International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 6 Issue 1, November-December 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Science Process Skills in Relation to Values Gained through Learning Science

Vasudha C R

Research Scholar, Regional Institute of Education (NCERT), Mysuru, Karnataka, India

ABSTRACT

Science is not only of acquiring knowledge about facts, theories, or gaining text book's theoretical generalizations. Doing Science means applying the processes to reach the knowledge and process data. The process of doing science should bring in holistic development of the children including the development of values. The process of doing science involves Science process skills. So in this study, the researcher has attempted to find the relationship between science process skills and science values of class 8 students in Mysuru, Karnataka State. Research findings have shown that there is a positive relationship between science process skills and science values. And gender has no influence on the relationship between science process skills and science values. The implications of the study are discussed in this paper.

KEYWORDS: *Science process skills, Science values*

How to cite this paper: Vasudha C R "Science Process Skills in Relation to Values Gained through Learning Science" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-1, December 2021, pp.1670-1673, URL: www.ijtsrd.com/papers/ijtsrd49089.pdf

IJTSRD49089

INTRODUCTION

Science Process Skills have been defined as a set of broadly transferable abilities, appropriate to many Science disciplines and reflective of the behaviour of scientists (Padilla, 1990). Science A Process Approach (SAPA), a programme of American Association for the Advancement of Science (AAAS), grouped Science Process Skills into two types—basic and integrated (Livermore,1964). The basic process skills provide a foundation for learning the integrated process skills. According to Lind (1998), process skills are skills used while considering problems and in formulation of conclusions. These skills are used by scientists during their work. It can be used to assist students in gaining these important skills, thus enabling them to understand and learn the world in which they live. These skills are the basis for scientific thinking and research. According to Abruscato (2000), discoveries of scientists arise from a group of very different and important abilities referred to as their scientific process skills. As the goal for each individual is to be scientifically literate, process skills occupy a significant role. Çepni (1997) defined SPS as facilitating basic activities in regards to learning science, gaining research method and techniques, helping students to be active and to make learning permanent (as cited in Karsli & Sahin,2009). Science Process Skills are based on scientific inquiry and associated with cognitive and investigative skills.

Science Process Skills are scientific activities that facilitate the meaningful understanding of ideas. According to Ayas (2007), SPS are classified as basic (observation, testing, classification, relating number with space, and recording data), causal (prediction, determination of variables, and drawing a conclusion), and experimental (making a hypothesis, modeling, doing the experiment, changing and testing the variables, and making a decision). Most of the classifications of Science Process Skills enlisted by Nay (1971), Klopfer (1971), AAAS (1993), Harlen and Elstgeest (1994), Longfield (2002) contain more or less same basic and integrated skills.

Classification of science process skills as given by SAPA is as follows. The basic processes observing, classifying, using numbers, measuring, using

space/time relationships, communicating, predicting, inferring; and the integrated processes defining operationally, formulating hypotheses, interpreting data, controlling variables, experimenting. Processes in the first group, the "basic processes," are considered for the primary grades; the second group, the "integrated processes," are taught in intermediate grades.

The Delor's commission (1996) of UNESCO in its report entitled 'Learning: the Treasure Within' advocates the need to cultivate core universal values like human rights, sense of social responsibility, social equity, democratic participation, tolerance, cooperative spirit, creativity, environmental sensitivity, peace, love, truth, non-violence, and so on within the learner. Education for human values is an important area that needs to be promoted at all stages of education. Values are abstract and multi-dimensional and present an ideal for the members of the society to shape their personalities. Science offers many opportunities for value inculcation. These cannot be imposed, but need to be part and parcel of the teaching-learning process. There is no need to have a separate period for value education; teachers can integrate values during teaching-learning of different subjects like science, language, social studies, mathematics, arts, crafts, and so on. For example, during the teaching-learning of the concepts such as the *States of matter* you can discuss the values of coordination, unity, and staying togetherness based on how the bonding and forces of attraction vary between the molecules of the three states. Similarly, while discussing friction, one can talk about how reducing friction increases the efficiency of a machine by preventing energy dissipation. In the same way, quarrelling leads to wastage of energy and time. Thus science offers many opportunities of value inculcation for students.

