SCIENCE PROCESS SKILLS OF HIGHER SECONDARY SCIENCE STUDENTS IN RELATION TO THEIR ACHIEVEMENT IN SCIENCE

Amrita Katyayni[1], Ph. D. & Ms. Shahin[2]

[1]*Assistant Professor, Vasanta College for Women*

[2]*M.Ed. Student, Vasanta College for Women*

Introduction

Progress of any civilization depends upon the advancement in Science and Technology. Science is only capable of dispelling the darkness of ignorance, supertitions, dogmas and beliefs etc. The greatest contribution to development of mankind is through scientific revolutions. Therefore, every progressive society must have Science education as its priority. In Webstar's dictionary, Science is defined as a systematized knowledge derived from observation and experimentation, carried on, in order to determine the nature on principles of what is being.

According to Kerlinger (1964) there are two views of science in the scientific world-static & dynamic. The static view is what a layman thinks of Science-i.e. Science is a body of facts and also a way of explaining any observed phenomena. The emphasis is on the present state of knowledge and addition to it. Whereas, the dynamic view regards Science as an activity, "What Science does." This view emphasizes theory and interconnected conceptual schemata that are fruitful for further research.

Science contributes its unique skills with its emphasis on hypothesizing, manipulating the physical world & reasoning from data.

The scientific method, scientific thinking and critical thinking are terms used at various times to describe the science skills. Today the term "Science Process Skills" is commonly used, popularized as Science-A Process Approach.

These Science Process Skills are defined as a set of broadly transferable abilities, appropriate to many Science disciplines & reflective of the behavior of scientist. SAPA grouped process skills into two basis & integrated.

Basic Science Process Skills are observing, inferring, measuring, communicating, classifying and predicting, integrated science process skills are controlling variables, defining operationally, formulating hypotheses, interpreting data, experimenting, formulating models.

Literature Review:

Studies on assessment and development of Science Process Skills has been done by many researches.

Hilal Aklamis & Omer Ergin (2008) conducted a study on the effect of Science process Skills in education on student's scientific creativity, science attitude and academic achievements. The aim of study was to investigation the effect of teaching scientific process skills on students to promote scientific creativity, attitude towards science and achievement in science. The subject of research consisted of 40 students of seventh grade of elementary school existing in Buca district of Izmir province in Turkey. The result of research concluded that the Scientific Process skills in education increased the students achievement and scientific creativity; however no meaningful progress was made on their attitude towards science when compared to teacher centered method.. **Kanli (2007)** conducted a study to find out the effects of laboratory based 7E learning cycle model and verification of laboratory approach on the development of students „Science Process Skills and concept achievement using Science Process Skills test, and force concept inventory to compare skills and conceptual achievement of control and experimental groups students reveals that the use of 7E learning cycle model of inquiry base laboratory approach applications in terms of students‟ science process skills and conceptual achievements. **Sharma (1994)** conducted study on the effectiveness of an instructional propramme in development Science process Skills among elementary school children. The objective of the study- to experimentally validate instructional programme specifically designed to foster Science Process Skills and explore the factors affecting development of process skills. The sample consisted of

schools offering NCERT syllabus. The study was delimited to pupils of standard-III studying in there was CBSE schools. The experimental & parallel group design was employed. The collected data was analyzed using the ANCOVA. The finding of the study revealed that instructional programme was effective in developing process skills and achievement in science content..

Madhu Kumari (1993) Studied on 85 XI grade students and found male & female students did not significantly differ in Science Process Skill. She found co-relation between Science Process Skill and achievement in science. **Darchingpuii (1989)** carried out a study of science achievements, science attitude and problem solving ability among secondary school students in Aizawl and indicated a significant relationship b/w scores on scientific attitude and achievement in science. A significant sex difference in achievement in science & problem solving ability also existed. **German (1989)** investigated the effect of the directed inquiry approach on Science Process Skills and science problem solving. The sample for this study included four sections of ninth and tenth grade general biology. Students were grouped by academic ability with the experimental group consisting of average ability students and the comparison group consisting of above average ability students. The research reported that the use of a directed-inquiry approach improved the learning of Science Process Skills.

