CHAPTER – II

REVIEW OF RELATED LITERATURE
2

REVIEW OF RELATED LITERATURE

Review of related literature, provides a comprehensive understanding about what has already been researched about a topic. It forms the basis for subscribing rationale for having chosen the problem for the study. Review of related literature allows the researcher to acquaint himself with the current knowledge in the field or area in which, he is going to conduct the research. It also helps the researcher to delimit and define the problem. The knowledge of the related literature makes the researcher up-to-date with the work that others have done and helps state the objectives clearly and concisely.

By reviewing the related literature, the researcher can avoid unfruitful and useless problem areas. He can select those areas in which positive findings are very likely to result and his endeavors would be likely to add to the knowledge in a meaningful way. Through the review of related literature, the researcher can avoid unintentional duplication of well established findings. It is of no use to replicate a study, when the stability and validity of its results have been already clearly established.

The review of related literature gives the researcher an understanding of the research methodology, which refers to the way the study is to be conducted. It helps the researcher know the tools and instruments, which proved to be useful in the previous studies. It also provides an insight into the statistical methods, through which the validity of the results is to be established.
The specific reason for reviewing the related literature is to know the recommendations of the previous researchers for further research.

Good, Barr and Scates (1941) analyzed the purposes of review of related literature as: to show whether the available evidence material solves the problem adequately without further investigation, to provide ideas, theories, explanations or hypotheses valuable in formulating the present study, to suggest the research methods to the problems, to locate comparative data useful in interpretation of the results and to contribute to the general scholarship of the investigator.

Turney and Robb (1971) state that the identification of a problem, development of a research design and determination of size and scope of the problem, all depend to a great extent on the ease and intensity with which a researcher has examined the literature related to the intended research.

For any worthwhile study in any filed of knowledge, the research worker needs an adequate familiarity with the library and its many sources. The search for reference material is a time consuming, but very fruitful phase of research programme. Every investigator must know what sources were available in his/her field of enquiry, which he/she is likely to use and where and how to find them. (Sukia, et. al., 1980)

According to John W. Best (1959), practically all human knowledge can be found in books and libraries. Unlike other animals that must start a new life with each generation, man builds up accumulated and recorded knowledge of the past.
Availability of adequate information about educational thought and research does not by itself result in possession of knowledge by investigator. The investigator may be very keen to possess up-to-date information regarding chosen field, and may try hard to be up-to-date, and yet fails to get enough information due to non-existence of source of such information. (Sukhia 1980)

In the field of education, as in the other fields too, the research worker needs to acquire up-to-date information about what has been thought and done in the particular area from which he intends to select a problem for research. But, it is found that the extent of important and up-to-date information regarding educational research and ideas possessed by educational workers are very limited. (Sukhia 1980)

In the review of related literature, the findings of the research studies are quoted as under:

1. Studies related to creativity.
2. Studies related to scientific attitude.
3. Studies related to attitude towards science.

**CREATIVITY**

The approaches to studying creativity called the 5-Ps, namely, person, process, product, press and potential are quite popular.

Guilford, J.P. (1950), as the president of the American Psychological Association, in an address pointed out: “Of approximately 121,000 books and papers listed in psychological abstracts in about twenty three years, only 186 seemed to have some bearing on the topic of creativity.”
Passi, B.K. and Buch, M.B. (1989) reviewed 166 out of a lot of 4,703 research studies reported in the four Surveys of Research in Education. But teachers’ creativity and its relationship with scientific attitude is not considered for any study.

Passi (1997) has observed that, in spite of definitional divergences and other difficulties to conduct research in creativity, there has been a consistent growth of research in the area. Indian researchers have shown interest in this complex and multi-faceted phenomenon but significant educational problems have not yet been undertaken. Up to 1970, only five studies were completed. But, the situation is gradually improving. In 1993, as many as 214 research studies have been completed in India. Less than ten studies are on creativity of the teachers and no studies are noticed on the relationship with attitude towards science.

Gunwant Dhatrak and Shashi Wanjari (2011) found that the secondary school students had an average level of creativity.

**Creativity and Teacher**

Classroom is a dynamic, interactive, complex and ever-changing social environment. Every moment in teaching, teachers are facing new challenges. They have to solve a lot of problems, which they have not been taught directly or experienced before. They have to plan and implement their lessons in such situations where there is no available formula to implement it.

Shalley and Gilson (2004) stated that most managers would agree that there is room, in almost every job, for employees to be more creative.
Randi and Corny (1997) viewed that in-depth studies on creativity of teachers are rare, though its importance is widely accepted among educators now-a-days.

Dewey's (1960) classic work ‘Democracy and Education’ tells us that teachers are persons whose work requires them to make qualitative judgments. The teacher's judgments are similar to those made by an artist. Teacher, as an artist, should have more creativity to mould the behaviour of the young children.

In a book entitled "Creativity in Teaching", Miel (1961) suggested that the teachers might express their creativity in three areas of tasks: integrity in classroom relationships, development of teaching content, and inventiveness in the use of time, space and materials.

