CHAPTER III

REVIEW OF RELATED LITERATURE

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REVIEW OF RELATED LITERATURE

The present chapter contains a brief summary of the empirical and semi-empirical research studies which have direct or indirect bearing on the main problem under study.

The independent variables of the study are the select personality variables. The major focus of the study is to investigate the influence of those personality variables, on a specialised form of cognitive achievement, viz. Process Outcomes in Basic Science. The review will therefore be confined to those studies which explore the association between personality variables and different forms of cognitive achievement and process skills. The important studies of this kind, classified under the following major heads are presented below:

A. Studies on process skills
B. Studies on personal adjustment
C. Studies on social adjustment
D. Studies on examination anxiety
E. Studies on achievement motivation
F. Studies on science interest

3.1 STUDIES ON PROCESS SKILLS

Doran and Sellers (1978) identified that mental ability is related to process achievement. The relationship was not strong, however, as biology achievement and mental ability together accounted for only nine per cent of variance in process skill achievement.
Simpson and Wasik (1978) administered pre and post test in science processes and science preferences to elementary student teachers. The result showed that science and biology preference items predicted students' performance at a significant level.

Andrew (1980) found that girls are superior to boys in skills in scientific processes.

Hough and Piper (1982) found a significant relationship between the pupils' process scores and attitude scores ($r = 0.45$).

Bhargava (1983) observed a moderate relationship of achievement in physics with the three processes of science, namely observing, measuring and drawing inferences and a low level of correlation was observed with the remaining processes. Boys were found to be superior to girls on the processes of observation, measuring and drawing inferences. With growth in age, a decline in ability to perform in science processes was observed. Urban students outperformed their rural counterparts in rural areas on science processes.

Menon (1986) found that the overall proficiency in the process skills steadily increased as students went up from standard to standard.

Zerega et al. (1986) Wallberg's study indicate that girls scored higher on variables such as scientific process inventory and test on understanding science.

Poulase's (1987) study showed that the F-values corresponding to the main effects of personality variables were significant in the case of four out of
the nine variables. Sex and residence of the subjects were also found to have a significant influence on process outcomes. Male subjects were seen to be superior to female subjects in their process achievement.

Miller and Wynne (1988) did not see any special association between the processes and science. These processes are common to systematic thought in all formal discipline, and to informal common sense reasoning. That is, they are general cognitive skills which man routinely employs throughout his life without any need for formal instruction.

Varghese (1989) found out that there is a significant relation between process outcomes in biology and attitude towards problem solving in maths, science, science interest and achievement motivation. No significant difference was seen among rural and urban students and among boys and girls.

Lobo’s (1990) study revealed that teacher students who possess science process skills were able to improve pupils’ achievement through their modified behaviour. It is observed from the study that as a result of process skills teaching, teachers tend to be more heuristic, problem solving oriented and speculative in contrast with those who are not given this training.

Mason (1990) divided the participants of junior high school science projects into three groups: (1) the teacher assigned project; (2) student self-select project; and (3) no-project control. Students were allowed six weeks to complete the project assignment. The study showed that statistically significant changes occurred in student process skills as the effect of various projects.
Huang’s (1991) results showed that there was a significant prediction of chemistry achievement (by test of integrated process skill scores) and group assessment of logical thinking abilities scores and a statistically significant relationship was obtained between these two scores.

Jegede’s (1991) results showed that students with a high level of belief in African traditional cosmology, made significantly fewer correct observations in comparison with those with a low level of belief. This throws light on the observational skills and environment.

Sing and Black (1991) revealed the existence of an apparent interaction between process skills and contexts. Pupils achievement on the interpretation skills was significantly higher in everyday contexts than in scientific contexts, whereas in application skills it was significantly higher in scientific contexts.

Suresh (1991) identified sociological, cognitive and environmental variables related to process outcomes in biology. It was concluded from the study that process outcomes in biology could be predicted by employing four independent variables, viz. intelligence, science learning approach, parental education and parental income. These predictors were found to be positively and significantly related to science process outcomes.