The literature review suggests Science is a practical subject and it is more important to acquire scientific Skills then mere scientific knowledge but unfortunately, our curriculum in science is loaded with theoretical facts and is examination ridden. The traditional classroom methods fails to develop the Science Process Skills in our students and there is need to conduct more researches on Science process skills and how it co related with students' achievement.

Research Question:

The research questions of the study was:

What is the level of science process skills of higher secondary science students and its relation with academic achievement of science.

Objectives of the study

The objectives of the study are:

1. To find out the level of Science Process Skills of higher secondary students.

2. To compare the Science Process Skills of higher secondary science students with respect to gender.

3. To find out the relation between Science Process Skills & the academic

achievement of science.

Research Hypothesis

The research hypothesis framed were:

1. There is difference in Science Process Skills of higher secondary science students with respect to gender.

2. There is relation between Science Process Skills and the academic achievement of science.

Research Design

In the present investigation, descriptive survey method was used to meet the objectives of the study.

Population and Sample of the study

Higher secondary science students of Varanasi city comprise the population of the study will be selected by stratified random sampling method. Government & private CBSE higher secondary school will be selected for two strata, from where sample of 100 students was drawn.

Tool of the study

"Samanvit Prakriya Kaushal Pareekshan" constructed & standardized by Dr. S.B. Bhattacharya & N. N. Pandey was used in this study.

Data collection and Analysis

The data was collected with the help of tool and appropriate statistical technique will be used according to the nature of data.

Delimitations of the study

The Delimitation of the study were:

1. The study was delimited to Varanasi city only.

2. The study was conducted only on the CBSE board school of Varanasicity.

Data Analysis and Interpretation

Data was collected with the help of "Samanvit Prakriya Kaushal Pareekshan" constructed and standardized by Dr. S.B. Bhattacharya and N.N. Pandey.

**Objective 1: To find out the level of science process skills of higher secondary science students.**

The distribution of science process skills" scores for total sample was studied. For this, the scores were divided into class intervals and frequencies in each class intervals were determined. The frequency distribution of science process skills scores for total sample is given in table 1

Table 1: Frequency distribution of science process skills scores.

Class Interval	Frequency
1-3	7
4-6	11
7-9	19
10-12	23
13-15	15
16-18	18
19-21	5
22-24	0
25-27	2

From frequency distribution table, it is observed that there are few students who scored very low and very high scores of science process skills. There are maximum number (23) of students scoring in the class interval of 10-12 followed by 19 number of students in class interval of 7-9. Descriptive statistical measures such as mean, median, mode, skewness, kurtosis were further determined to study the nature of distribution of data and to assess the levels of science process skills of respondents. The above table is graphically represented in figure .1

Figure 4.1 Graph show in Figure 1: Frequency distribution of science process skill scores ofstudents.
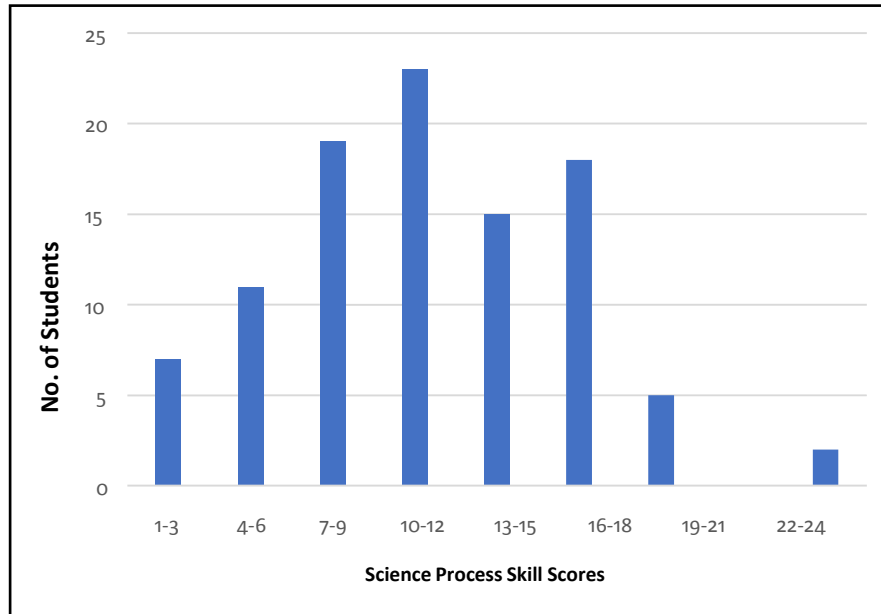
In this graph student's science process skills score is shown on x-axis while the number of student are shown on y-axis. Most of the students have scored 10-12 marks while no one has scored marks from 22-24. Eighteen students have got the score of 16- 18 while there are fifteen students have the score from 13 to 15. There are 19 students with the score of 7-9. Only 2 students have the score of 25-27.

