



# RELATIONSHIP BETWEEN SCIENCE PROCESS SKILLS AND ACHIEVEMENT IN SCIENCE OF SECONDARY SCHOOL STUDENTS

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**Abstract:** Science education is crucial for the understanding of our environment. It is an essential tool for technological development in any society. Hence, nations all over the world continue to ensure that the teaching of science subjects is to be done in a manner that enhances the achievement of intended objectives. Being a compulsory subject in schools, teaching of science aims to equip students with knowledge regarding nature and developing scientific temper and positive attitude towards learning of science. In this respect development of science process skills is considered indispensable part of science education. Therefore, in the present paper, the investigator makes an attempt to study the relationship of science process skills and achievement in science of secondary school students. Survey method has been adopted for this study. 560 secondary school students studying in class IX were selected by multi stage sampling technique from 12 schools of Patna district of Bihar (India) for data collection. Co-efficient of correlation by covariance method was used for analysis of data. The findings of the study reveal that there is a positive correlation between science process skills and the achievement in science of male, female, government and private secondary school students.

**Keywords - Relationship, Science, Science Process Skills, Achievement, Secondary School Students**

## I. INTRODUCTION

Science and technology plays a major role in the development of any country and to a great extent it depends on how science education is imparted in educational institutes and especially at secondary stage of school education. There is a great interest among the researchers, educators and policy makers to study how do students learn science and which aspect of science education is emphasised by the science teachers? Also, what skills are important for better understanding of the various concepts of science and how to improve the students' achievement in science? Development of certain science related skills is considered essential for attaining the aims of science education as per the studies of many researchers. (Zeidan and Jayosi, 2015; Abungu, 2014; Singh and Imam, 2014 and Aktamis and Ergin, 2008). Hence this paper focuses on the relationship between science process skills and proficiency of secondary school students in terms of their academic achievement in science.

National Curriculum Framework (2005) cites that Process validity requires that the curriculum engage the learners in acquiring the methods and processes that lead to generation and validation of scientific knowledge, and nurture the natural curiosity and creativity of the child in science. Hence development of Process Skills for effective learning of science is very essential.

### **Science Process Skills**

Science process skills are a set of skills commonly used by scientists and others for conducting scientific inquiry. When learners interact with their environment in a scientific way, they find themselves observing, questioning, hypothesizing, predicting, investigating, interpreting, and communicating. These are often called the "process skills" of science.

These process skills are classified into two as basic and integrated skills. Basic science processing involves observing, question raising, measuring, communicating, classifying, predicting and inferring. Integrated science process skills require controlling variables, defining terms operationally, formulating hypotheses, interpreting data, and formulating models. The basic and integrated skills together improve the thinking and reasoning abilities.

### **Achievement in Science**

The word 'Achievement' refers to the act of attaining a desired objective or aim or level. Educationally, the word 'achievement' refers to an individual's performance up to a desired level in a particular field. Achievement means the extent to which teaching and study has resulted in mastering. It is the outcome of general and specific learning.

Academic achievement of pupils refers to the knowledge attained and skills developed in school subjects. So, academic achievement in science means the achievement of students in the science subjects in relation to their knowledge, attaining ability or degree of competence in school tasks usually measured by standardized tests and expressed in grades or units based on pupil's performance.

## **II. REVIEW OF RELATED LITERATURE**

Zeidan and Jayosi (2015) investigated the relationship between the Palestinian secondary school students knowledge level of science process skills and their attitudes toward science, and the effect of gender and residence of these students on their knowledge level of science process skills and on their attitudes toward science. Results showed that the association between knowledge level of science process skills and attitudes toward science were significant

Abungu et. al. (2014) studied the effect of the science process skills teaching approach (SPSTA) on students' self concept in chemistry on students studying in the secondary schools in Nyando district of Kenya. The results revealed that science process skills teaching approach (SPSTA) had significant effect on students' self-concept in chemistry.

Agbaje and Alake (2014) conducted a research study to investigate the Students' Variables as Predictor of Secondary School Students' Performance in Science in Ikere Local Government Area of Ekiti State, Nigeria. The study revealed that students' variables like study habit, attitude to and interest of students in Science subjects are better predictors of students' performance in science subjects, while student's gender has no influence on students' academic performance.

Nikam (2014) in his study explains how questioning strategy can be used to enhance science process skills among school students which will help to stimulate science education. The study finds that effective use of questioning strategy can promote thinking among students and forces them to have experiments to get the answers.

Raj (2014) studied the Science process Skills of students studying in high schools of five districts of Tamil Nadu. The major findings of the research show that there is very low positive correlation between the science process skills and achievement in science among high school students. Mean scores of communicating skill was higher than the other dimensions of science process skills.

