

Study of Metacognition in Relation to Achievement in Science among Secondary School Students

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ABSTRACT

The objective of the present study was to study the relationship between metacognition and achievement in science among secondary school students. For this reason, total 200 students of 10+2 students of senior secondary school students were taken as sample. The study was descriptive in nature. Data was collected by using Metacognition Inventory (MCI) developed and standardised by Govil(2003). Academic Achievement was measured by taking average of marks obtained in physics and chemistry in annual science examination of class 10+1. It can be concluded from results that there was significant and positive relationship between metacognition and academic achievement of 10+2 students.

INTRODUCTION

When we think of the word 'science', we automatically think of chemicals or astronauts or engineers building bridges. These activities are most common for a scientist but science is so much more than this. It is not even restricted to studying fields like biology, chemistry, and physics. Today, science has its wings spread over a number of fields of study. There are sciences of life, physical sciences, social sciences, food sciences, agricultural sciences, forensic sciences, space sciences etc. This list is endless.

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Science has contributed tremendously to making individuals progressive. 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 (National Curriculum Framework, 2005). Without a science-literate population, the outlook for a better world is not promising. This hints towards the need to provide quality science education right from the basic schooling. In order to develop individuals who are globally competitive to handle such a competitive technological environment, educational institutions have to play a significant role in providing quality science education.

Science education aims at providing essential science proficiency, effective methods of acquiring knowledge, drawing inferences from experiments, developing scientific temperament and building a bridge between technology and culture. Science education also plays a critical role in motivating students to adopt technology based careers which are deemed indispensable in contemporary Indian societies, so that they can easily face scientific development challenges.

Science education has an important place in curriculum both at school and university stages of education in India. Continuous advances in scientific and technological researches have led to the growth and greater application of science in contemporary society. Accordingly, science becomes a priority area in education, both at the compulsory education level as well as the level of specialization in science.

Each individual is surrounded by science in everyday life. It finds application in each and every activity of life. Whether you are talking a friend on phone, or sitting comfortably in your air conditioned office, or taking medication, science is everywhere. Science is rooted deeply in our everyday lives in thousands of ways. So, we can't even probably imagine its substantial impact on our lives and cultures. Advancements in the field of science and technology has changed the

way we think, live and act. There isn't a single aspect of life which is not influenced by science. Due to this deep and constructive contribution of science towards the development of societies and individuals, the subject matter of science has gained huge importance in school education.

School students are naturally curious, which makes science an ideal subject for them to learn. Science allows students to explore their world and discover new things. It is also an active subject containing activities such as hands on labs and experiments. Science is an important part of the foundation for education for all children. Science is a way of knowing and thinking about the natural and physical world. Science covers the broad field of knowledge that deals with observed facts and the relationship among those facts observing, inferring, classifying predicting and communicating are some of the skills fundamental to science. While most feel that Science in Education is a necessity they tend to use it as a tool for reaching a specific target or personal mark, after which there no further need to seek greater education.

Understanding the process of learning has always been area of importance in education knowing the way we learn help an individual to learn better as it involves encoding of information, planning, comprehension and evaluation. Baker (2009) wrote that learning depend, in part on the effective use of basic cognitive processes such as memory and attention he activation of relevant back ground knowledge and the deployment of cognitive strategies to achieve particular goal.

METACOGNITION

Metacognition is a new concept that can have a huge impact on learning. Metacognition as a noun refers to a student's awareness of their level of understanding of a topic. Poor metacognition may indicate poor study strategies. Accurate metacognition is one of the key difference between successful and struggling students. Metacognition is a complex and multi-faceted phenomenon.

What is Metacognition?

Metacognition is the awareness and control of one's own cognitive processes.

What is cognition?

The mental or cognitive processes involved in gaining knowledge and comprehension. These are higher level functions of the brain.

What are the main cognitive processes?

Attention, perception, remembering, thinking, judging, problem solving, imagination, planning and learning.

What does it mean to be aware of these processes?

Essentially it is first the ability of a mind to stand back and watch itself in action. In other words, we are able to examine that we will learn, remember and think and this ability seems to be unique to the individuals. This knowledge about how we process the information gives us the opportunity to change the way we were processing it. Metacognitive knowledge can really improve self-confidence and intellectual performance. It has been shown to compensate for IQ and lack of prior knowledge. To sum up, metacognition is a superior cognitive ability to see yourself as a cognitive processor and to regulate your own cognitive activities.

Metacognition is simply and commonly defined as "thinking about thinking." Metacognition refers to the knowledge that people have about their own thought processes. The term "Metacognition" has been used in psychology and education research literature since mid-1970s.

"Metacognition was originally referred to as the knowledge about and regulations of one's own cognitive activities in learning processes." Flavell (1979)

Cross and Paris (1988) called metacognition as "the knowledge and control children have over their own thinking and learning activities".