Edison (1992) examined the relationship of microcomputer graphics and alphanumeric modes of data presentation with ninth grade high school biology students’ process skills and conceptual understanding of selected genetic concepts. This study revealed that the microcomputer graphics and
alphanumeric modes of data presentation resulted in students’ ability to use specific process skills in problem solving.

Lock (1992) did not find any gender difference in observation, reporting or planning skills, and there was no differential performance on the use of scientific language. Girls performed less well in relation to self-reliance and performance differences in the interpretation skill, approach significantly with boys’ superior performance.

Mattheis et al. (1992) study recorded a moderately strong and almost identical correlation between the reasoning skills as measured by the group assessment of logical thinking and integrated process skills measured both for each sample. The results implied a relationship between reasoning and process skills of junior high school students.

McCain’s (1992) results showed that in regard to attitude, the process science group performed significantly higher than the textbook science group. The results suggested that the process science may be the more desired instructional approach to achieve overall objectives of students’ science education regardless of reading ability. Process science appeared to be a more effective curriculum than textbook science in accomplishing scientific literacy, which is described as a blend of knowledge, process skills and attitudes.

Lee (1993) found a significant correlation between science process skills, attitude towards science and cognitive development.

Poulouse (1993) conducted a study on process outcomes in the learning of physics of university entrants; the role of manifest anxiety in combination
with sex and residence of subjects, revealed that those with manifest anxiety will, the other factors (sex, residence) remaining same, achieve higher in science when achievement is conceived in terms of process outcomes in physics.

Roth and Roy (1993) concluded that process skills need not be taught separately. Integrated process skills develop gradually and reach a high level of sophistication when experiments are performed in meaningful contexts.

Sebastian (1993) conducted a survey of selected enquiry skills among standard nine students, which revealed that boys and girls are equally good in process skills, but the skill of observation seems to be higher among boys. Science club membership and other science facilities seems to be significantly related to the acquisition of science enquiry skills.

Hamil (1994) recommended that (1) process skill instruction should be included in the instructional programmes through the use of a process skill unit in content area or in a process skill methods course, and (2) educators should consider the possibility that formal reasoning ability and process skill proficiency may be indistinguishable competencies.

Germann (1994) found that academic ability, biology knowledge and language preference had significant direct effects on science process skill achievement. There were significant mediated effects by cognitive development, parents' education and attitude towards science in school. The variables of cognitive development and academic ability had the greatest total effects on science process skills.
Hykle (1994) found that the achievement in science and achievement in science process skills are significantly related.

Kok-Auntoh and Brian (1994) examined the generalisability of science process skills for students carrying out whole investigations, using a sample of 135 eighth graders in Singapore. The study showed that the skills of preliminary trials, planning, communicating and interpreting are generalizable.

Sharma's (1994) study revealed that the teachers' style characterized by a judicious cognitive demand, emphasis on guided discovery and higher number of opportunities for the practice of process skill is more likely to facilitate the development of process skills among children than the teaching style characterized by marked learnings towards teacher domination and didactiveness, lower cognitive demand, no emphasis on discovery and lack of provision of opportunities for the practice of process skills.

Walters and English (1995) found that syllogistic reasoning and inductive reasoning were significantly correlated with both simultaneous and successive synthesis. The strongest correlation was found between simultaneous synthesis and inductive reasoning.

Germann and Aram (1996) assessed the students' performance on the science processes of recording data, analysing data, drawing conclusions and providing evidence. A total of 304 students field tested the alternative assessment of science process skills. Their responses were used to develop a research rubric and then this rubric was used to determine response patterns that could inform both instructions and assessment of science process skills. Only 61 per cent of students performed the activity, and recorded data
successfully. Sixty-nine per cent of students did not attend to the hypotheses in drawing their conclusion. Eighty-one per cent did not provide specific evidence for their conclusions.

Germann *et al.* (1996) found that explicit, incremental development of the science process skills of formulating hypotheses and identifying variables, together with model examples, may be a means to facilitate student success in designing science experiments.