NCF 2005 included values in the ethical validity of the science curriculum as follows:

Science is a dynamic, expanding body of knowledge, covering ever-new domains of experience. In a progressive forward-looking society, science can play a truly liberating role, helping people escape from the vicious cycle of poverty, ignorance and superstition.

The advances in science and technology have transformed traditional fields of work such as agriculture and industry, and led to the emergence of wholly new fields of work. People today are faced with an increasingly fast-changing world where the most important skills are flexibility, innovation and creativity.

These different imperatives have to be kept in mind in shaping science education. Good science education is true to the child, true to life and true to science. This simple observation leads to the following basic criteria of validity of a science curriculum:

1. *Cognitive validity* requires that the content, process, language and pedagogical practices of the curriculum are age appropriate, and within the cognitive reach off the children.
2. *Content validity* requires that the curriculum must convey significant and correct scientific information. Simplification of content which is necessary for adapting the curriculum to the cognitive level of the learner must not be so trivialised as to convey something basically flawed and/or meaningless.
3. *Process validity* requires that the curriculum should engage the learner in acquiring the methods and processes that lead to the generation and validation of scientific knowledge and nurture the natural curiosity and creativity of the child in science. Process validity is an important criterion since it helps the student in 'learning to learn' science.
4. *Historical validity* requires that the science curriculum be informed by a historical perspective, enabling the learner to appreciate how the concepts of science evolve over time. It also helps the learner to view science as a social enterprise and to understand how social factors influence the development of science.
5. *Environmental validity* requires that science be placed in the wider context of the learner's environment, local and global, enabling him/her to appreciate the issues at the interface of science, technology and society, and equipping him/her with the requisite knowledge and skills to enter the world of work.
6. *Ethical validity* requires that the curriculum promote the values of honesty, objectivity, cooperation, and freedom from fear and prejudice, and inculcate in the learner a concern for life and preservation of the environment.

Rationale for the Study

Education at school level should bring in holistic development of the individual, contributing towards the development of a healthy society. Values are to be inculcated among the learners to shape their personalities. These cannot be imposed but need to be inculcated in the process of teaching – learning.

Gaining values while learning other subjects such as Science, Mathematics, Social Studies, Languages, and so on is potentially achievable. Learning science gives ample opportunities for inculcating values among learners. Learning science is nothing but acquiring the science process skills. It implies that the students mastering science process skills must have gained the values. So this research paper is aimed at finding the relationship between inculcating values among the learners and acquisition of science process skills.

Research questions

1. What is the relationship between science process skills and science values of students at secondary level?
2. What is the relationship between science process skills and science values of students at secondary level with respect to gender?

Objectives

1. To study the relationship between science process skills and science values.
2. To study the relationship between science process skills and science values of students at secondary level with respect to gender.

Hypothesis

1. There is no significant relationship between science process skills and science values of students at secondary level.
2. There is no significant relationship between science process skills and science values of students at secondary level with respect to gender.

Analysis and Interpretation

Objective 1

1. To study the relationship between science process skills and science values.

The critical value of "r" at 0.01 levels of significance is 0.393. The computed value of "r" at 0.01 level of significance is 0.595, which is greater than the critical value of "r". So the null hypothesis 'There is no significant relationship between science process skills and science values of students at secondary level' is rejected. The alternative hypothesis 'There is a significant relationship between science process skills and science values of students at secondary level' is accepted.

Table 1: Co-efficient correlation between science process skills and science values of students at secondary level

	Variables	N	Mean	SD	R - value	P value	Remarks
1	Science process skill	40	14.33	4.305	0.595	<0.01	Significant
2	Science values	40	124.55	24.897		<0.01	

Correlation is significant at the 0.01 level (2-tailed).

Objective 2

1. To study the relationship between science process skills and science values of students at secondary level with respect to gender.