Veenman, et.al. (2004) observed that while the different terms helped to focus on research, the domain of metacognition is still one that lacks coherence. According to them the importance of metacognition is now well-accepted, however, an inconsistency in the conceptualization persists. This lack of clarity and coherence in the domain of metacognition calls for more research.

Martinez (2006) defines metacognition as “Monitoring and control of thought”. He further clarifies that metacognition has several “diverse functions as language” such as metamemor, metacomprehension, problem-solving and critical thinking.

Hacker (2009) stated “Metacognition involves awareness of how they learn, an evaluation of their learning needs, generating strategies to meet these needs and then implementing the strategies.”

ACHIEVEMENT

Achievement is another word for accomplishment. Academic success is important because it is strongly linked to positive outcomes. We values Academic success is important because working people will need higher levels of education to tackle the technologically demanding occupational of the future. Now a day you need a post-secondary education in order to get a job. The definition of academic achievement refers to the levels of schooling you have successfully completed and the ability to attain success in your studies when you receive great grades, this is an example of academic achievement, when you attend college and graduate, school, this is an example of academic achievement.

Achievement means the extent to which learner is profiting from instructions is given area of learning as claimed by (Crow & Crow 1956).

According to Trow (1960), “Academic Achievement is the attained ability or degree of competence in school , usually measured by standardised test and expressed is age or grade unit based upon norms defined from a wide sampling of pupils performance.”

Traver (1970) stated that achievement is the result of what an individual has learned from some educational experiences.

Achievement is the result of certain intellectual or physical activity defined according to individual and objective organisational pre-requisite proficiency as claimed by (Marchiner 1973)

Dececco and Crawford (1977) stated that achievement is the expectancy of finding satisfaction in mastering challenging and difficult performance.

ACHIEVEMENT IN SCIENCE

According to (Niemi, 1999), educationally, the achievement may be defined as the mastering of major concepts and principles, important facts and prepositions, skills, strategic knowledge and integration of knowledge. More systematically, achievement is some time fractionated into knowledge components (Ruiz-Primo, 1998) like declarative knowledge is composed of domain-specific production. Achievement is viewed basically as the competence a person has in an area of content. In India, there have been numerous criteria of assessment of achievement in science. Credit points, grading and marking systems are some of them. Now in C.B.S.E. schools, marks are allotted for performance and they are considered to be true indicators of a student’s achievement in a particular subject. Grades are also allotted according to pre-decided criteria.

Achievement in science is considered one of the important criteria for judging a student. Normally, when someone asks about achievement, they ask the marks secured in science and mathematics. This is because they are better indicators of intelligence and efficiency. On the basis of the achievement of a student in science and mathematics, subjects are allotted to him for further study. Choosing science stream demands a high degree of achievement in science. Hence, evaluation of academic achievement level is necessary so that academic avenues can be planned. Science achievement is the degree to which a student has learnt and mastered all the science skills. This is usually estimated by performance on a prepared and pre-scheduled test. Science achievement is a function of many intellectual and non-intellectual variables.

Metacognitive ability is important in science achievement because it produces powerful knowledge that enables students to control their learning of science subject by demonstrating a conscious application of cognitive strategies. Very often students become passive recipients of knowledge of science concepts leading to less involvement in the proper learning of the subject. The metacognitive process helps students depend on and analyse the learning task. This makes the students conscious and alert learners of science.

JUSTIFICATION OF THE STUDY

In the present technological era, technology and its applications are found in every aspect of personal, and professional life. In India science education has been given due importance right from the beginning of the post independence era. All education commission stressed the need to focus on building individuals with scientific temperament and logical thinking.

Science education was given a prime position by Kothari Commission for development in India. While curriculum in science has been updated from time to time, still it is observed that the academic performance of students in the subject of science is not up to the marks. It is because achievement in science is dependent on several factors. Use of systematic and meaningful strategies leads to better academic achievement in science. For this we need to ensure those science teachers are equipped with constructive strategies to make science learning a joy for the learner. One promising way to by which science can be learned meaningfully is through metacognition. One can argue that metacognition is likely to facilitate that process of reaching and learning science in a multi directional way because it encourages students to become aware of their thinking process.

Ozsoy (2011) found that there is a significant positive relationship between Metacognition and mathematics achievement.

Maqsood (1997) investigated the effects of metacognitive skills and nonverbal ability on the academic achievement of high school pupils. He found that metacognitive ability tends to associate positively with the academic attainment of high school pupils.

Thus metacognition adopted by the students are likely to be the predictors of achievement in science. A number of studies have been conducted to study the effect of metacognition. The present study is expected to contribute to the field of theory and practice. Study of metacognition as correlates of students achievement in science would enable educators, educational planner, teachers etc. to enhance the learning outcome of students in science.

