Educational
Administration
Theory and Practice

An Analysis Of Basic Science Process Skills Among Secondary School Students In Ranipet District

M. Revathi[1*], Dr. S.Malathi[2]

[1*,2]Ph.D. Research Scholar & [2] Emeritus Professor, N.K.T. National College of Education for Women, Affiliated to Tamil Nadu Teachers Education University, Chennai. Mail id: mrevathi0903@gmail.com

ARTICLE INFO	ABSTRACT
	The aim of this study was to explore the basic science process skills of secondary school students based on their gender and standard. A descriptive survey method was used to gather data from 600 secondary students, using a stratified random sampling technique in the Arakkonam educational block of the Ranipet district in Tamil Nadu, India. Each participant was given a 60-item Basic Science Process Skill test, which was developed and standardized by the researcher. The test's Cronbach Alpha reliability coefficient was found to be 0.734, indicating good reliability. The findings of the study demonstrated that there were significant differences in basic science process skills based on gender, with girls outperforming boys. Furthermore, students in X standard performed significantly better than IX standard students. **Keywords:** Basic Science Process Skills, Gender, Standard, Secondary school students.

INTRODUCTION

In this present technological era, one of the most needed thinking skills is science process skills and they are necessary for understanding the functioning of the nature of science. These skills are not only beneficial for students but they needed by everyone to lead their life successfully. These skills are interlinked into our lives. The only matter is how, when, and where we express these skills in our routine life is a big question. Scientists used these skills during their research activities. Science process skills are very important for students to understand the science concepts. These skills are the learning outcomes of the student because science process skills emphasize the learning process, activity, creativity, values, and also the attitude of students that will be applied in everyday life (Maison and Darmaji, 2019).

Science process skills, as defined by Padilla (1990), are a set of broadly transferable abilities, appropriate to many science disciplines and reflective of the behaviour of scientists.
Dogan (2016) defined science process skills as skills that facilitate learning sciences, the award means of research and active learning, developing an individual's sense of responsibility while learning, and increasing the permanence of knowledge.
Behera (2014) referred to these as "Process Skills", which are the problem-solving strategies used by individuals.

The American Association for the Advancement of Science (AAAS), UNESCO (1992) identified thirteen process skills under two major classifications namely basic and integrated (Savitha, 2018). Basic Science Process Skills (BSPS) are Observing, Classifying, Communicating, Measuring, Predicting and Inferring. These basic process skills are the foundation for acquiring integrated process skills. Integrated Science Process Skills (ISPS) are identifying and defining variables, describing the relationship between variables, formulating and testing hypotheses, collecting of data, designing investigation and experimentation, manipulating the variables, identifying the cause and effects, acquiring organizing, and displaying the data with charts, graphs, and tables. These process skills are all interrelated with one another; there is no sequence or particular order of these skills. Any skill can begin first, all other skills follow later. Usually, observation skills come first, and all other skills follow later.

REVIEW OF RELATED LITERATURE

Herda et al., (2020) conducted a study to determine the level of science process skill ability of senior high school students in Jambi who were learning chemistry. The results showed that the students had a low level of achievement in science process skill for each type.

Ahija (2019) investigated the relationship between science process skills and academic achievement among secondary school students. The research findings revealed that boys had significantly better mean scores than girls in terms of science process skills.

Derilo (2019) conducted a study to determine the level of science process skill acquisition of students and its impact on their academic performance in science. The results showed that students had an average level of basic science process skills.

Tilakaratnea and Ekanayakeb (2017) assessed the level of understanding of basic science process skills, among grade six and seven students. Results indicated that there is statistically significant difference in the level of understanding of BSPS between the gender for sixth graders and no difference between genders for seventh graders.

Ahmet Gures, and Songul Cetinkaya et al., (2014) made a study in Turkey to determine the levels of use of basic process skills among high school students. The results showed that the differences between students' grade levels scores, order of admission to high school, and type of school had a significant effect on the potential use of basic science process skills.

NEED AND SIGNIFICANCE OF THE STUDY

Science process skills are the main tools that students use to explore and comprehend scientific concepts in their surroundings (Nejla Gultepe, 2016). Therefore, it is crucial for students to have a sound understanding of these skills. Basic science process skills are a prerequisite for learning integrated science process skills. If these skills are not included in the assessment, there is a risk that they may be neglected in teaching, as pointed out by Harlen (2013). From the above points, it is evident that basic science process skills have significant importance in science education, as well as in an individual's life. Therefore, it is necessary to evaluate the basic science process skills of secondary school students. This is the reason why it has been selected as a research topic.

OBJECTIVES OF THE STUDY

1. To find out the level of basic science process skills among secondary school students.
2. To examine if there are any significant differences in the basic science process skills of secondary school students based on their gender.
3. To investigate if there are any significant differences in the basic science process skills of secondary school students based on their standard.

HYPOTHESES OF THE STUDY

The following hypotheses were formulated based on the objectives of the study.
1. The level of basic science process skills of secondary school students is average.
2. There is no significant difference in the basic science process skills of secondary students based on gender.
3. There is no significant difference in basic science process skills of secondary students based on standard.