Gurbaksh Lal (1974) studied the relationship between creative thinking and vocational anxiety and their effect on success in teaching, by taking the sample of 300 teacher trainees studying in three Colleges of Education in Punjab. He found that a high vocational anxiety was inversely related to teaching success, and interaction effect of vocational anxiety and creative thinking on teaching success was found to be significant.

Singh (1978) found, in his study on the 100 trained graduate teachers in science, that teachers with high creativity significantly talked less, asked more divergent questions and gave more time to students for thinking before responding to their questions than the teachers with low creativity.
Sansanwal (1979) studied on B.Ed students of the Department of Education, Indore, revealed that the high creative group tended to be cheerful, active, talkative, frank, expressive, effervescent and carefree.

Choudhry (1982) identified that there was a significant relationship between creative thinking abilities and some of the indices of the classroom verbal behaviour, high creative teachers increased pupil’s freedom to participate by praising, accepting and developing their ideas and they processed the content and talked more at convergent, divergent and evaluative levels and less factual level.

Bhagoliwal (1982) found that more effective teachers were characterized by having more of creative potential indicated by imagination resources reflected in object and person relations whereas less effective teachers lacked productive resources.

Shukla, P.C. (1984) found that non-innovative teachers were found to be reserved, detached, critical, cool, less intelligent, dull, tending towards trauma and tension, frustrated, excitable and restless and innovative teachers were found to be emotionally stable, calm and mature, assertive, independent, self-assured, happy-go-lucky, impulsive, lively, gay, enthusiastic, more venturesome, socially bold, spontaneous, trusting, imaginative, shrewd, calculating, placid, experimenting, analytical, free-thinking, inclined towards relaxation and composure.
Jain, Smeeta (1992) identified a positive and highly significant correlation between creativity and classroom creativity, teaching aptitude and teaching skills.

Amabile (1997) cited as Arthur Schawlow, winner of the noble prize in physics in 1981, was once asked what, in his opinion, made the difference between highly creative and less creative scientists. He replied, “The labor of love aspect is important. The most successful scientists often are not the most talented. But they are the ones who are impelled by curiosity. They’ve got to know what the answer is.”

Feist and Barron (2003) from a longitudinal study starting when respondents were graduate students found that creative individuals tended to be more autonomous, introverted, open to new experiences, norm-doubting, self-confident and self-accepting.

Creativity and Locality

Locality may play a major role in shaping the personality of the learner. The urban students are well equipped with diversified experiences than the rural ones. For example, every year, science fairs are organised by the Department of Education only in urban areas of the state. Very few (it depends on the teacher’s capability and interest) of the rural students participate in these fairs and they are not in a position even to visit them. After completion of graduation too, majority of the rural graduates are not aware of science fairs. Without proper exposure, it is very difficult to get right attitude towards science subject. Students are interested to learn the subject to the best of their
abilities and they work hard to get good marks in the examination, but due to lack of direction their efforts are wasted and their abilities are under utilised in the society. Rural students are blessed with natural surroundings and pollution-free environment. They will be free from stress and can think creatively in the natural environment. A study conducted by Narendra (2006) revealed that 95% of the teacher educators in the state of Andhra Pradesh are with rural background.

An interesting fact is that, of all the selected candidates passing the national competitive exams such as IITs and IIMs, less than 1% came from rural background. Similar to gender difference, there is no agreement in terms of locality too: 1. There is no influence of locality on creativity. 2. Rural students are superior to urban students in creative thinking. 3. Urban students are superior to rural students in creative thinking.

Aaron, Marihal and Malatesha (1969) explored the differences in creativity among rural and urban students and found no significant difference in the creativity of the two groups.

Singh (1981) found no significant difference in the creativity of urban and rural students.

Joshi (1982) also found no significant difference in the creativity of urban and rural students.

Chandrakant (1987) also found no significant difference in the creativity of urban and rural students.
Jayaswal (1977) reported no significant difference between teacher trainees from urban and rural areas in creativity.

Desai, N.N. (1987) found no difference in the creative thinking ability of urban and rural higher secondary students.

Afshan (1991) investigated the difference between rural and urban gifted girls on creativity and found no significant difference in the mean scores.

Sharma (1974) reported that rural students were significantly more creative than urban students.

Passi (1971) observed that urban students were significantly more creative than rural students.

Srivastava (1978) reported superiority of urban students over rural students in creativity.

Dhramangadan (1981) reported that urban students scored significantly higher than rural students on flexibility and originality measures of verbal and figural creativity.

Singh, G. (1985) found that the mean scores of urban students were higher than those of the rural students on all the seven dimensions of creativity.

Sharma, H.L. (1986) found that the civil service personnel without experience belonging to urban areas had the maximum creativity scores, and engineering personnel without experience belonging to rural areas had the lowest creativity scores.
Trimurthy, S.P. (1987) on the study of Creative Thinking Ability (CTA) of secondary school students, confirmed that the urban students were better than the rural students in both verbal and non-verbal CTA.