STATEMENT OF THE STUDY

Operational Definitions Of The Terms Used

Metacognition

Metacognition refers to awareness and regulation of one's cognitive processes. Thus metacognition includes two components- a) knowledge of cognition b) regulation of cognition. In the present study, metacognition means scores obtained by the students on Metacognition Inventory developed by Punita Govil (2003).

Achievement In Science

Achievement in Science means proficiency of performance in a science subject. In the present study achievement in science means average percentage of marks obtained by 10+1 grade students of science stream studying in C.B.S.E. affiliated schools of Amritsar district in their Physics and Chemistry final examination.

Secondary School Students

In the context of the present study, students studying in grade 12th (Science stream) of C.B.S.E. affiliated schools of Amritsar district are referred to as secondary school students.

Objectives Of The Study

To study the relationship between metacognition and achievement in science among secondary school students.

Hypothesis Of The Study

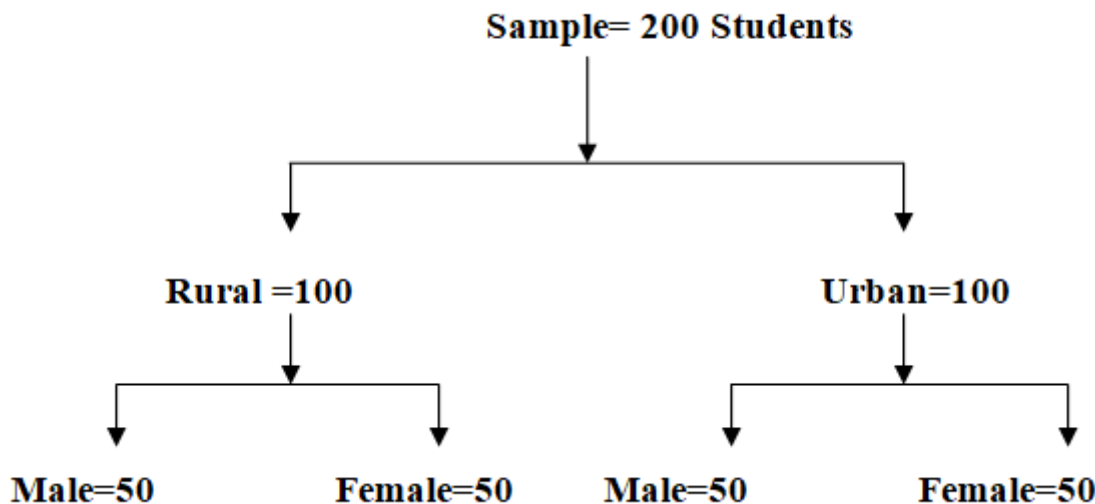
There exists no significant relation between metacognition and achievement in science among secondary school students.

Design Of The Study

In order to fulfil the research objectives of the present study a 'Descriptive Research Method' was used.

Sample

200 students of 10+2 class from different secondary schools affiliated to C.B.S.E. was selected as sample in the present study.



Tools Used

- 1.) Metacognition Inventory (MCI) developed and standardised by Govil (2003).
- 2.) Academic Achievement as obtained by taking average of marks obtained in physics and chemistry in annual science examination of class 10+1.

Statistical Techniques

Mean and Correlation was used as Statistical Techniques in the present study.

Delimitation Of The Study

- 1.) The present study was delimited to 200 students of Amritsar district.
- 2.) Only the students of science stream were selected for the present study.
- 3.) The present study was delimited to the students studying in 10 +2 standard of C.B.S.E affiliated secondary schools.

Hypothesis

“There exists no significant relation between metacognition and achievement in science among secondary school students.”

Table 1 : Coefficient of correlation between Academic Achievement and Metacognition of 10+2 Students

S. No	Variable	N	Mean	Coefficient of Correlation (r)
1	Metacognition	200	63.76	.504**
2	Academic Achievement in Science	200	68.11	

****Significant at the 0.01 level of significance**

Table 1 presents the coefficient of correlation between academic achievement and metacognition of 10+2 students. The calculated value of coefficient of correlation is 0.504 which is significant at 0.01 levels of significance. It shows that metacognition and academic achievement of 10+2 students are positively and significantly related to each other. Thus the hypothesis 3 stating that “There exists no significant relation between metacognition and achievement in science among secondary school students” stands REJECTED at 0.01 level of significance.

FINDINGS

There was significant and positive relationship between metacognition and academic achievement of 10+2 students.

CONCLUSIONS

Based on the analysis and discussion carried on the results obtained that Significant and Positive relationship was found between metacognition and academic achievement of 10+2 students.

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