headmasters also.

5. As a life skill: This can be used as an input to personality development which consists of skills of listening, observing, thinking and problem solving. One most important input this programme provides is of openness. It is very essential to live in a democratic society. It can be said that this programme can become useful to improve the creativity of a layman. So various voluntary organisations that work for people at large for improving the process of decision-making can include such intentions of creativity.

7.14 : Suggestions for further study:

Though number of researches have been undertaken on creativity in general; there are a few researches carried out in the area of development of creativity, that too at school level. Hence with reference to the present study, following topics can be suggested for further study:

1. The test of CIT used by the researcher was not a standardized one. The test of creativity in teaching can be standardized.
2. In this study all the process and product aspects were included. But to compare them, one group can be treated by process aspects of CIT and other group can be by product aspects only and as a result, their increase in CIT can be compared.

3. Separate programmes for openness, redefinition, elaboration can be prepared, executed and their effects can be measured.

4. Interaction analysis in classrooms based on the factors of creativity in teaching can be made. That would help teacher educators understand the differential significance of various factors of creativity.

5. A scale for a creative head master can be prepared and used to measure creativity of headmasters in school management. That would help change the atmosphere in the schools.

6. Analysis of question papers of exams of B. Ed. colleges on the basis of factors of creativity in teaching can be undertaken and the extent of creativity that is included and developed would throw light in the implicit orientation that exists in course contents in vogue.

7. This programme can be induced in content cum methodology workshop and its effects can be tested, so that direct relation to each school subject in terms of process and product factors could be though of in the context of specific subject structures.

8. The relationship between creativity in teaching and reading habits can be tested, so that creativity can be stressed through programme improving reading habits.
9. Relationship between experience of teaching and creativity in teaching can found out so that contribution of professional exposure and significance of the experience can be gauged.

10. Relationship between creativity in teaching of teacher educators and their student teachers can be studied.

11. A programme for increasing exposure can be prepared, implemented and its effect on creativity in teaching can be assessed.

**Summary:**

In this chapter, all the previous chapters are summarised. In the second section of this chapter, implications of the present study are mentioned. Some topics for further research are also suggested.

"*Reasoning draws a conclusion, but does not make the conclusion certain, unless the mind discovers it by the path of experience.*"

— Roger Bacon

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grS>r :
'धारी फठेिदक: सुमित्रा भावे, सुनील सुकठनकर
निर्माता: सुमित्रा भावे, सुनील सुकठनकर
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