

# Science Process Skills among Tribal and non-Tribal Elementary School Students

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## ABSTRACT

**Education is the development of all the capacities inherent in an individual which enable him to control his environment and fulfil his needs. Thus education leads to a planned systematic and judicious life. It gets rid of the wilderness that is also very innate in an individual. Formal education comprises of everything which a man needs to lead a fruitful life. Science education can be said to be bare necessity for human survival. Science education has become a must in this fast changing and fast moving world in order to maintain a balance between mans own need and environmental sustainability. Man and science are very inseparable. So deliberately science education has gained the much needed heed.**

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## INTRODUCTION

With the advancement of science, science education has also gone a drastic change with regards to its relevance, content, process and product. Science has accumulated facts and it has a conceptual structure. Its most distinguishing characteristics are its methodology. The scientific method involves several processes like observation – looking for regularities and patterns making hypotheses devising qualitative or mathematical models deducing their consequences verification of or falsification of theories through observation and controlled experiment and thus arriving at the principles theories and laws governing the natural world. The laws of science are never viewed as fixed eternal truths. Even the most established and universal laws of science are always regarded as provisional subject to modification in the light of new observations experiments and analysis. Thus science is a dynamic expanding body of knowledge covering new domains of experience.

Bruner (1962) insists that the memorization of facts is not as important as the acquisition of the process of knowledge. "To instruct someone in a discipline is not a matter getting him to commit results to mind. Rather, it is to teach him to participate in the process that makes possible the establishment of knowledge. We teach a subject not to produce little living libraries on the subject, but, rather to get a student to take part in the process of knowledge. Getting knowledge is a process, not a product". The National Council of Educational Research and Training, (NCERT) while planning the integrated science curriculum for the middle school students, identified the process approach as one of the core elements of the course. While discussing the philosophy of the integrated curriculum, the document Integrated Science Curriculum - an introduction (NCERT, 1982) states: "a science curriculum must stress more on these processes than the products of science. The knowledge of the product is useful in understanding the processes of science and for concretizing the processes for pedagogical use. But understanding of the processes is useful both for daily life as well as in furthering scientific knowledge".

The importance of science has been realized and has been accepted as an integral part of school curriculum. The emphasis is on all aspects of science, which is related to knowledge, skill and society. Thus, the objectives of science teaching include the following aspects.

- Concepts of science
- Process of science
- Social, moral and ethical aspects of science.

Processes of science reflect the ways scientists adopt for acquiring the body of knowledge is known as the scientific method or method of inquiry or processes of science. The scientists use experimentation and observation as the basis of developing conceptual schemes. The development of conceptual schemes by experiment and observation and the premise that these conceptual schemes lead to further experimentation and observation are considered as the fundamental aspects of the nature of science. Thus, processes of science make a vital contribution to the education of the students. There is every possibility that students learn skills, which are developed while passing through the

processes of science. The processes of science have been defined as the characteristics of activities and scientific methods of analysis. In other words these are the method which scientists practice while searching new knowledge or doing laboratory work or conducting some experiments.

Processes are an integral part of the learning experiences of students so that they can learn and practice the methodologies of science.

The commission of science education of the American association for the advanced science (AAAS) has developed a list of processes of science which have been the basis of preparing science curriculum for primary school children, known as science-A Process Approach. These processes of science are as follows:

- Observation
- Classification
- Measuring
- Communicating
- Formulating question and hypotheses
- Experimenting
- Making operational definition
- Formulating models
- Interpreting data and drawing inferences
- Identifying variables.

Science process skills as defined by SAPA (Science a Process Approach), 1969, states “science process skills are described as a set of broadly transferable abilities appropriate to many science disciplines and reflective of the behaviour of scientists.

Science operates through processes. Consequently teaching and learning of science needs to be characterized by focused emphasis on processes i.e. experimentation, observation etc. Gagne (1968) considers that process of science can be viewed as subject of general processes. According to him there are learning and intellectual capabilities, which involves usages of processing information. Process skills are not only important in teaching science they are also relevant in teaching any subject that involves a process of inquiry.

Process skills to Gagne; carry the promises of broad transferability across many subject areas. Each process skills learnt if sufficient training is given enables the students to make suitable contribution to rational thinking in everyday affairs and to a wide range of problems both social and scientific.

Science process skills form the major theoretical force in education. There need strongly emphasized in primary, middle and secondary curriculum and classroom. The process skills represent the rational and logical thinking used in any subjects.

Competencies in process skills enable student to set information and produce solution for problem. Victor (1985) states “ the science program should make children aware that science is a way of life and an exciting processes of enquiry and discovery that man uses to explore, discover and explain the natural phenomenon of the world in which he lives”.

