Research Paper Education

A study of intelligence, concept-attainment in science and learning style as predictors of science processes among IX grade students.

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ABSTRACT

The present study aimed to examine intelligence, concept-attainment in science and learning style as predictors of science processes. Sample consisted of 600 students of class IX of U.P. board schools of Allahabad city. The tools used for the study were: 'Science Processes Test' and 'Learning Style Inventory' constructed by K.S. Misra for measuring science processes; learning style and 'Test of "g" Culture Fair Scale 2; Form A' by R.B. Cattell and A.K.S. Cattell, Hindi version prepared by R.N. Singh and S.D. Kapoor for measuring intelligence and 'Concept-attainment Test in Science' constructed by the researcher. The findings of the study revealed that intelligence and concept-attainment in science are positively related to science processes and intelligence and ability to identify concept belonging to examples emerged as the best predictors of science processes.

KEYWORDS science processes, concept-attainment in science, intelligence, learning style.

Introduction:

Any country which keeps her children bereft of his investigative aspect of science steals the seeds of her future in science. Science education can develop curiosity, spirit of inquiry, investigations, broad thinking, reasoning ability, scientific innovative and scientific approach and other cognitive abilities among students.The shift from the teacher-centred method of teaching science to child-centred activity based method which encourages and develops spirit of inquiry, develops understanding of the ways of scientific thinking, the develops scientific method for doing work as scientist and prepares students for their possible careers in science and technology, led to the development of science process skills (Akinbobola,2006). Acquiring and developing science process skills facilitates access to scientific information. In today's educational process, gaining scientific thinking skills is crucial. For this reason, science process skills should be included in the science curriculum. As the basis of analytical scientific thinking, science process skills are life-long learning process which we use in constructing knowledge and in problem solving (Hazir & Turkman, 2008). Science process skills are cognitive and psychomotor skills employed in problem solving. They are the skills used in the problem identification, inquiry, data gathering, making hypotheses, transformation, interpretation and communication. Science process skills can be acquired and developed through processing and training in teaching learning process. According to Bybee et. al. (1989) and Ango (1992), science process skills can be classified into two categories as basic process skills viz- observing, measuring, classifying, communicating, inferring, using numbers, using relationship, questioning and integrated science process skills viz- controlling and manipulating variables, hypothesizing, defining operationally, formulating models, designing experiments and interpreting data. Basic science process kills are vital for learning science and concept formation at the primary and junior secondary school stage while integrated science process skills are more appropriate at the secondary and tertiary level. So, using science process skills is an important indicator of transfer of knowledge which is necessary for analytical thinking, decision making, problem solving and functional living as a scientifically literate person.

Tobin (1982) found positive relationship between formal reasoning ability and integrated science process. Padilla et.al. (1983) found that integrated process skill teaching might influenced by formal thinking ability. Bhargava (1983) found that scores of science processes are highly correlated with intelligence and achievement in physics. Ramesh (1984) found that above average intelligence group had higher mean scores on the process skill than average and below average intelligence groups. Hykle (1994) found that content achievement in science and science process skills are significantly correlated. Myer and Dyer (2006) investigated that students taught by using the investigatory laboratory approach were reported as higher content knowledge and science process skills scores than students taught using prescriptive laboratory approach. Atkamis and ergin (2008) investigated that science process education increased the students' achievement in science and scientific creativity. Feyzioglu's study (2009) revealed positive effect on science process skills and chemistry achievement. Vebritano and Osman (2011) investigated the effectiveness of various constructive teaching media in science teaching and learning process to improve the students' science process skills and science achievement.

Objectives of the study:

The objectives of the study are as follows:

To find out the relationship of science processes with intelligence, concept- attainment in science and learning style.

To find out whether intelligence, concept-attainment in science and learning style contribute to prediction of science processes.

Hypotheses of the study:

Following hypotheses are formulated as:

There is no significant relationship between science processes and intelligence, concept-attainment in science, learning style.

Intelligence, concept-attainment in science and learning style contribute to prediction of science processes.

Methodology:

The sample for this study consisted of 600 IX class students of U.P.Board schools of Allahabad City. 'Test of Science Processes' and 'Learning Style Inventory' constructed by K.S. Misra were used for measuring science processes and learning style. For measuring intelligence 'Test of "g" Culture Fair Scale 2, Form A' by R. B. Cattell and A. K. S. Cattell, Hindi version prepared by R. N. Singh and S. D. Kapoor was used. 'Concept-attainment in science' constructed by researcher was used for measuring concept-attainment in science. Product moment co-efficient of correlation and step-wise multiple regression analysis have been used for analysis of data.