Gunwant Dhatrak and Shashi Wanjari (2011) found that the urban students are more creative as compared to rural students.

**Creativity and Gender**

The results of research on gender differences, especially in creativity, are varied and hence are not conclusive. There are three contradictory trends observable on this issue: 1. Males are superior to females in creative thinking, 2. Females are superior to males in creative thinking and 3. There are no sex differences in creativity.

There are a number of researches reporting male superiority in creative abilities. This view may find its origin in the findings of some surveys conducted even long ago, which indicated very low contribution of women towards creative act as compared to men.

Cattle (1903) listed only 32 women out of 1000 prominent persons.

Ellis (1904) listed just 55 genius women out of 1030 persons in the study of British genius, while Castle (1913) observed only 868 outstanding women down through the ages.

Jayaswal (1977) stated that male teacher trainees were significantly higher than female trainees on the originality component of creativity.

Singh (1978) found that male students scored significantly higher than females on total elaboration.
Jarial and Sharma (1981) found that male students were significantly better than female students on the fluency aspect of creativity.

Pandey (1980) noticed that male teachers were superior to female teachers in fluency and originality.

Sharma, K. (1982) analysed the factors related to creativity and found that boys were more creative as compared to girls.

Shakuntala (1992) found that boys were better than girls on the fluency component of verbal creativity.

Karimi (2000) revealed that boys are strikingly excelled than girls in creativity.

While the above researchers indicated male superiority in creative ability, some other researchers observed that females were superior to males on several aspects of creativity.

Pandit and Katiyar (1976) found that female students were significantly higher than male students on each of the components of creativity, viz., fluency, flexibility and originality.

Jayaswal (1977) found that female teacher trainees were significantly superior to male teacher trainees in case of fluency and flexibility components.

Tripathi, V.K.D. (1983) confirmed that the female teacher trainees were higher on creativity than the male teacher trainees.

Bharadwaj (1985) observed that verbal fluency was greater among females than males.
Pandey (1984) reported that females scored significantly higher than males on elaboration.

Brar, S.S. (1986) found that the high creative girls scored comparatively higher than the high creative boys in the area of total performance in the theory part and in the art and craft part of B.Ed. examination.

Rejskind, Rapagna and Gold (1992) found that female students shown higher creative ability than male students in divergent thinking test.

Kim and Michael (1995) conformed that the female teachers were higher on creativity than the male teachers.

Misra (2003) found that female students are more creative than male students.

Rosa M. Limiñana Gras (2010) noticed significant differences in the creativity performance of male and female pupils and female pupils are more creative.

As mentioned earlier, there is a third category of studies involving samples ranging from elementary school children through high school to college students, which indicated no sex differences in creativity.

Raina (1971) found that there is no significant difference in the verbal creativity or fluency, flexibility, and composite scores of non-verbal creativity of male and female teachers.

Lal (1977) found that there is no significant difference in the creativity scores of male and female teacher trainees.
Arora (1978) observed that men and women did not differ significantly in their mean performance on TTCT.

Singh (1978) observed no significant difference between male and female students with respect to spontaneous flexibility.

Singh (1981) observed that sex did not seem to have any significant differential effect upon high and low creativity among student teachers.

Chaudhary, G.G. (1983) noticed no significant difference between the mean creative thinking scores of male and female children of rural and urban areas.

Desai, N.N. (1987) found no differences between male and female students with regard to creative thinking ability.

Goldsmith and Matherly (1988) found that there is no gender difference in the measures of creativity.

Masih (1989) found that both male and female students of B.Sc. (Hons.) and B.Ed. were equally creative.

Gautam (1992) found no significant sex differences in the development pattern of creative thinking.

Kumar (1992) found that the male and female students did not show any significant difference in their creative thinking ability.

Rodríguez and Grande (2007) found no difference between men and women in terms of creativity.

Gunwant Dhatrak and Shashi Wanjari (2011) observed no significant correlation between creativity of boys and girls.
Creativity and Scholastic Achievement

Majority of the institutions are giving priority to the percentage of marks at graduation level. But the tests conducted at graduation level are prepared by the university level teachers and they are not trained in constructing standard tests.

Hanushek and Rivkin (2004) described various attempts to estimate the impact of teacher quality on student achievement. Estimates suggested that the differences in annual achievement growth between an average and a good teacher are large. Within one academic year, a good teacher can move a typical student up at least four percentiles in overall distribution. It is clear that having a series of good teachers can dramatically affect the achievement of any student.

Yamamoto (1964) found that there was no difference in academic achievement between the high creative and the high I.Q. groups although there was a mean difference of twenty I.Q. points.

Struthers (1996) confirmed that creativity was positively related to high achievement.

Foodor and Carver (2000) found that achievement motivation was positively related with creativity.

Karimi (2000) noticed a significant positive relation between creativity and academic achievement.