Descriptive statistical measures such as mean, median, mode, skewness, kurtosis were further determined to study the nature of distribution of data. The statistical measures are presented in table 4.2.

Table 2: Basic statistics of science process skills (N=100)

Basic statistics	Value
Mean	11.17
Standard Error	0.524751986
Median	11.5
Mode	7
Standard Deviation	5.247519857
Sample Variance	27.53646465
Kurtosis	-0.225611835
Skewness	0.08946243
Range	25
Minimum	0
Maximum	25

The basic statistics shows that higher secondary science students have low level of science process skills scores. The mean value was calculated as 11.17 and standard deviation 5.24. The minimum score is 0 and the maximum score is 25, with the range of 25. The distribution has skewness of 0.089 and kurtosis -0.225. The data is slightly positively skewed and platykurtic. However, skewness and kurtosis values are near to the normal distribution. Therefore, data is normally distributed.

Objective 2: To compare the science process skills of higher secondary science student with respect to gender.

HO: There is no difference in the science process skills of higher secondary science students with respect to gender.

To find out the difference in science process skills of male and female higher secondary science students, difference in mean scores was tested with the help of t test. The findings are summarized in table 3.

Table 3: t-value for difference in science process skills of male and female higher secondary science students.

Gender	N	Mean	SD	t -value	0.05 level of significance
Male	50	14.92	3.68	10.27 (df 98)	Significant
Female	50	7.42	3.66		

*0.05 level of significance

The mean and standard deviation scores of male students were calculated as 14.92 and 3.68 respectively whereas the mean and standard deviation scores of female students were found 7.42 and 3.36 . The mean scores of male students are higher than the mean scores of female students. The mean difference was also found to be significant, as the t-value was calculated as 10.27, which is above the table t-value 1.98(98 df).Therefore null hypothesis is rejected. Thus there is significant difference in science process skills of male and female students at 0.05 level of significance.

Objective 4: To find out the relation between science process skills and the academic achievement in science.

HO: There is no relation between science process skills and the academic achievement of science.

To find out the correlation between the achievement in science at X Board Examination and the SPKP scores, the product moment correlation coefficient was calculated . The correlation between variables is presented in table.5

Table 4.5: Correlation table (Science Process Skills and Achievement in Science)

Sum of science process skills score	Square of science process skill	Sum of achievement scores	Square of sum achievement square	Product of science process skill scores and achievement scores	Total no. of students
$\sum X$	$\sum X^2$	$\sum Y$	$\sum Y^2$	$\sum XY$	N
1117	15203	1697	30615	19858	100

From the correlation table 4.5, it was found that the correlation between science process skills and science achievement in class X boards was + 0.41 which is significant at 0.05 level for 98 df. Therefore, null hypothesis is rejected. Thus, there is significant positive co-relation between Science Process Skills and the academic achievement in science. This implies the achievement in science is positively correlatedwith the of science process skills.

Interpretation of Results

The findings reveal that higher secondary science students have low level of science process skills. This implies curriculum is theoretic lacking in focus towards science skills and competencies.