Laying stress upon ‘skills’, National curriculum framework (2005) states “Science education in India should undergo a paradigm shift. Rote learning should be discouraged. Inquiry skills should be supported and strengthened by language, design and quantitative skills. Schools should give much greater emphasis on to curricular and extracurricular elements aimed at stimulating investigation ability inventiveness and creativity.

### **Need of the Study**

Science process skills have been strongly emphasized since SAPA (1969) published Science as a Process Approach. It is reflected in the science curriculum and is clearly stated in its objectives. Research on process skill development is being taken in relation to method of teaching. At the elementary level, different studies have fixed that the science curriculum improvement study helps students to better identify variables (Allen, 1971) better experiment and interpret data (Weber and Renner, 1972) and to better analyze experiments and name variables (Boyer and Linn 1978). Ostlund (1992) has established link between experiential instructional strategies and improvements in science process skills. In order to assess the effectiveness of ongoing science teaching in schools of Jharkhand and in particular Jamshedpur with a sizeable tribal population in this industrial city of India this study is being taken up. Moreover this study is also important to know whether students of tribal community along with the non tribal community has the same level of process skills of science as there is a difference in culture among the tribal and non tribal communities. Very few studies have been conducted to assess the status science process skills

of elementary level students and among tribal student it almost negligible. Hence the researcher very enthusiastically intends to study “Science process skills among tribal and non tribal elementary school students.”

**Objectives of the study**

1. To compare the science process skills of the tribal and non tribal students of elementary level
2. To compare the science process skills of the tribal students of elementary level with respect to gender
3. To compare the science process skills of the non tribal students of elementary level with respect to gender
4. To compare the science process skills among the tribal and non tribal girls students of elementary level
5. To compare the science process skills among the tribal and non tribal boys students of elementary level.

**Hypotheses of the Study**

1. There would be no significant difference in science process skills of tribal and non tribal students of elementary level
2. There would be no significant difference in science process skills of tribal students of elementary level with respect to gender
3. There would be no significant difference in science process skills of non tribal students of elementary level with respect to gender
4. There would be no significant difference in science process skills of tribal and non tribal girl students of elementary level
5. There would be no significant difference in science process skills of tribal and non tribal boys students of elementary level

**Delimitation of the study**

This study was delimited to class seven students of Jharkhand Academic Council(JAC) affiliated Schools only.

**METHODOLOGY**

**This study is a descriptive survey research and was conducted to assess the science process skills of tribal and non tribal students of elementary level.**

**Sample and Sampling technique:**

Sample is the overall representation of the whole population, on the basis of which generalization is applicable to the population for which sample is obtained. The representative sample would be a miniature or replica of the population at least with respect to the characteristics related to the investigation, if not in all respects. Since the study aimed at assessing the Science process skills of tribal and non tribal elementary school students a sample of 200 students were drawn purposively from 10 schools of Jamshedpur.

**Tools**

Science Process Skill test developed by the researcher was used for the study. Reliability of the test was established and the split half reliability co-efficient for the whole test is .907 and test retest reliability co-efficient was found to be .98. content vality of the test was also established. The test carries 42 items and each correct response is assigned 1 mark. So the maximum mark of the test is 42.

**Analysis and interpretation of data**

***Comparison of Science Process skills of tribal and non tribal students of elementary level***

**Hypothesis 1**

There would be no significant difference in science process skills of tribal and non tribal students of elementary level

In order to test this hypothesis, mean scores of science process skills were calculated. Mean, standard deviation and t-value of scores in science process skills were computed and presented in table-1

**Table 1: Mean score of Science Process Skills of Tribal and Non-tribal students of elementary level**

Process Skills	Tribal Students (N=100)		Non Tribal Students (N=100)		't'-value
	Mean	S.D.	Mean	S.D	
	20.56	6.807	21	5.58	.4999

The data in the table 1 reveals that the science process skills mean scores of tribal students group is 20.56 which is marginally lesser than their non tribal counterpart whose mean score is 21. It also shows that the science process skills are average among both the student categories as the test is of 42 marks. The tabulated t value is .4344 which is lesser than the table t value of 1.97 at .05 level of significance and 198 degrees of freedom. Hence the hypothesis is accepted

This result also indicates that science process skills are culture free.it is not affected by the culture of any specific culture. It also alarms the necessity to review the pedagogy of science in common Indian Schools.

**Comparison of Science Process skills of tribal students of elementary level with respect to gender**  
**Hypothesis 2**

There would be no significant difference in science process skills of tribal students of elementary level with respect to gender

In order to test this hypothesis, mean scores of science process skills were calculated. Mean, standard deviation and t-value of scores in science process skills were computed and presented in table-3

**Table 2: Mean score of Science Process Skills of Tribal Boys and Girls students of elementary level**

Process Skills	Tribal Students Boys (N=62)		Tribal Students Girls (N=38)		't'-value
	Mean	S.D.	Mean	S.D	
	21.54	5.66	19	6.66	2.0355*

\*significant at .05 level of significance

The data in the table 2 reveals that the science process skills mean scores of tribal boys students is 21.54 which is higher than their tribalgirls counterpart whose mean score is 19.The standard deviation of tribal boys' students is 5.66 which is lesser than standard deviation of the tribal girls students which is 6.66. This shows that the tribal boys students are ahead of their female counterparts in science process skills.The tabulated t value is2.0355 which is greater than the table t value of 1.98 at .05 level of significance and 98 degrees of freedom. Hence the hypothesis is rejected. There exists a significant difference in science process skill of boys and girls tribal students in favour of the boys.

