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Research Paper Education

Relationship between science processes and concept-attainment in science.

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ABSTRACT

The present study aimed to investigate the relationship between science processes and concept-attainment in science. Sample consisted of 600 students of class IX of U.P. Board schools of Allahabad city. For data collection 'Test of Science Processes' developed by K.S Misra was used for measuring science processes. 'Concept-attainment Test in Science' developed by the researcher was used to measure concept-attainment. Pearson's product moment co-efficients of correlation were computed to test the hypothesis. The findings of the study revealed that concept-attainment in science and its three dimensions are positively related to two science processes namely - designing experiments and identifying supporting data.

KEYWORDS : Science processes and concept-attainment in science.

Introduction:

Science education emphasizes teaching science for all, with ultimate goal of developing scientific literacy (American Association for the Advancement of Science, 1989, 1993). The National Science Education Standards (NRC, 1996) define science literacy as "the knowledge and processes required for personal decision making, participation in civic and cultural affairs and economic productivity. Ultimately, the goal of teaching the nature of science is to produce scientifically literate students and citizens." A scientifically literate person should have an understanding of concepts, principles, theories, methods and processes and awareness of the complex relationship between science, technology and society. Scientific literacy can be referred to as the ability to citizens to:

- Acquire scientific knowledge, principles and facts.
- Understanding scientific concepts and processes.
- Identify scientific questions, investigating and draw evidence based conclusions.
- Engage in scientific discourse and make decisions about self and natural world.

Scientific literacy encompasses developing interest in science and understanding scientific concepts by asking questions, investigating and drawing evidence based conclusions, and an understanding of science concepts, principles, theories and processes and the interrelationship between science, technology and society. So, developing science process skills among students is one of the major goals of scientific literacy. Science process skills are defined as the skills used by scientist for composing knowledge and making conclusions. American Association for Advancement of Science (1993) advocated thirteen scientific skills. These skills are best thought of as a set of intellectual skills that are associated with acquiring reliable information about nature of science. In thirteen science process skills eight are " basic science processes" namely – observing, classifying, using space/time relationship, measuring, using numbers, communicating, inferring and predicting and five skills are called " integrated science processes" namely – controlling variables, interpreting data, formulating hypotheses, defining operationally and experimenting which are more appropriate for middle, secondary and higher secondary students.

Review of related literature:

Abangu (2014) found that science process skills teaching strategy positively enhanced the achievement in chemistry. Supasorn and Waengchin (2014) found that use of scientific investigation learning activities enhances students' learning achievement of chemical reactions and integrated science process skills. Koksal and Berberoglu (2014) and Simsek and Kabapinar (2010) indicated that the guided-inquiry approach enhanced the experimental group students' understanding of science concepts, achievement and science process skills. Delen and Kesercioglu (2012) found positive relationship between academic achievement and science process skills – observing, data interpreting, predicting, classifying, formulating hypotheses and defining operationally. Brotherton and Preece (1997) found that teaching science process skills had positive and persistent effect on science achievement. Mabie and Baker (1996) found that students with ability to define a problem, construct hypotheses, design experiment and interpret data are highly correlated with academic achievement. Padilla, Okey and Gerrad (1984) found that instruction in science process skills such as identifying and controlling variables, formulating hypothese and experimenting are beneficial for overall science achievement. Bhargava (1983) found a moderate relationship of academic achievement in physics with three processes namely – observing, measuring and drawing inferences and low level of correlation with two processes – making prediction and making and testing hypotheses. Marek (1981) found moderate correlation between content achievement in biology and achievement in inquiry skills with reference to formulating problems, formulating hypotheses, designing experiments, interpreting data.

Objective: The objective of the present study is - 'To find out relationship between concept-attainment in science and science processes among secondary students.'

Hypothesis: It was hypothesized that 'There is no significant relationship between concept-attainment in science and science processes.'

Methodology: Correlational survey method of descriptive research has been used to conduct the present study. Sample for the present study comprised of 600 students. It was selected from IX class students of U.P. Board schools of Allahabad City by using multistage random sampling technique. For data collection 'Test of Science Processes' developed by K.S Misra was used. It measured five science processes namely- drawing inferences, exclusion of variables, designing experiments, interpreting data and indentifying supporting data. 'Concept-attainment Test in Science' developed by the researcher was used to measure concept-attainment in science. It consisted of three subtests which measured ability to identify concept belonging to examples, ability to identify example of a concept and ability to identify concept belonging to examples. Pearson's product moment co-efficients of correlation were computed to test the hypothesis.

Results and discussion: It was hypothesized that 'there is no significant relationship between concept-attainment in science and science processes.' Product moment co-efficients of correlation have been computed for testing of hypothesis. Results have been shown in table -1.

Table – 1 shows that the values of correlation between drawing inference on one hand and concept-attainment in science and its three dimensions namely - ability to identify concept belonging to examples, ability to identify example of a concept and ability to identify concept belonging to examples on the other are 0.024, 0.071, 0.045 and 0.034. These four values of correlation are not significant at .05 level. So, it can be inferred that drawing inferences is not related to concept-attainment in science.

Table - 1
Correlation between concept-attainment in science and science processes of IX class students

Variables	Total concept-attainment in science	Ability to identify concept belonging to examples	Ability to identify example of a concept	Ability to identify concept belonging to examples
Drawing inferences	0.024	0.071	-0.045	0.034
Exclusion of variables	0.074	0.037	0.061	0.045
Designing experiments	0.244**	0.206**	0.194**	0.177**
Interpreting data	0.099	0.089	0.119*	0.004
Indentifying supporting data	0.350**	0.307**	0.272**	0.256**

*/** significant at .05/.01 level

The values of correlation between exclusion of variables on one hand and concept-attainment in science and its three dimensions on the other are 0.074, 0.037, 0.061 and 0.045. These four values of correlation are not significant at .05 level. So, it can be inferred that exclusion of variables is not related to concept-attainment in science.

The values of correlation between designing experiments on one hand and concept-attainment in science and its three dimensions on the other are 0.244, 0.206, 0.194 and 0.177. These four values of correlation are significant at .01 level. So, it can be inferred that ability of designing experiments and concept-attainment in science are positively related.

The values of correlation between interpreting data on one hand and concept-attainment in science and its three dimensions on the other are 0.099, 0.089, 0.119 and 0.004. Values of correlation between interpreting data and ability to identify example of a concept are significant at .05 level. It means that interpreting data and ability to identify example of a concept are positively related. The remaining values of correlation are not significant at .05 level. It means that interpreting data is not related to total concept-attainment in science, ability to identify concept belonging to examples and ability to identify concept belonging to examples.

The values of correlation between identifying supporting data on one hand and concept-attainment in science and its three dimensions on the other are 0.350, 0.307, 0.272 and 0.256 respectively. All values of correlation are significant at .01 level. So, it can be inferred that identifying supporting data is positively related to concept-attainment in science.

To sum up, it can be inferred that concept-attainment in science and its three dimensions are positively related to designing experiments and identifying supporting data. It means that science processes are positively related with concept-attainment in science. Delen and Kesercioglu (2012), Lati et al. (2012),Feyzioglu (2009), Atkamis and Ergin (2008), Mabie and Baker (1996), Hykle (1994), Padilla, Okey and Gerrad (1984), Bhargava (1983) and Marek (1981) have found positive relationship between science process skills and achievement in science. These findings lend to the finding of the study.

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