Rosa M. Limiñana Gras (2010) found that a low relationship between creativity and academic performance.
Indian researchers studied the relationship between scholastic achievement and creativity. In majority of the studies, the achievement of students in the annual examination was considered as an index of their scholastic achievement.

Raina, M.K. (1986) found a positive and significant relationship between creativity and scholastic achievement.

Dhalla, T. (1990) reported a positive and significant relationship between creativity and scholastic achievement.

Srivastava, S. and Srilatha, R. (1992) reported a positive and significant relationship between creativity and scholastic achievement.

Paramesh, C. R. (1973) found a positive and significant relationship between creativity and student’s achievement in science.

Bagga, D. (1973) reported that the achievement of students in science subjects was negatively though negligibly related to composite verbal and non-verbal creativity.

Joshi, R.J. (1974) found a positive and significant relationship between creativity and achievement in English.


Dhaliwal, P.S. and Saini, B.S. (1976) reported that the dimensions of creativity, namely, fluency and flexibility were positively and significantly related with achievement in history and geography separately.
Dhaliwal, P.S. and Saini, B.S. (1976) reported that originality was positively and significantly related with achievement in Hindi.

Badrinath, S. and Satyanarayan, S. B. (1979) found that the scholastic achievement and creativity were positively related.

Sharma, K., (1982) analysed the factors related to creativity and found that scholastic achievement was positively related to the measures of creativity.

Bawa, S.K. and Kaur, Parvinder (1995) revealed a significant positive correlation between all the four measures of creativity and achievement in all the school subjects except social studies. Achievement in languages tended to be better related to the creative thinking than in social studies and general science.


Suman and Umapathy (2003) found that high achievers performed better on seeing problem test, unusual uses test, consequences test, test of inquisitiveness, square puzzle test and composite creativity as compared to low achieving adolescents.

Indira and Nirmala Devi (2006) found that the creative stimulation affected the development and achievement.

Kunjan, Trivedi and Richa Bhargava (2010) found that the high achieving adolescents had higher level of creativity than low achiever group.

Gunwant Dhatrak and Shashi Wanjari (2011) found no significant relation between creativity and scholastic achievement of secondary school students.
Creativity and Socio-Economic Status

The results of research on SES differences, especially in creativity are varied and hence are not conclusive. Many studies have reported that creative people came from high socio-economic status families.

Ranjan Pandit and Katiyar (1976) found that creativity was positively and significantly related to the level of socio-economic status and level of scholastic achievement.

Jarial (1979) found that the students belonging to high socio-economic status scored significantly higher than the students of upper middle, lower middle and low socio-economic status groups on creativity tests; the students belonging to upper middle class socio-economic status scored significantly higher than students of low socio-economic status and the students of lower middle socio-economic status scored significantly higher than students of low socio-economic status on creativity.

Sharma (1980) found that the students of high socio-economic status scored significantly higher than the students of low socio-economic status in originality and total creativity, where as it had no effect on fluency and flexibility components.

Sharma, K. (1982) analysed the factors related to creativity and identified that creativity was higher in nuclear families and families with higher SES.

Chaudhary, G.G. (1983) found that the higher the socio-economic status, the higher was the creative thinking ability of the student.
Singh and Katiyar (1977) observed that the students of low socio-economic status were higher than those belonging to middle and high socio-economic status in all the areas of creativity.

Seetharam and Vedanyagan (1979) reported that there was no significant difference in the creativity scores of high, middle and low socio-economic students.

Badrinath and Satyanarayana (1979) did not find any significant difference in the creativity scores of the students of high, middle and low socio-economic status.

Tripathi, V.K.D. (1983) found that there was a positive correlation between the SES and creativity scores.

Singh, G. (1985) found that the students from the higher socio-economic group scored higher than the students from the lower socio-economic group on all the seven dimensions of creativity.

Desai, N.N. (1987) found no significant difference between the means of high SES and low SES students in creativity.

Dutt (1988) found that the total verbal creativity was not found to be related significantly to socio-economic status.

Gautam (1992) found that the high and the low socio-economic status groups of students did not differ on creativity.
Creativity and Faculty

Some studies were carried out to find out whether or not students from different disciplines like science, arts, home science and commerce differ in their creativity.

Jha (1977) found that science students were superior to arts and commerce students in their creativity.

Srivastava (1978) reported that science students were superior to arts and commerce students in their creativity.

Ashok (1985) found a positive and significant relationship between creativity components and science achievement.

Awasthy (1979) reported that science students were significantly higher than arts students in fluency and flexibility areas of creativity.

Ranjana Pandit and Katiyar (1976) observed that science students were significantly better than arts students in fluency, flexibility and originality.

Baljeet Kaur and Sansanwal (1980) found that students studying commerce were found to be highly creative compared to science and home science students, but science students were more creative than those belonging to home science.