### III. SIGNIFICANCE OF THE STUDY

Science process skills are central to the development of the affective skills and play a major role in science education and in the lives of the pupils pursuing science education influencing their achievement. Thus, adolescent students need proper guidance and great care should be taken at this stage in developing the process skills which will definitely help these children to understand the nature and significance learning Science. Under such circumstances, it becomes important to investigate the learning of science by children, who are the potent citizens of tomorrow. However, this important aspect of science teaching needs more in-depth study by the educationalists, researchers and policy makers especially in the state of Bihar. Hence the investigator of the present study focussed on this important aspect of science teaching.

### IV. STATEMENT OF THE PROBLEM

Development of process skills in science is considered as an important aim of science education and so due attention should be given in developing these skills among students through the teaching of science. Hence the investigator proposes to study the relationship between Science Process Skills and Achievement in Science of secondary school students.

### V. TITLE

Relationship between Science Process Skills and Achievement in Science of Secondary School Students

### VI. OPERATIONAL DEFINITIONS

**Relationship:** Relationship means the mutual connection between two or more things. For the present study it means the correlation between the variables science process skills and achievement in science.

**Science:** Science is the systematic study of the structure and behaviour of physical and natural world around us. Science as a subject in secondary school includes Biology, chemistry and Physics

**Process Skills:** Process skills refer to the cognitive and psychomotor skills employed to learn science such as inference, observation, prediction, measurement and classification. Operationally, for the present study, process skills are defined as the scores obtained by the subjects in Test of Science Processes (TSP-MK) by Karuna Shankar Mishra (2012).

**Achievement:** In the present study Achievement refers to the content knowledge of science in students. Operationally, for this study, achievement in science means the scores obtained by the subjects in Science Achievement Test (SAT) constructed by the investigator.

**Secondary School Students:** Students studying in class IX and X are known as Secondary School Students.

### VII. OBJECTIVES OF THE STUDY

1. To find the relationship between Science Process Skills and Achievement in Science of male secondary school students.
2. To find the relationship between Science Process Skills and Achievement in Science of female secondary school students.
3. To find the relationship between Science Process Skills and Achievement in Science of government secondary school students.
4. To find the relationship between Science Process Skills and Achievement in Science of private secondary school students.
5. To find the relationship between Science Process Skills and Achievement in Science of Secondary School Students.

## VIII. NULL HYPOTHESES

1. There is no significant relationship between Science Process Skills and Achievement in Science of male secondary school students.
2. There is no significant relationship between Science Process Skills and Achievement in Science of female secondary school students.
3. There is no significant relationship between Science Process Skills and Achievement in Science of Government secondary school students.
4. There is no significant relationship between Science Process Skills and Achievement in Science of private secondary school students.
5. There is no significant relationship between Science Process Skills and Achievement in Science of secondary school students.

## IX. RESEARCH METHODOLOGY

**Method** - In the present study descriptive survey method has been used.

**Population** - Population of the study consists of all the secondary school students of Patna district of state of Bihar of India studying in class IX.

**Sample** - A sample of 560 students studying in class IX of twelve schools of Patna district was selected by multi stage sampling technique.

**Tools:** The researcher used the following tools for data collection

1. **Test of Science Process (TSP)**- The investigator has used the adapted form of the test of science processes by Karuna Shankar Mishra (2012). This test of science processes has been designed to measure ability of drawing inference, excluding variables, designing experiments, testing hypotheses, interpreting data and identifying supporting data. The value of the test retest reliability coefficient was found to be 0.783 which is significant at 0.01 level of significance.
2. **Science Achievement Test (SAT)** – A Self constructed Science achievement test was used to measure the learning output of the students of IX grade in science subject. The main objective of this test is to find the level of academic achievement of secondary school students in science subject. Test retest method was used by the investigator to establish the reliability of this test which was found to be 0.82.

**Statistical Analysis** - Coefficient of Correlation by Covariance method was used to analyze the data and find the relationship between Science Process Skills and Achievement in Science of the students.

## X. DELIMITATIONS OF THE STUDY

The study of this paper is delimited to

1. Secondary School Students studying in class IX only.
2. Secondary School Students of twelve schools of Patna district only.
3. Relationship between Science Process Skills and Achievement in Science of the secondary school students.
4. Demographic variables Gender and Type of School.

**XI. RESULTS AND DISCUSSIONS**

**Null Hypothesis 1 :** There is no significant relationship between Science Process Skills and Achievement in Science of male secondary school students.

**Table – 1**  
**Correlation between Science Process Skills and Achievement in Science of Male Secondary School Students**

Science Process Skills		Achievement in Science			N	r	Remarks
$\Sigma X$	$\Sigma X^2$	$\Sigma Y$	$\Sigma Y^2$	$\Sigma XY$	265	0.713	Significant
5077	104903	4580	85470	92695			

(The critical value of 'r' for df 263 at 1% level of significance is 0.16021)

It is inferred from the above table 1 that the calculated value of correlation between Science Process Skills and Achievement in Science of the secondary school students is higher than the critical value of correlation at 1% level of significance. Therefore, the null hypothesis is rejected. Hence there is significant high positive relationship between Science Process Skills and Achievement in Science of the male secondary school students.

