CHAPTER VII

CONCLUSION
The present section of the report is the concluding chapter which presents the implications of the study, limitations and suggestions for further research.

IMPLICATIONS

a) Improvement of quality of science teachers

The quality of the future citizens of a nation depends largely on the quality of its teachers. Teachers have a significant role to play in the society, since they are described as social engineers, catalytic agents and reformers. Teacher’s professional development is central to the overall change process in education. Professional development can help overcome shortcomings that may have been part of teachers’ pre-service education and keep teachers abreast of new knowledge and practices in the field. Excellent professional development requires providers who are capable of facilitating varied experiences and who know about both science and teaching. Both pre-service and in-service teacher education have to focus on understanding and application of teachers’ competencies and thus need a facelift. The responsibility of national and local governments, higher education institutions, and mostly teacher educators both in pre-and in-service education, in this regard is phenomenal.

Due consideration and emphasis in the following areas would contribute largely towards improving the quality of science teachers of the 21st century.

- Process -skill application in classroom Procedures
- Flexible cum viable instructional strategy integration.
- Adaptation of multi-pronged assessment techniques
b) Improvement in the quality of learning environment

Learning can occur anywhere, but the positive learning outcomes generally sought by educational systems happen in quality learning environments. Effective utilization of the infrastructural facilities in terms of well-lit and technology integrated classrooms, well-equipped science laboratories, well maintained library would enhance the quality of the learning environment. All students irrespective of the locality and management of their school, need to be exposed to quality learning environment, where in, they can explore science learning through inquiry using the various science process skills. Educational authorities have to monitor this aspect to ensure better science learning outcomes – knowledge, attitude and skills, to mould the future citizens who are expected to be highly productive, effective communicators, inventive thinkers, and masters of technology.

c) Improvement of the ‘contextual’ factors

The 21st century is characterized by learners who have a different mixture of social expectations, learning characteristics and needs than students in previous generations. Addressing the needs of such learners require co-operative efforts from school and home along with the motivation of the learner. It is essential that student’s motivation to learn science be fostered in science classrooms through innovative instructional strategies, integration of information and communication technology, etc. The motivation to learn science can lead students to scientific literacy to understand scientific knowledge, identify important scientific questions,
Conclusion

draw evidence – based conclusions, and make decisions about how human activity affects the natural world. Family the strong, well-knit social unit offers a strong support to the student for better achievement in science. The various school and home factors facilitating science learning need to be addressed.

LIMITATIONS

The limitations of the study are the following:

1. The Science Process Skills Elicitation Schedule developed and administered could not include process skills pertaining to psychomotor and affective levels that are connected with laboratory instrumentation, experimentation or video recording. The use of a paper and pencil test to assess practical skills has been criticized by several researchers who advocate for practical manipulation of apparatus and physical demonstration of practical skills. This presents a limitation in the sense that the SPROSES developed does not accommodate these requirements.

2. The context variables selected were delimited to select variables - science instructional, motivational and familial - that could seriously affect the learning outcomes in science.

3. Significant background/ intervening variables like socio-economic status, cultural differences, adjustment variables, intelligence etc., though considered, were excluded from the purview of the study.

4. In order to focus more attention on the objectives of the study, the grades assigned for the achievement in science were based on the data of the final examination marks, taken from the respective schools as per school records.

5. The instructional preferences of the science teachers were analysed based on their responses to the developed STIPAS. Classroom observations of science teachers, though planned, could not be materialized.
6. The investigation pertaining to the student category of the present study, turned to a special case of multiple function of the same variable among different pairs of variables; where one variable functioned as ‘independent’ took the role of ‘dependent’ in another pair.

7. Though the student sample was drawn from various topographical areas of Kerala, the study did not analyze the variables on the basis of topographical features.

3. **SUGGESTIONS FOR FURTHER RESEARCH**

The present study has helped to open up possible new areas of interest for aspiring investigators in the field of science education. Though not exhaustive, an attempt has been made to list a few areas of immediate interest, based on the findings of the study.

1. Studies may be conducted to assess the acquisition of each of the basic and integrated science process skills and their relationship with achievement in science at the secondary school level.

2. Studies regarding the construction and validation of science process skills inventory incorporating the practical skills through performance tasks may be attempted.

3. The study can conducted to assess the extent of acquisition of science process skills in secondary school students based on institutional (functional) efficiency of schools, as determined by the pass percentage obtained for the S.S.S.L.C examination.

4. Current assessment methods narrow students’ learning experiences, in sharp contrast to the broad view of learning goals endorsed in educational policies. Research can explore the clear links between science curriculum goals and the required assessment methods.

5. Strategies for linking research, policy formation, classroom practice, and teacher education might be explored.

6. Studies can be attempted to ponder on ways focusing on differentiated instruction to address the needs of new generation learners who have a
different mixture of social expectations, learning characteristics and needs than students in the past.

7. Research may be done on analysing the influence of science process skill measures on the affective components of the learner.

8. Acquisition of science process skills are expected to improve as a student advances in the academic calendar. Research may be attempted to analyse the improvement (if any) in the extent of acquisition of science process skills with advancement in grade.

9. Studies may be done to determine the contribution of familial factors towards achievement in science of the secondary school students.

10. Research may be attempted to explore methods to trigger intrinsic motivation in the science learners so as to initiate a genuine interest in learning science.

11. Research may be conducted to inquire into the strategies essential to energize the in-service training sector and to ignite the spark in teachers to implement the learning in favour of teaching and learning in science.

12. Studies may be adopted to examine the extent of acquisition of science process skills in secondary school students among marginalized sections of the society.

13. Research may be done on the extent of awareness of science teacher trainees in imparting science process skills in the real classroom situations.

**CONCLUSION**

The present study reveals that the select context variables –Science instructional, motivational and familial - contribute significantly towards the acquisition of science process skills which eventually influence the achievement in science of the secondary school students. Achievement is the result of a conscientious effort made by the learner, with honest support from parents, teachers and the society at large. Hence, due emphasis has to be given to the science instructional, motivational and familial factors, to facilitate the expected learning outcomes in science.
The wealth of teaching experience, an exemplary orientation to emerging educational practices and excellent science laboratory facilities at school coupled with the following affective components - scientific attitude, a bend of mind towards academic research, intrinsic motivation for auto empowerment, a concern for the science learner as a future citizen in the competitive world, a strong will to overcome professional lethargy, an obligation to improve the quality of science education - would help the science teacher make a difference in the field of science education.

Educational systems are currently undergoing transformational changes throughout the globe and one of these is a shift from a philosophy that focuses mainly on the transmission of information to an understanding that supports the constructivist paradigm of teaching and learning. As the global population crosses the seven billion milestone, due importance on the acquisition of science process skills, and the instructional preference of the science teacher in favour of the science learner would contribute towards fostering education for global excellence.