Jayaswal (1977) found that male teacher trainees in science were significantly higher in creative ability than teacher trainees in arts. He also found that female teacher trainees in arts were significantly better than their male counter parts in the same faculty.
Masih (1980) found no significant difference in the components of creativity of students of B.Ed. and B.Sc. (Hons.).

Desai, N.N. (1987) found no difference between science and common stream students.

**Creativity and Intelligence**

Kumari, K. (1975) found no significant relationship between intelligence and creativity, no significant relationship between creativity and adjustment and no significant relationship between creativity and value patterns.

Sharma, K. (1982) found that creativity was significantly higher in the high I.Q. group in comparison to the middle and low I.Q. groups.

Sharma, K. (1982) found the middle I.Q group is significantly higher than the low I.Q. group on creativity.


**Creativity and Multicultural Background**

Singh, G. (1985) found that the culturally superior group scored significantly higher on creativity than the culturally inferior group.

Lambert, Tucker, and d’Anglejan (1973) found creativity was at relatively high rates among first and second generation immigrants.

Simonton (1999) found that creativity at relatively high rates among first and second generation immigrants.

Tadmor and Tetlock (2006) argue that multicultural experiences help individuals to recognize and integrate viewpoints grounded in diverse cultures,
and consequently enhance their cognitive complexity—that is, their ability to tolerate and even reconcile conflicting ideas and perspectives.

Leung and Chiu (2008) identified that some cross-cultural researchers have found evidence that multicultural exposure has positive effects on a variety of tasks, including negotiation, idea generation, remote association of ideas, and imagination tasks like drawing depictions of aliens.

Maddux and Galinsky (2009) found evidence that living abroad and being immersed in a culture different from one’s own promotes creative problem solving.

**Creativity and School Climate**

Singh, G. (1985) found that the students from the advantaged school climate scored higher than those from the disadvantaged school climate.

Ganesan, V. (1987) found that creativity of knowledge workers and their innovative performance had a positive but insignificant relationship and organizational climate by itself was related to innovative performance when creativity was controlled.

Rajagopalan, S. (1988) found that the high classroom climate (high authenticity, legitimacy and productivity) was found to be effective on the creative level of students of classes VIII and IX and also found that the classroom climate and intelligence had a significant effect on creativity scores of students of both the classes.

Ahmed (1998) found that verbal creativity was affected greatly by the enriched school environment. It was concluded that verbal abilities develop
more in a highly enriched but formal environment, while non-verbal ability is equally affected by an enriched formal as well as informal environment.

**Creativity and Values**

Mackinnon (1964) found that creative architects scored high in theoretical and aesthetic values and low in economic values.

Blatt and Stein (1957) found that the creative industrial research chemists possessed higher economic and aesthetic but lower social and religious as well as authoritarian values.

Yamamotto (1961) studied creative teachers and found them to score high on theoretical orientation.

Walberg and Welch (1967) showed that the innovative teachers were higher in theoretical and aesthetic values but lower in economic, religious and political values.

Singh (1977) found that the creative student teachers were significantly higher than the non-creative teachers in economic values.

Krishnan, S. (1993) found that the social values, aesthetic values and economic value were positively significant with creative ability.

**Creativity and Home Background**

Getzels and Jackson (1961) found that the parents and the home atmosphere appear to be more instrumental in fostering or hindering the creative talents of their children.

Mackinnon (1964) found that creative subjects were given more independence and responsibility during childhood than the average child.
Creativity and Scientific Attitude

Gunwant Dhatrak and Shashi Wanjari (2011) found low correlation between scientific attitude and creativity of secondary school students.

Creativity and Scientific Attitude with locality

Gunwant Dhatrak and Shashi Wanjari (2011) found low significant correlation between scientific attitude and creativity of rural students.

Gunwant Dhatrak and Shashi Wanjari (2011) found moderate correlation between scientific attitude and creativity of urban students.

Creativity and Scientific Attitude with Scholastic Achievement

Gunwant Dhatrak and Shashi Wanjari (2011) found low correlation between scientific attitude and creativity with scholastic achievement of boys.

Gunwant Dhatrak and Shashi Wanjari (2011) found low correlation between scientific attitude and creativity with scholastic achievement of girls.

From the analysis of different studies carried out on creativity, it may be observed that most of the studies were conducted at school level and very few studies at teacher education level.

Scientific Attitude

It has been argued that the full unfoldment of creativity requires the ending of rigidity and, therefore, of fragmentation in the overall planetary culture. Although science literally means knowledge, the scientific attitude is concerned much more with rational perception through the mind, and with
testing such perceptions against actual fact through experiments and observations.

There are tangible as well as intangible outcomes of science teaching and education. The tangible outcomes of science education are scientific knowledge and problem solving.

The teacher through his actions must be able to convince the students that scientific attitudes are an integral part of his behaviour. His intellectual honesty, willingness to admit error, listening to others’ ideas and dealing with facts in an unbiased way make a favorable and lasting impression upon pupils.