Joseph (1998) identified cognitive, affective, social and environmental variables related to process outcomes in physics. It was concluded that process outcomes in physics could be predicted by employing four independent variables, viz. intelligence, attitude towards science learning, science learning interest and socio-economic status. These predictors were found to be highly correlated to process outcomes in physics.

### 3.1.1 Major Trends Indicated by the Survey

The review of related studies on process skills give isolated pictures of correlates of science processes. The above-mentioned studies explored the various aspects of science process skills. Most of them tested the effectiveness of special programmes on the development of science process skills; their transfer effects; proper instructional time to secure high degree of retention etc. Very few studies have been conducted in this area. For a generalization in this regard, more research is needed.
3.2 STUDIES ON PERSONAL ADJUSTMENT

Using Mittal adjustment inventory for college students Chawla (1970) found that adjustment was closely related to one’s achievement.

Rao (1970) in a study relating to scholastic achievement found that high achievers and low achievers differ significantly in their personal adjustment.

Abraham (1974) in a study relating to factors that affect achievement concluded that the achievement level is associated with personal and social adjustment.

Iyer (1977) in a study of factors relating to mathematic achievement found a definite relation for personal adjustment with achievement of secondary school pupils.

Shivappa (1980) in a study of factors affecting academic achievement of high school pupils noticed that personal adjustment is a negative correlate of social achievement.

Nair (1983) found that the personal adjustment variable facilitates achievement in secondary school biology.

Bharathi’s (1984) study revealed that girls perceived themselves better adjusted and also aspired to be better adjusted than boys. No age difference was found in self-concept with respect to adjustment.

Pouluse (1987) found that personal adjustment has a significant influence on process outcomes of university entrants.
Hima (1995) found that boys and girls in the secondary schools of Kerala differ in their personal adjustment. Girls have better personal adjustment than boys. Rural pupils have more problems than the urban group.

Mathewson (1997) conducted a study of personality factors related to achievement in science. The survey revealed that the mean scores of normal achievers were significantly lesser than the mean scores of underachievers in test anxiety and achievement. Personal adjustment, social adjustment, social facilities, self-acceptance were accounted with the cognitive outcomes of the total student population.

Agarwal’s (1999) study on adjustment of failed and passed students of five districts of Garhwal region of Srinagar showed that the adjustment has no significant relationship with achievement.

Nair (1999) compared personality variables of regular and correspondence pre-degree students and found that regular students were personally well adjusted than correspondence students. Nair’s (1999) another study of personality and familial variables discriminating between over and underachievers in secondary school science and mathematics showed no significant difference in personal adjustment of over and underachievers in science.

3.2.1 Major Trends Indicated by the Survey

(1980) study show a negative relationship and Agarwal’s (1999) study show no relationship between these two variables. Bharathi’s (1984) and Hima’s (1995) study indicated that girls are superior to boys in personal adjustment.

3.3 STUDIES ON SOCIAL ADJUSTMENT

Jha (1970) concluded that there was a significant positive relation between achievement in science and adjustment of students in secondary schools.

Sharma’s (1972) results showed that there were significant differences among the overachievers, average achievers and underachievers with regard to their adjustment in school, home and social fronts. The overachievers were better adjusted than the underachievers in all their areas of adjustment.

Badami and Goswami (1973) found that social adjustment is significantly associated with school achievement and that social adjustment may be attained through efforts.

Soman (1977) noticed a considerable influence of social adjustment on mathematics achievement of secondary school students.

Iyer (1977) in his study of factors related to underachievement in mathematics among secondary school children of Kerala found that social adjustment has a significant role in differentiating between under and non-under achievers in mathematics.

In a study, Singh (1978) noticed that the superior children did not differ from the average children in their social adjustment.
Saxena (1979) noted that underachievers in schools were significantly poor in adjustment in their social surroundings than the overachievers.

Poduska (1980) concluded that adjustment is the ability to select appropriate and effective measures to meet the demands of the environment while maintaining a healthy attitude towards the circumstances.