This result also indicates that gender is also a deciding factor in acquisition of science process skill. The results may be attributed to the lacking of importance of Girls science education among the parents who may not be aware of education and importance of girl child education.

**Comparison of Science Process skills of non tribal students of elementary level with respect to gender**  
**Hypothesis 3**

There would be no significant difference in science process skills of non tribal boysand girls students of elementary level

In order to test this hypothesis, mean scores of science process skills were calculated. Mean, standard deviation and t-value of scores in science process skills were computed and presented in table-3

**Table 3: Mean score of Science Process Skills of Non Tribal Boys and Girls students of elementary level**

Process Skills	NonTribal Students Boys (N=54)		NonTribal Students Girls (N=46)		't'-value
	Mean	S.D.	Mean	S.D	
	21.88	5.52	20.4	5.88	1.835

The data in the table 3 reveals that the science process skills mean scores of non tribal boys students is 21.88 which is higher than their non tribal girls counterpart whose mean score is 20.4. The standard deviation of non tribal boys' students is 5.52 which are lesser than standard deviation of the non tribal girls' students which is 5.58. This shows that the non tribal boys students are ahead of their female counterparts in science process skills. The tabulated t value is 1.835 which is lesser than the table t value of 1.98 at .05 level of significance and 98 degrees of freedom. Hence the hypothesis is accepted. Though a slight higher edge is in favour of the boys there exists no significant difference in science process skill among the boys and girls nontribal students.

This can be attributed to the equal opportunities and equal importance being paid to both the genders at home and school.

***Comparison of Science Process skills of non tribal and non tribal boys students of elementary level.***

**Hypothesis 4**

There would be no significant difference in science process skills of tribal and non tribal boys' students of elementary level

In order to test this hypothesis, mean scores of science process skills were calculated. Mean, standard deviation and t-value of scores in science process skills were computed and presented in table-4

**Table 4: Mean score of Science Process Skills of Tribal and Non Tribal Boys students of elementary level**

Process Skills	Tribal Students Boys (N=62)		NonTribal Students Boys (N=54)		't'-value
	Mean	S.D	Mean	S.D.	
	21.54	5.66	21.88	5.52	.32

The data in the table 4 reveals that the science process skills mean scores of tribal and non tribal boys students are 21.54 and 21.88 respectively. Though the non tribal boys are slightly more in science process skills but the difference is not statistically significant. The t value which is calculated is .32 which is lesser than the table t value of 1.98 at .05 level of significance and 114 degrees of freedom. Hence the hypothesis is accepted.

This can be attributed to the equal opportunities and equal importance to all students without any discrimination of tribal and non tribal communities. This also shows that the acquisition and development of science process skills is independent of any particular culture.

***Comparison of Science Process skills of non tribal and non tribal girls students of elementary level.***

**Hypothesis 5**

There would be no significant difference in science process skills of tribal and non tribal Girls students of elementary level

In order to test this hypothesis, mean scores of science process skills were calculated. Mean, standard deviation and t-value of scores in science process skills were computed and presented in table-4

**Table 5: Mean score of Science Process Skills of Tribal and Non Tribal Girls students of elementary level**

Process Skills	Tribal Students Girls (N=38)		NonTribal Students Girls (N=46)		't'-value
	Mean	S.D	Mean	S.D.	
	19	6.66	20.4	5.88	1.022

The data in the table 5 reveals that the science process skills mean scores of tribal and non tribal girls students are 19 and 20.4 respectively. Though the non tribal girls are slightly more in science process skills but the difference is

not statistically significant. The t value which is calculated is 1.022 which is lesser than the table t value of 1.99 at .05 level of significance and 82 degrees of freedom. Hence the hypothesis is accepted.

This can be attributed to the equal opportunities and equal importance to all students without any discrimination of tribal and non tribal communities. This also shows that the acquisition and development of science process skills is independent of any particular culture. As there may be less awareness about education among the tribal population for girls in comparison to non tribal population the result is indicating a slighter higher score of science process skills in favour of non tribal girls.

### **CONCLUSIONS**

Effective Science education and acquisition of Science Process skills is not dependant upon any culture and even gender in common. Effective science teaching can be implemented where students participate and learn science with hands on experience can certainly lead to imbibing better Science Process skills.

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