India Science Report (2005) revealed that the highest number of students wishes to become teachers (32% in rural areas and 20% in urban areas), but this desire reduces over the years. In classes six to eight, for instance, 30% of the students said they wished to become teachers and this falls to 23% among students in classes 11 and 12. The proportion that wanted to become doctors remained more or less the same at all classes in school (around 20%) while the proportion that wanted to become engineers rose marginally (to around 23%). Thus, the three most preferred professions turn out to be teacher, doctor and engineer.

Swarnamma (1978) revealed that the teachers of Wisconsin did not unconsciously attempt to develop characteristics of scientific attitude among the pupils of upper primary classes.

This was supported by the study of Davis, which stated that the teachers of Wisconsin did not consciously attempt to develop the characteristics of
scientific attitude. If pupils have acquired these characteristics, they have acquired them by some process of thinking on experiences outside the classroom. So, they must try to develop scientific attitude.

Radha, K.V. (1984) found that scientific attitude and personal adjustment differentiated significantly.

Shinde, Y.K. (1982) found that the correlation between the scientific attitude scores and non-formal science activity scores was negligible and not significant.

Srivastava (1986) observed that the amount of scientific knowledge or general exposure to science courses had impact on scientific attitudes positively, and scientific knowledge helped in the formation of scientific attitudes.

Kulakarni (1988) found that the work experience was effective in inculcating love for scientific attitude in the pupils.

Ghosh Shibani (1989) attempted to draw the attention of science educators to the concept of ‘scientific literacy’ and ‘scientific enquiry’ in the teaching of science and helped them with scientific aptitude test and scientific attitude test for facilitating their job.

Digumarti Bhaskara Rao (1990) found that the scientific attitude in secondary school pupils was average.

Survey in the science journal Nature, (1997) revealed that 40 percent of U.S. scientists said they believe in God—not just a creator, but a God to whom one can pray in expectation of an answer. That is the same percentage of
scientists who were believers when the survey was taken 80 years earlier. In fact there are religious people who attempt to use scientific theory and scientific method to provide support for some of their religious beliefs. There are also members of religious orders who practice science as well as their religion.

Gwanwant Dhatrak and Shashi Wanjari (2011) found that secondary school students possessed an average level of scientific attitude and creativity.

**Scientific Attitude and Science Teachers**

Shrivastava (1983) found that science teachers, non-science teachers, science students, and non-science students demonstrated positive scientific attitudes.

Bhaskara Rao, et.al. (1986) found that 65% of the sample holds low scientific attitude and only 35% hold average scientific attitude and unfortunately no one was with high scientific attitude.

Bhaskara Rao, et.al. (1989) in another study found that prospective science teachers were holding low scientific attitude.

**Scientific Attitude and Locality**

Ghosh Shibani (1989) found no significant difference with respect to place of habitation.

Dubey (1992) found significant difference in scientific temper between rural girls and urban girls.
Gunwant Dhatrak and Shashi Wanjadi (2011) found significant difference between scientific attitude of rural and urban students. It means that scientific attitude of urban students was high as compared to rural students.

**Scientific Attitude and Gender**

Shinde, Y.K. (1982) made it clear that the boys and girls did not differ in their scientific attitudes.

Ghosh Shibani (1989) found no significant difference with respect to sex.

Digumarti Bhaskara Rao (1990) found no influence of sex on scientific attitude.

Kumar Udaya Sam (1991) found no significant difference between the mean scores of scientific attitude of boys and girls.

Gunwant Dhatrak and Shashi Wanjadi (2011) found no significant correlation between scientific attitude of boys and girls.

**Scientific Attitude and Academic Achievement**

Shinde, Y.K. (1982) made it clear that students with high academic achievement had high scientific attitude, students with average academic achievement had average scientific attitude, and the low achievers had a low scientific attitude.

Paulose (1995) interpreted that there was a significant relation between higher scientific attitude and higher science achievement.

Gunwant Dhatrak and Shashi Wanjadi (2011) found negative correlation between scientific attitude and scholastic achievement of secondary school students.
Gunwant Dhatrak and Shashi Wanjari (2011) found low correlation between scientific attitude and scholastic achievement of rural students.

Gunwant Dhatrak and Shashi Wanjari (2011) found negative correlation between scientific attitude and scholastic achievement of girls.

**Scientific Attitude and Socio-Economic Status**

Ghosh Shibani (1989) found no significant difference with respect to socio-economic conditions and scientific attitude.

**Scientific Attitude and Teaching Methods**

Kulakarni (1975) found that the work experience was effective in inculcating scientific attitude.

Kishor and Puri (1990) found that the scientific attitude of the students who were taught physics through individually guided system was improved significantly as compared to the group taught through the conventional method.

It has often been said that you can’t teach something you don’t know. A corollary to this generalization might be this: pupils cannot learn attitudes that their teachers do not have’.