METHODOLOGY

Sample
A normative survey method was adopted to study a sample of 600 secondary school students, including both boys and girls in standard IX and X, from three different types of school management in Arakkonam educational block, Ranipet district, Tamil Nadu, India. Stratified random sampling technique was used to select the sample. The total sample was divided equally based on gender and standard.

Tool Used
The following tool was employed in the present study.

Basic Science Process Skills Test
The investigator developed and standardized a tool for collecting the data for assessing basic science process skills of secondary school students with the help of her research supervisor. The BSPS test consists of 60 multiple-choice questions with six types (each type has 10 items) namely observing, classifying, measuring, communicating, inferring, and predicting skills. The questions were selected in a manner that covered the

basic science process skills. For each question, one mark was allotted. The total mark for the BSPS test was 60. The Cronbach Alpha reliability coefficient of the test was found to be 0.734.

Statistical techniques used
1. Percentage analysis
2. t-test to see the significant difference.

RESULTS AND DISCUSSION

Hypothesis-1 "The level of basic science process skills of secondary school students is average".

Table-1 shows the level of basic science process skills of secondary students-Whole sample

Variable	Level	Marks	N	Percentage
Basic science process skills	Low	0-18	284	47%
	Average	19-41	161	26%
	High	42-60	155	25%

The above table indicates that almost half of secondary students exhibit a low level of basic science process skills, leading to the rejection of null hypothesis.
The study's result are in line with previous studies conducted by Herda et al. (2020); Maison & Darmaji (2019); and Aydogdu (2015) who found that there is a low level of science process skills among students. This contradicts the research report of Derilo (2019), Maneer. V (2019) and Aydin (2013) who found that there is an average level of science process skills among students.

Hypothesis -2 "There is no significant difference in the basic science process skills of secondary students based on gender".

In order to test the above null hypothesis t-value is calculated.

Table-2 shows the mean and standard deviation of basic science process skills scores of secondary school students based on gender.

Types of Basic science process skills.	Gender	N	Mean	S.D.	t-value	p-value	Remarks
Observing Skill	Boys	300	7.22	1.504	6.562	.000	Significant
	Girls	300	7.95	1.189			
Classifying Skill	Boys	300	6.95	1.428	1.211	.226	Not significant
	Girls	300	7.11	1.725			
Measuring Skill	Boys	300	6.85	1.444	2.707	.007	Significant
	Girls	300	7.19	1.655			
Communicating Skill	Boys	300	6.75	1.687	2.817	.005	Significant
	Girls	300	7.14	1.674			
Inferring Skill	Boys	300	6.71	1.656	2.654	.008	Significant
	Girls	300	7.10	1.874			
Predicting Skill	Boys	300	6.59	1.758	.558	.577	Not significant
	Girls	300	6.68	2.172			
Overall	Boys	300	41.10	4.760	4.697	.000	Significant
	Girls	300	43.18	6.044			

From the above table, it is inferred that there is a significant difference exists between boys and girls concerning the types of basic science process skills such as observing, measuring, communicating, inferring, and overall basic science process skills at a 1% level of significance. There is no significant difference between boys and girls with respect to the dimensions of basic science process skills such as classifying and predicting skills.
The total mean score of boys is 41.00, while for girls, it is 43.18. Looking at the mean scores, it is clear that there is a significant difference between them; hence the null hypothesis is rejected. Based on the mean value, it can be concluded that the girls perform better than boys in their basic science process skills.
The result of the study falls in line with the findings of Ahmet Gures et al. (2015), and Karar and Yenice (2012), who revealed that girls are found to be superior to boys in their basic science process skills and opposition to the research report of Ahuja (2019) Ugwanyi (2015), Ozturk et al., (2010) and Aydogdu (2006) who reported that boys were found to be superior to girls in science process skills.

Hypothesis -3 "There is no significant difference in the basic science process skills of secondary students based on standard".

In order to test the above null hypothesis t-value is calculated.

Table-3 shows the mean and standard deviation of basic science process skills scores of secondary school students based on standard.

Types of Basic Science Process Skills,	Standard	N	Mean	S.D.	t-value	p-value	Remarks
Observing Skill	IX Std.	300	7.380	1.456	3.705	.000	Significant
	X Std.	300	7.800	1.316			
Classifying Skill	IX Std.	300	6.770	1.620	4.151	.000	Significant
	X Std.	300	7.300	1.504			
Measuring Skill	IX Std.	300	6.866	1.617	2.494	.013	Significant
	X Std.	300	7.183	1.489			
Communicating Skill	IX Std.	300	6.740	1.725	3.014	.003	Significant
	X Std.	300	7.153	1.632			
Inferring Skill	IX Std.	300	6.633	1.852	3.831	.000	Significant
	X Std.	300	7.183	1.658			
Predicting Skill	IX Std.	300	6.346	2.072	3.654	.000	Significant
	X Std.	300	6.930	1.830			
Overall	IX Std.	300	40.73	5.388	6.431	.000	Significant
	X Std.	300	43.55	4.768			