Saun (1980) studied the adolescents of high school and intermediate colleges and noted that the male high achievers were more adjusted than the low achievers but a significant difference existed between the high and low achieving females in their social and educational areas of adjustment.

Somasundaram (1980) noticed a positive relation between social adjustment and school achievement.

Srivastava (1980) found that educational, social and emotional adjustment have positive correlation with high school achievers.

Nair (1983) found that the social adjustment exerted a significant influence on secondary school biology achievement.

Annamma (1984) came to the conclusion that women are better adjusted than men in most of the adjustment areas. Sex is a greater problem to women.

Ahluwalia and Kalia (1987) found that high achievers have less adjustment problems in the school adjustment area in comparison to low achievers. No significant difference was observed on social adjustment between these groups. Female high achievers were found to be better adjusted socially.
Poulouse (1987) found that social adjustment does not have any significant influence on process outcomes in physics of university entrants.

Sarojini (1987) conducted a study on personality problems of pupils of the age group 8-16 years and found that during the years 14-16 boys had more adjustment problems than girls. Adjustment problems were more for pupils in co-educational institutions.

Singh and Singh (1987) observed that higher caste students differ in social adjustment but not in emotional and educational adjustment.

Punithambal (1990) found that there is a significant positive association between adjustment and academic achievement for both disadvantaged and non-disadvantaged groups.

Thirugnanasambandam (1990) noticed that adjustment is a person’s interaction with his environment. Boys have significantly greater scores on the social adjustment scale than the girls. Tribal difference was also found in social adjustment.

Vasishtha (1991) noticed that high achieving boys demonstrated better social adjustment than their high achieving female counterparts.

Alexander and Rajendran (1992) concluded that female students are better adjusted than male students. Parents’ education influences their children’s adjustment, students of well-educated parents are better adjusted than students of poorly educated parents.

Monrow (1995) conducted a study to find out the relationship between personality variables and achievement of elementary school children. It was
found that the relationship between social adjustment and achievement is positive and significant.

Sabu (1996) pointed out that rural pupils are having poor social adjustment than urban pupils. Secondary school pupils are facing several problems and these problems have a significant relationship with their social adjustment.

Nair (1999) compared personality variables of pre-degree students of regular and correspondence stream and found that regular students are socially well adjusted than the correspondence students. In another study, Nair (1999) compared over and underachievers in science with their social adjustment and found that there exists no significant difference of overachievers and underachievers in science with their social adjustment.

3.3.1 Major Trends Indicated by the Survey

3.4 STUDIES ON EXAMINATION ANXIETY

Kapadia (1974) noticed that anxiety is negatively related to achievement.

Upmanya and Khairwall (1974) concluded that anxiety to some extent facilitates scholastic achievement.

Soman (1977) conducted a study on some affective correlates of mathematics achievement of secondary school students and revealed that test anxiety had a negative correlation with mathematics achievement.

Najma and Sathyanarayanan (1978) conducted a study about test anxiety among high school children. The study revealed that test anxiety and mathematics achievement are negatively correlated.

Karuna's (1979) study revealed that anxiety did not commonly influence academic achievement and creativity. There is a negative non-linear relationship between anxiety and academic achievement.

Fulkerson and Cynthia's (1982) study revealed that the high test anxiety students performed better on the criterion test than the students belonging to the low test anxiety group. There is only little interaction between test anxiety and performance of students.

Ganguli (1983) found that the difference between mean achievement test score obtained by high- and low-anxiety groups, is not statistically significant.
Siddique and Akhtar (1983) studied the relationship between anxiety and academic achievement. Results indicated that highly anxious students performed poorly.

Barinder's (1985) study showed that girls exhibit more general anxiety as well as test anxiety than the boys. There was a significant relationship between general anxiety and test anxiety of boys as well as girls.

La Cross (1985) found that test anxiety may be a major contributing factor to overall poor scholastic performance of students of grade one through eight.

Smith (1986) inferred that assessment via tests and examinations may be viewed as burdensome and irrelevant by gifted students. Teachers can help students to overcome negative attitudes including test anxiety.