The review reveals that the studies on science teachers are very few. The studies show that the scientific attitude is low among the teachers but we cannot take this generalization now. There is a need to survey this scientific attitude among science teachers. Studies on prospective sciences teachers are not found on the population of Andhra Pradesh. There is a need to explore this area.
ATTITUDE TOWARDS SCIENCE

An attitude is an emotional reaction towards a person or thing. It is a personal response to an object, developed through experience, which can be characterized as favourable or unfavourable. The use of science as the object or stimulus of these feelings delineates that set of attitudes known as ‘attitude towards science’. The concept of an attitude towards science is somewhat nebulous, often poorly articulated and not well understood.

The investigation of student’s attitude towards studying science has been a substantive feature of the work of the science education research community for the past 30-40 years. (Osborne, 2003)

Developing positive attitude towards science has been an exposed goal of most of the curriculum development efforts since 1950s. It was hoped that increasing interest in science would result in increased science enrolment, which in turn would yield a larger science work force pool and a science literate public. The increased attention to the effective outcomes of science has also resulted in a proliferation of attitude towards research studies, more measuring techniques, and several attempts to measure attitude towards science on an international level.

An early notable contribution towards its elaboration was made by Klofer (1971), who categorized a set of affective behaviours in science education:

- The manifestation of favourable attitudes towards science and scientists.
- The acceptance of scientific enquiry as a way of thought.
- The adoption of scientific attitude.
• The enjoyment of science learning experiences.

• The development of interests in science and science related activities.

• The development of interest in pursuing a career in science or science related work.

Shrigley (1974) found that the teachers with negative or neutral attitude towards science may transmit that attitude to their students.

Sherwood and Gabel (1980) informed that the teachers with a positive attitude towards science like to teach science and students taught by them will have positive attitude towards science.

Sood (1974) studied the attitude towards science and scientists among students and teachers and found that the understanding of science positively related to attitude towards science.

Piper and Moore (1977) revealed that inquiry oriented science curricula had positive impact on students attitude toward science.

Riley (1975) investigated the effects of science process skills training and reported that such training would promote science process skills; but Sherwood and Gabel (1980) study revealed no significant impact on student attitude toward science.

Haladyna and Shaughnessy (1982) mentioned that students’ attitudes toward science are determined by three independent constructs: teacher, student, and learning environment.
Sarah, Shanta Kumari and Williams (1983) found that the attitude of the high school pupils towards science and science education in Tamil Nadu was generally favorable but there was a wide disparity in their attitude.

Myers and Fouts (1992) found that research involving both secondary and older students indicated a relationship between teacher behaviors and students’ attitude toward science.

Maitra, Krishna and Alka (1997) identified that science being a dynamic discipline needs constant updating of one's knowledge, which was lacking in most of the teachers and the maximum number of teachers failed to show their innovativeness in procedure for evaluating their students.

Watters and Ginns (2000) found that pre-service teachers tend to have poor attitudes and beliefs about science and their capacity to be effective teachers of science.

Palmer (2001) found from previous literature that many pre-service teachers hold negative attitudes, which arose, from their knowledge, dispositions, beliefs, perceptions and past experiences upon entry into formal preparation programmes.

NCAER's National Science Survey (2004) found that despite the poor interest in science and technology programmes, most Indians have great faith in science; over three fourths feel science and technology is important for education, 58% feel the same way about the economy, and 72% about agriculture.
A study conducted by Peter and Santosh (2005) by taking the sample of forty students at intermediate level from Hyderabad revealed that 80% of the students were with negative attitude towards science. Eighty five percent of the students replied that because of their parent’s interest they selected science group.

Those pre-service teachers who studied science at high school found it to be largely a negative experience designed for "intelligent" students (Palmer, 1995; Mulholl and Wallace, 2003). But, in India, graduation in science is must to enter in science teacher education program. So, here, the attitude towards science is positive. But, the conditions in schools and colleges are not encouraging the students to get clarity.

With the increased number as well as proportion of students enrolling for science education; 28% of all enrolments at the graduate level were in the science field in 1995-96 and this went up to 31% in 2004. It is difficult to believe that there is any sense of crisis in the science education scenario in the country. Indeed, over three fourths of teachers polled in the National Science Survey-2004 were of the view that science education is growing. (India Science Report, 2005)

In the context of research indicating widespread scientific ignorance in the general population and an increasing recognition of the importance and economic utility of scientific knowledge and its cultural significance, the falling numbers choosing to pursue the study of science has become a matter of
considerable societal concern and debate in advanced countries. Attitude is the major cause of concern for the enduring ‘swing away from science’.

Lack of experience in science leads to a lack of understanding of science and contributes towards negative attitude towards science. Our institutions are known for lacking facilities to study science.

**Locality and Attitude towards Science**

Sood, J.K. (1992) found a significant difference between students from public schools and students from rural areas with regard to their understanding of science. The students of public schools had a high level of understanding of science.

Mitra, Krishna and Alka (1997) revealed that the rural girls of class X had very high and positive attitude towards science than the urban girls.

Prasanth (2004) found no significant difference between the scores of rural and urban groups with reference to attitude towards science.