Table 2: Co-efficient correlation between science process skills and science values of students at secondary level with respect to gender

Gender	Variables	N	r-value	P value
Male	Science process skills	22	0.349	0.111
	Science values			
Female	Science process skills	18	0.121	0.643
	Science values			

From the table of critical value, the critical value of "r" at 0.01 levels of significance is 0.515. The computed value of "r" at 0.01 level of significance for the relationship between science process skills and science values of students at secondary level with respect to boys is 0.349, which is less than the critical value of 'r'. The computed value of "r" at 0.01 level of significance for the relationship between science process skills and science values of students at secondary level with respect to girls is 0.121, which is less than the critical value of 'r' 0.561. So the null hypothesis 'There is no significant relationship between science process skills and science values of students at secondary level with respect to gender' is accepted.

Educational Implications of the Study

Findings of the study have shown that there is a significant relationship between science process skills and science values of students at secondary level. Through this study, it is evident that the students who are proficient in science process skills are also able to

possess the attainment of science values. This implies for the teacher community and curriculum planners to ensure the need for focusing on process of learning rather than focusing on the product. When the focus is on process of learning, it eventually takes care of attainment of values along with gaining the knowledge. It also implies that, if the content of science text books are process oriented than the content oriented, it would contribute towards holistic development of the individuals.

Discussion and Conclusion

Gaining values such as honesty, perseverance, objectivity, rationality, and sustainability at the age of adolescence along with the knowledge would eventually make students objective and rational thinkers along with concern for life. Orienting science classes towards process rather than the product would eventually result in the acquisition of values among the learners. So process oriented science classes not only providing the knowledge but also make pupils worthy citizens possessing noble virtues.

References

[1] Creswell, John W. *Research Design. Qualitative, quantitative and mixed methods approaches*. Second edition. University of Nebraska, Lincoln, Sage Publications, International Educational and Professional Publisher, New Delhi.

[2] Maranan, Veronique M. *Basic Process Skills and Attitude toward Science: Inputs to an enhanced students' Cognitive Performance*. https://files.eric.ed.gov/fulltext/ED579181.pdf

[3] National Council of Educational Research and Training. (2005). *National Curriculum Framework.* New Delhi. NCERT. (2013). *Pedagpgy of Science, Physical Science Part I, Textbook for B.Ed.* New Delhi: National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi.

[4] Sanderson, B. A., & Kratochvil, D. W. (1971). *SCIENCE—A PROCESS APPROACHDEVELOPED BY THE AMERICAN ASSOCIATION FOR THE ADVANCEMENTOF SCIENCE.* Palo Alto, California: American Institutes for Researchin the Behavioral Sciences. https://files.eric.ed.gov/fulltext/ED064066.pdf

[5] UNESCO Principal Regional Office for Asia and the Pacific (Thailand) [670]. (1993). Strategies and Methodsfor Teaching Valuesin the Contextof Scienceand Technology. *UNESCO Principal Regional Office for Asia and the PacificP.O. Box 967, Prakanong Post Of LiceBangkok 10110, Thailand* (p. 52). Thailand: UNESCO Principal Regional Office for Asia and the PacificP.O. Box 967, Prakanong Post Of LiceBangkok 10110. https://unesdoc.unesco.org/ark:/48223/pf0000095247

[6] Cepni, S. (2007). Araştırma ve Proje çalışmalarına Giriş (Genişletilmiş Üçüncü Baskı), Trabzon: Celepler Matbaacılık.

[7] Çepni, S., Ayas, A., Johnson, D. & Turgut, M. F. (1997). Fizik Öğretimi. Ankara: Milli Eğitimi Geliştirme Projesi Hizmet Öncesi Öğretmen Eğitimi Deneme Basımı.

[8] Karslı, F., & Şahin Çakır, Ç. (2009). Developing worksheet based on science process skills: Factors affecting solubility. *Asia-Pacific Forum on Science Learning and Teaching*, *10*.

[9] Harlen, W. (1999). Purposes and procedures for assesing science process skills. Assessment in Education, 6(1), 129-144.

[10] Choirunnisa, N., Prabowo, P., & Suryanti, S. (2018). Improving Science Process Skills for Primary School Students Through 5E Instructional Model-Based Learning. *Journal of Physics: Conference Series*, *947*, 012021. https://doi.org/10.1088/1742-6596/947/1/012021