Chandler and Mako's (1987) study supported that students high in test anxiety scored significantly lower in examination than the students low in test anxiety, when ability is controlled.

Strauss and Clarke (1989) conducted a study on fear and trembling in the examination hour. It explains the effect of examination fear and anxiety on student performance and cites ways to alleviate the problem and promote better learning.

Sreelathamma (1992) found that there was no significant association between the achievement in biology and examination anxiety ($r = 0.0122$) of the secondary school biology students.
Mackenzie (1994) conducted an investigation about examination preparation, anxiety and examination performance in a group of adult students. Findings showed extreme levels of trait anxiety associated with lower final examination performance. Test anxiety was significantly correlated with trait anxiety but not with exam performance.

Remadevi (1995) found a significant difference between the anxiety of boys and girls of secondary school students. Private school pupils were found to be more anxious than government school pupils, urban and rural pupils have significant difference in anxiety.

Cipriani (1996) conducted a study on science, self-concept and anxiety in the area of science education and found that science state anxiety was shown to be higher in girls attending in co-educational school environment although this finding was not significant. Anxiety was shown to be significantly higher for girls in the co-educational setting.

Promod’s (1999) study on 15-17 age group children of Chennai city revealed that boys and girls differ in their anxiety levels. Girls showed more trait anxiety and situational anxiety than boys.

Nair (1999) compared personality variables of pre-degree students of regular and correspondence stream and found that correspondence students have high examination anxiety than regular students. Another study by Nair (1999) revealed that examination anxiety of overachievers and underachievers of secondary school was not found to be significant.
3.4.1 Major Trends Indicated by the Survey


3.5 STUDIES ON ACHIEVEMENT MOTIVATION

Ghuman (1976) found that the overachievers and underachievers did not differ significantly on achievement motivation or personality traits. He also found a high achievement motivation in overachievers than in underachievers.

Deaux (1977) indicated that males and females tend not to differ consistently on achievement motivation.

Desai (1979) found a positive relationship between pupils’ motivation and their academic achievement.

Hirunval (1980) noted a positive relationship between self-concept, academic motivation and academic achievement. Sareen (1980) found that
male and female X class pupils do not differ from one another with respect to their achievement motivation.

Gupta's (1982) study revealed that achievement motivation is significantly correlated with academic and with over and underachievement.

Kaur (1983) found that there are sex differences in achievement motivation, girls score less than boys.

Bharathi (1984) conducted a study on self-concept and achievement motivation of early adolescents and found that the strength of achievement motivation increased significantly from twelve years to sixteen years. No sex differences were found in achievement motivation.

The findings of Ahluwalia (1985) were (i) sex of the child had no effect on achievement motivation; (ii) age was significant and positively related to achievement motivation; (iii) rural-urban upbringing of children had no effect on achievement motivation of children; (iv) children from central schools were achievement motivated, next in order were public and then government schools.

Koul (1986) found that achievement motivation is a facilitating factor for achievement.

Tripathi (1986) found that (i) the level of achievement motivation of boys and girls was low; (ii) achievement of boys and girls was highly correlated with achievement motivation; and (iii) among the five correlates of achievement motivation, academic achievement proved to be the most dominant factor.
Coul (1989) found that achievement motivation is positively related to the academic achievement of boys and girls. Lee (1989) found that there existed positive correlation between achievement motivation and science achievement.

Alice (1991) studied the factors influencing motivation and found that a positive relationship exists between motivation and academic achievement.

Velna (1991) studied achievement motivation and achievement in the school of Mexican and Anglo-American eighth grade students and found that there was no significant difference in the relationship between achievement motivation scores and the grade point averages and no significant difference in the relationship of boys and girls.

Wang (1991) found that the effect of achievement motivation, goal acceptance and goal difficulty alone and interactively on task performance was significant. The important finding of Yeh (1991) was that a weak but positive correlation was found between achievement motivation and academic achievement.

Phil p's (1993) study showed that achievement motivation has low relationship with the achievement of students.