The curriculum is more theoretical than practical. Resources are not available to a growing population, shortage of trained teacher. Policy makers in different attitude toward science.

The significant difference was observed in science process skill of male and female higher secondary science students. This may be due to gender disparity present in our society. This indicates the prevelant gender discriminations in teaching facilities. This is grim situation as women are the main pillars for our future. It denotes that there is need to pay attention to women‟s science education so that they develop scientific temperament, attitude and necessary scientific skills.

This is a number of social factors both at home and at schools. Home sociolization is another factor, that may prevent girls from developing the characteristics of science process skills. Girls are dependent and passive. Girl students also have lower motivation

than male students. Student teacher interaction is also a big problem in case of girl students.

The mean scores of government higher secondary science students found higher than the mean scores of private higher secondary science students discussion This implies that private schools are further lacking in infrastructure, facilities and quality of teachers required for development of science process skill.

The teacher of higher secondary schools are product of teacher training college. Therefore, they know the teaching skill and they use properly in their classes. Government school also have well trained teacher, laboratory and technician. Government school get more fund than private school. Workshop, seminar and other programmes are organized by government school which improved their teacher's skill which are also funded by government.

Further the correlation between the achievement in science at 10th Board Examination and the science process skill scores was found to be significant .This implies that developing science process skills can also enhance the achievement in science. Focus on Developing skills and competencies in the curriculum helps in motivating students towards science learning, it helps in enhancing their understanding of science concepts, thereby it further helps in achieving better in science.

Finding were observed by Singh (1986) and Srivastava (1989) whose study revealed that significant correlation exists between achievement and science process skills. Singh (1986), Srivastava and Prasad (1990) found the positive correlation between total science process skills score and achievement in science.

Conclusion

Based on findings of the study it is concluded that the higher secondary science students possess low levels of science process skills. This indicates that our science curriculum is based more on theoretical aspects. For the development of vocational specialization, there is need to emphasize its practical aspects also for its better development. Male students have significantly higher science process skills score over female students. This indicates that girls are shy in nature, they are afraid of asking questions, they have low motivation, comparison to boys. There is a still a necessary to change the attitude towards the girls education.

Further finding reveal positive correlation science process skills and the academic achievement in science. This indicates that when there is development of science process

skills among the learner, then we enhancing their understanding of science concepts.

References

Webstar's New Twentieth Century Dictionary of the English Language (1979).

William Collins Publications, INC, p. 1622.

The chamber's dictionary (1901). New Delhi: Allied Chambers (India) Ltd. p.1478.

Gagne, R.M. (1965). The Psychological Basis of Science – A Process Approach. Washington D.C. American Association for the advancement ofScience.

Best, J.W. (1978). Research in Education, New Delhi : Prentice Hall of India Pvt. Ltd.

Garret, H.E. (1981). Statics in Psychology of Education. Bombay; Allied Pacific Pvt. Ltd.

Hilal Aklamis and Omer Ergin, "The Effects of Scientific Process Skills in Educations on students " Scientific Creativity, Science Attitude and Academic Achievement". In Asia pacific Forum on Science Learning teaching. Vol-issue- 01, June 2008.

Kumari, Madhu (1993). A Study of Science Process Skill, logical reasoning and achievement of XI grade Science students. M.Ed. dissertation, Faculty of Education, BHU.

Darchingpuii, „ "A Study of Science Achievement, Science Attitude and Problem Solving Ability among Secondary School Students in Aizawal". Ph.D.Edu., NEHU. IN Fifth Survey of Educational Research, Vol-II. New Delhi: NCERT, 2000.p.1239.

Singh, Madhu (1986). Science Process Skill and achievement: A correlation study M.Ed. Dissertation, Faculty of Education, BHU.

Sherwood R.D. and D. Gabel (1980). Basic science skills for prospective elementary teachers: measuring and predicting success. Science Education. 62(3). pp. 191-196.

Campbell, R.L. and J.R. Okey (1977). Influencing the planning of teachers with instruction in Science Process Skills. Journal of Research in Science Teaching. 14(3). pp. 231-234.