**Null Hypothesis 2 :** There is no significant relationship between Science Process Skills and Achievement in Science of female secondary school students.

**Table - 2**  
**Correlation between Science Process Skills and Achievement in Science of Female Secondary School Students**

Science Process Skills		Achievement in Science			N	r	Remarks
$\Sigma X$	$\Sigma X^2$	$\Sigma Y$	$\Sigma Y^2$	$\Sigma XY$	295	0.728	Significant
5059	94261	4684	82726	86095			

(The critical value of 'r' for df 293 at 1% level of significance is 0.15031)

It is inferred from the above table 2 that the calculated value of correlation between Science Process Skills and Achievement in Science of the secondary school students is higher than the critical value of correlation at 1% level of significance. Therefore, the null hypothesis is rejected. Hence there is significant high positive relationship between Science Process Skills and Achievement in Science of the female secondary school students.



**Null Hypothesis 3 :** There is no significant relationship between Science Process Skills and Achievement in Science of Government secondary school students.

**Table – 3**  
**Correlation between Science Process Skills and Achievement in Science of Government Secondary School Students**

Science Process Skills		Achievement in Science			N	r	Remarks
$\Sigma X$	$\Sigma X^2$	$\Sigma Y$	$\Sigma Y^2$	$\Sigma XY$	280	0.515	Significant
5934	131158	5390	109792	117167			

(The critical value of 'r' for df 278 at 1% level of significance is 0.15526)

It is inferred from the above table 3 that the calculated value of correlation between Science Process Skills and Achievement in Science of the secondary school students is higher than the critical value of correlation at 1% level of significance. Therefore, the null hypothesis is rejected. Hence there is significant relationship between Science Process Skills and Achievement in Science of the Government secondary school students.

**Null Hypothesis 4 :** There is no significant relationship between Science Process Skills and Achievement in Science of Private secondary school students.

**Table – 4**  
**Correlation between Science Process Skills and Achievement in Science of Private Secondary School Students**

Science Process Skills		Achievement in Science			N	r	Remarks
$\Sigma X$	$\Sigma X^2$	$\Sigma Y$	$\Sigma Y^2$	$\Sigma XY$	280	0.715	Significant
4202	68006	3874	58404	61623			

(The critical value of 'r' for df 278 at 1% level of significance is 0.15526)

It is inferred from the above table 4 that the calculated value of correlation between Science Process Skills and Achievement in Science of the secondary school students is higher than the critical value of correlation at 1% level of significance. Therefore, the null hypothesis is rejected. Hence there is significant relationship between Science Process Skills and Achievement in Science of the Government secondary school students.

**Null Hypothesis 5 :** There is no significant relationship between Science Process Skills and Achievement in Science of secondary school students.

**Table – 5**  
**Correlation between Science Process Skills and Achievement in Science of Secondary School students**

Science Process Skills		Achievement in Science			N	r	Remarks
$\Sigma X$	$\Sigma X^2$	$\Sigma Y$	$\Sigma Y^2$	$\Sigma XY$	560	0.725	Significant
10136	1999164	9264	168196	178790			

(The critical value of 'r' for df 558 at 1% level of significance is 0.111054)

It is inferred from table 5 that the calculated value of correlation between Science Process Skills and Achievement in Science of the secondary school students is higher than the critical value of correlation at 1%

level of significance. Therefore, the null hypothesis is rejected. Hence there is significant relationship between Science Process Skills and Achievement in Science of the secondary school students.

## XII. FINDINGS OF THE STUDY

1. There is significant high positive correlation between Science Process Skills and Achievement in Science of the male secondary school students
2. There is significant high positive correlation between Science Process Skills and Achievement in Science of the female secondary school students.
3. There exists a significant moderate positive correlation between Science Process Skills and Achievement in Science of the Government secondary school students.
4. There is significant high correlation between Science Process Skills and Achievement in Science of the Private secondary school students.
5. There is significant high positive correlation between the overall scores of Science Process Skills and Achievement in Science of the secondary school students.

## XIII. RECOMMENDATIONS

1. Science should be taught through experimentation and hands on activities so as to train the students in scientific enquiry and process skills of science.
2. Students should be encouraged to design low cost innovative apparatus and experiments to have a deeper understanding of scientific laws and principles.
3. Teaching of science should not be confined within the four walls of classroom and laboratory. Rather they should be motivated to observe their surroundings and the natural phenomenon for developing the scientific aptitude and basic process skills of science.
4. Policy makers, curriculum developers and textbook writers and other stakeholders involved in science education should modify the school science curriculum and textbooks so as to give more emphasis on the practical aspects of science.
5. Action research on the problems of under achievement in science subjects may be undertaken by teachers and henceforth remedial classes should be organized.

## XIV. CONCLUSION

From the findings of the present study it is seen that there is significant positive relationship between Science Process Skills and Achievement in Science. This means that those students who have better level of process skills in science performed better in science than others and vice versa. Hence more emphasis should be laid on developing the process skills of science such as observation, classification, drawing inference and interpreting data.

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