Anitha (1996) and Suja (1996) found that achievement motivation has a determining influence on the achievement of students. Motivation is an essential factor for achievement.

Nair (1999) compared over and underachievers in science with their achievement motivation. He found that achievement motivation of
overachievers and underachievers was not significant. Nair (1999) also found that achievement motivation of pre-degree students studying in the regular stream was higher when compared with students studying in the correspondence stream.

3.5.1 Major Trends Indicated by the Survey


3.6 STUDIES ON SCIENCE INTEREST

Clarke (1972) conducted a study on the commonalities of science interests held by intermediate children. The investigation revealed that the intelligence quotient difference did not produce any significant shifts in interest. Interest in particular area of science was significantly related to sex differences. Boys have more interest in science than girls.

Chatterjee (1974) found that there was a systematic positive relationship between science interest and probabilities of success in science. High achievers differed significantly from low achievers in their interests and the interaction between interest and achievement was found to be significant.
Roy (1977) found that interest, comprehension and retention scores showed consistent difference between groups. Stevenson and Atwood (1978) found that science interest scores are poor indicators of achievement of science process skills among junior high school students. Nagpal (1979) noted that the academic achievement was dependent on the students' interest in a specific subject. The study conducted by Joseph (1979) also revealed a positive and significant relationship between science interest and achievement in chemistry.

Goswami's (1982) inquiry into reading interest in relation to intelligence, SES and academic achievement revealed the existence of a significant relationship between academic achievement and reading interest. Joshi's (1983) study came out with findings such as, the pupils having a high score as the personality traits and emotional stability were more interested in studies. SES, parental education, emotional stability and residence of the students have high correlation with scientific interest.

Kumar (1985) compared the interests, needs and adjustment problems of the gifted with those of the average children and found that the gifted children are highly interested in scientific areas. Goldstein (1986) found that correlation of curiosity and interest with science achievement yielded significant positive values. Also, high and significant correlation was obtained when the physics and chemistry scores of the science career group were correlated with their interest scores.

Poulose (1987) found that science interest has a significant influence on process outcomes in physics among university entrants. Abdi (1989) studied the science interest of sixth grade students and found that students
were generally interested in science programmes, but the level of interest was low. Gender difference had no educational significance. Interest was correlated to achievement on some topics but not others.

Punch and Rennie (1989) found that science related affect is related more strongly to previous than to subsequent achievement, and that students’ perceptions of their past performance in science form the most important component variable of both previous and subsequent achievements. Varghese (1989) tried to determine the effect of select affective variables on process outcomes in biology. He found that science interest is positively related to process outcomes in biology.

Malviya (1991) found scientific attitude and scientific interest to be mutually associated. Ampili (1991), in her study found that there was very close and significant correlation between science process outcomes and science interest. Nelliappan (1992) noted that various components of learning environment are significantly related to interest.

The study of Sundararajan (1993) indicated that the students perceived physics classroom climate and their scientific interest are significantly and positively related. Also, significant difference was found in scientific interest between students belonging to different levels of perceived physics classroom climate.

Doran’s (1995) study on the correlates of practical skill performance revealed that student interest in science has high relationship with process skill acquisitions. Greenfield (1995) noted that girls remain behind to boys in science achievement and interest at the upper grade levels, in part because they experience different situations in and out of school.
John (1995) studied science interest as a correlate of science achievement and found that the correlation between science interest and science achievement was significant, high and positive.

Joseph (1998) found that science learning interest and process outcomes in physics of secondary school children has a very high relationship.

3.6.1 Major Trends Indicated by the Survey


3.7 CONCLUSION

The above review of the studies help to develop a wide perspective of the nature of the interaction of the variables concerned by the present investigation. The area of research concerned with the investigation of personality correlates and process outcomes in science are almost well covered. The influence of personality correlates on the outcomes of pupils is almost positive and significant. It may be noted that the study of process outcomes of primary school children in Basic Science is of vital importance in the present educational set-up of Kerala. This in itself argues for the need for a study of this kind.