Results and discussion:

Hypothesis - 1. It was hypothesized that 'there is no significant relationship between science processes on one hand and intelligence, concept-attainment in science and learning style

on the other.' This hypothesis has been tested with reference to three dimensions of concept-attainment in science viz.- ability to identify concept belonging to examples, ability to identify example of a concept, ability to identify concept belonging to attributes ; and three dimensions of learning style namely- enactive learning style, figural learning style and verbal learning style . Product moment coefficients of correlation have been computed for testing of the hypothesis. Results have been shown in table-1.

Observation of atble-1 shows that correlation between science processes and intelligence is .295. It is significant at.01 level. So, it can be inferred that intelligence is positively related to science processes. This means that intelligent students show better performance on science processes. The finding draws support to the finding of Edmund (1981), Tobins (1982), Bhargava (1983), Padilla et.al. (1983), Ismail and Joseph (2005), Aruna and usha (2006), who found positive relationship between mental ability and science process skills.

Table-1
Correlation between science processes and intelligence, concept- attainment in science, learning style among IX grade students

S.No.	Independent variable	Value of correlation with science processes
1.	Intelligence	.295**
2.	Total concept-attainment in science	.272**
3.	Ability to identify concept belonging to examples	.246**
4.	Ability to identify example of a concept	.204**
5.	Ability to identify concept belonging to attributes	.168**
6.	Enactive learning style	.062
7.	Figural learning style	.025
8.	Verbal learning style	.053

** Significant at .01 level

Observation of table-1 shows that correlation between science processes on one hand and concept-attainment in science and its three dimensions on the other are .272, .246, .204 and .168 respectively. These values of correlation are significant at.01 level. So, it can be inferred that concept-attainment in science is positively related to science processes. The findings of McClain (1992), Suresh (2001), Atkamis and Ergin (2008), Feyzioglu (2009) and Lati et. al. (2012), who found science process skills and achievement in science are positively correlated, led to support the present finding.

Observation of atble-1 also shows that correlation between science processes on one hand and enactive, figural and verbal learning style on the other are .062, .025 and .053 respectively. The values of correlation are not significant at .05 level. It means that learning style is not related to science processes. This finding reflects the impact of wrote memory, examination-oriented study, no use of laboratory practical and no more emphasis on hands- on inquiry approach while learning science. Lati et al. (2012) found positive effect of inquiry learning activities on integrated science process skills and science achievement. Smith & Renzulli (1984) revealed that matching teaching and learning styles can significantly enhance academic achievement at the primary and secondary school levels.

Hypothesis - 2. It was hypothesized that 'intelligence, concept-attainment in science and learning style do not significantly contribute to prediction of science processes.'Step-wise multiple regression analysis was used for testing this hypothesis. Three dimensions of concept-attainment in science viz.- ability to identify concept belonging to examples, ability to identify example of a concept, ability to identify concept belonging to attributes, intelligence and three dimensions of learning style viz.- enactive, figural and verbal learning style were also used for predicting science processes (SP). Results have been shown in table-2.

Table-2
Results of multiple regression analysis showing the best predictors of science processes

S.N.	Predictor variable	R square change	B	t	Constant
1.	Intelligence	.087	.216	5.365**	9.186
2.	Ability to identify concept belonging to examples	.021	.281	3.672**	
R = .328 F = 35.998** R Square = .108 df =2,597					

** Significant at .01 level

Table-2 shows that intelligence and ability to identify concept belonging to examples emerged as the best predictors of science processes among IX grade students. The value of R is .328 and the value of R-square is .108. It means that intelligence and ability to identify concept belonging to examples contribute to 10.8% of the variance in science processes. R-square change values indicate that intelligence can predict 8.7% of the variance while ability to identify concept belonging to examples can predict 2.1% of the variance in science processes. The value of B for intelligence and ability to identify concept belonging to examples are .216 and .281 respectively. The value of constant is 9.186. So, the regression equation can be written as-

SP = 9.186 + .216 intelligence + .281 ability to identify concept belonging to examples.

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