From the above table, it is inferred that there is a significant difference exists between IX- standard and X-standard students with respect to all the types of basic science process skills such as observing, classifying, measuring, communicating, inferring, predicting, and overall skills at a 1% level of significance.
The total mean scores of IX-standard students are 40.73 and the X-standard students are 43.55. Looking at the mean scores it is clear that there is a significant difference exists between them, hence the null hypothesis is rejected and it is concluded that the X-standard students are better than IX-standard students in their basic science process skills.
The result of this study falls in line with the findings of Tilakaratnea and Ekanayakeb (2017) and Dokeme and Aydin (2009) who revealed that there is a statistical difference in the student's performance on the basic science processes skills test linked to their grade level.

CONCLUSION

The study reveals that the level of basic science process skills among secondary school students is low. Furthermore, the analysis of data indicates that there is a significant difference in the performance of boys and girls, as well as between IX and X standard students regarding to their basic science process skills. The gender differences in science process skill performance are due to several factors. These factors include societal norms and expectations, cultural beliefs and values, self-efficacy and confidence, teacher expectations and bias, peer influence, curriculum and instructional methods, and assess to resources. To address these disparities, a multifaceted approach is required, including promoting inclusive teaching practices, challenging gender stereotypes, providing equitable access to resources and opportunities, and fostering a supportive learning environment where all students feel empowered to engage with and excel in science process skills. The combination of developmental factors, accumulated knowledge, increased experience with inquiry-based learning, maturity, exposure to formalized assessment practices, and instructional emphasis likely contributes to X-standard students performing better in science process skill tests compared to IX-standard students.

REFERENCES

1. Ahuja, A. (2019). Study of Science Process Skills and Academic Achievement among Secondary School Students. VINDHYA BHARTI.
2. Aydın, A. (2013). Representation of science process skills in the chemistry curricula for grades 10, 11 and 12/Turkey. International journal of Education and Practice, 1(5), 51-63.
3. Aydogdu, B. (2015). The investigation of science process skills of science teachers in terms of some variables. Educational Research and Reviews, 10(5), 582-594.
4. Behera, S., & Satyaprakasha, D. C. (2014). Effectiveness of multimedia teaching on process skill in biology. International Journal of Informative &Futuristic Research, 1(8).

5. Derilo, R. C. (2019). Basic and integrated science process skills acquisition and science achievement of seventh-grade learners. European Journal of Education Studies.
6. Dogan, I., & Kunt, H. (2016). Determination of prospective preschool teachers' science process skills. Journal of European Education, 6(1), 8-18.
7. Dökme, İ., & Aydınlı, E. (2009). Turkish primary school students' performance on basic science process skills. Procedia-Social and Behavioral Sciences, 1(1), 544-548.
8. Gürses, A., Çetinkaya, S., Doğar, Ç, & Şahin, E. (2015). Determination of levels of use of basic process skills of high school students. Procedia-Social and Behavioral Sciences, 191, 644-650.
9. Gultepe, N. (2016). High School Science Teachers' Views on Science Process Skills. International Journal of Environmental and Science Education, 11(5), 779-800.
10. Harlen, W. (2013). A rather circular look at effective primary science practices.
11. Herda, A., Johari, A., Maison, M., Rusdi, M., & Asyhar, R. (2020) Science Process Skill Ability Level of Senior High School Students in Learning Chemistry in Jambi. International Journal of Scientific and Technology Research, 9(4), 1829-1833.
12. Karar, E. E., & Yenice, N. (2012). The investigation of scientific process skill level of elementary education 8th grade students in view of demographic features. Procedia-Social and Behavioral Sciences, 46, 3885-388.
13. Maison, M., Darmaji, D., Kurniawan, D. A., Astalini, A., Dewi, U. P., & Kartina, L. (2019). Analysis of science process skills in physics education students. Jurnal Penelitian dan Evaluasi Pendidikan, 23(2), 197-205.
14. Maneer. V & Arshitha. P (2019). Science Process Skill among Higher Secondary School Students. International Education & Research Journal (IERJ), Vol. 5 Issue 1
15. Özturk, N., Tezel, Ö. & Acat, M. B. (2010). Science process skills levels of primary school seventh grade students in science and technology lesson. Journal of Turkish Science Education, 7(3), 15-28.
16. Padilla, M. J. (1990). The science process skills. Research Matters-to the science Teacher, 9004, 1-4.
17. Savita, S. (2018). Effect of Activity Based Method on Science Process Skills Academic achievement and Attitude of Secondary level students.
18. Tilakaratne, C. T. K., & Ekanayake, T. M. S. S. K. Y. (2017). Achievement level of science process skills of junior secondary students: Based on a sample of grade six and seven students from Sri Lanka. International journal of environmental & science education, 12(9), 2089-2108.
19. Ugwanyi, A. A. (2015). Science Process Skills Acquired by Senior Secondary School Students in Enugu Educational Zone (Doctoral dissertation, Master's Thesis, Nsukka: University of Nigeria).