**Gender and Attitude towards Science**

There are few quantitative studies on the attitude of women toward science-the most developed area being research on young girls (Simpson and Oliver, 1990; Jones et. al., 2000; Mullis, et. al., 2000; Breakwell and Robertson, 2001). Most of the published studies on women and science found significant gender differences, with women being less positive towards science (Fox and Firebaugh, 1992; Trankina, 1993; Pifer, 1996; Barke, et. al., 1997).
The research demonstrates that as girls grow older, they are less interested in science than are boys (Weinburgh, 1995; Catsambis, 1995; Simpson and Oliver, 1990; Shymansky and Kyle, 1988).

A study by Lightbody and Durndell (1966) in one school, using a slightly more sophisticated preference ranking system, has shown that boys were far more likely to report liking for science than girls. There was a wide spread belief among scientists and science educators that attitudes towards science are negative than desired. Declining enrolment and personal experiences have created a generally discouraging situation.

Schibeci (1984) reported that of all the variables that may influence attitude towards science, gender has generally been shown to have a consistent influence.

Simpson and Oliver (1985) in a multidimensional study among 4,000 students in grades 6 through 10, found that males show significantly more positive attitude towards science than females.

Ghosh (1986) found that, while boys and girls did not differ on scientific attitude and aptitude, there was a positive relationship between scientific aptitude, attitude and academic motivation.

In a study by Kar, D.K. (1990) examined the problem of relationship between attitude and achievement in general science of class IX students and found that boys were more favourably disposed towards science than girls.
Malviya, Dharma Shila (1991) took up a study of attitude towards science and revealed that there was no significant difference between male and female teachers’ attitude towards science.

Srivastava, Veena (1992) found that the girls had more favorable attitude towards science than boys.

Sood, J.K. (1992) noticed that male and female students differed significantly regarding their understanding of science and there was a significant difference between males and females regarding attitude towards science.

Hykle’s (1993) research indicated that males have a more positive attitude toward science, were more highly motivated to achieve in science, and more likely to select science courses as electives in high school.

Simpson, et. al. (1994) reported that gender was one of the most significant factors related to students’ attitude towards science.

Padhi J.S. (1994) found that the boys and girls differed significantly with respect to their attitude towards science.

Siegle and Reis (1994) found that adolescent female gifted students indicated that they had higher ability than males in language arts only, while male gifted students indicated that they had higher ability than females in mathematics, science, and social studies.

Molly Weinburgh (1995) in his Meta analysis covering the literature between 1970 and 1991 found that boys had more positive attitude towards science than girls.
Mitra, Krishna and Alka (1997) found that the boys had more positive attitude towards science as compared to the girls towards science practicals where as girls emphasized the knowledge aspect more. Boys showed more positive attitude towards science as compared to girls.

Swiatek and Lupkowski-Shoplak (2000) found that the attitude differences in gifted elementary school students, with boys favoring science and technology and girls favoring English, writing, foreign language, and reading.

Prasanth (2004) found no significant difference between urban boys and urban girls in terms of delayed post-test scores with reference to attitude towards science.

**Achievement and Attitude towards Science**

Sarah, Shanta Kumari and A. Williams (1983) identified that the coefficient of correlation between their attitude towards science and their achievement was 0.076 and it was not significant.

Simpson and Oliver (1990) found that students’ attitude toward science correlated with science achievement and participation in advanced science courses.

Kar, D.K (1990), while examining the problem of relationship between attitude and achievement in general science of class IX students, found a positive relationship.

Molly Weinburgh (1995) identified that the mean correlation between attitude and achievement was 0.50 for boys and 0.55 for girls, suggesting that the correlation was comparable.
Lee and Burkam (1996) found that the students’ attitude toward science correlated with science achievement and participation in advanced science courses.

**SES and Attitude towards Science**

Several studies have examined the relationship between socio-economic class and attitude towards science.

Bandyopadhyay, J. (1984) found that the parent education and SES led to favourable attitude towards science.

Breakwell and Beardsell’s (1992) study found that the class was negatively associated with attitude towards science. Children from lower social class are having more positive attitudes.

Darchingpui’s (1989) study indicated significant relationships between scores on scientific attitude and achievement in science.

**Attitude towards Science and Classroom Environment**

Padhi, J.S. (1994) identified significant relationship between classroom environment and attitude towards science in high school students.

**Attitude towards Science and Creativity**

Srivastava, Veena (1992) revealed that the boys having favorable attitude towards science were slightly better creative than those having unfavorable attitude towards science.

Majority of the researchers tried to study characteristics of good teachers and their impact on their students. Very few attempts were made to study require qualities of science teachers. No distinctive studies are available on
creativity, scientific attitude and attitude towards science of prospective science teachers. Thus, the review of the related literature helped to develop a clear insight into the problem and in selecting the present problem, namely, ‘A Study of Creativity, Scientific Attitude and Attitude towards Science of Prospective Science Teachers of Andhra Pradesh’.