



EFFECT OF METACOGNITIVE SKILLS AND SCIENTIFIC INTEREST ON ACADEMIC PERFORMANCE OF SENIOR SECONDARY SCIENCE STUDENTS

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ABSTRACT

The present study was undertaken to see the effect of metacognitive skills and scientific interest on academic performance of senior secondary science students of Haryana state. To conduct this study total sample of 400 students was selected randomly from twenty government and twenty private schools of Haryana state. The tool used for measuring the level of Meta-cognitive skills was Meta Cognitive Skills Scale (MCSS) developed and standardized by Madhu Gupta and Suman (2017). The tool used for measuring the level of scientific interest was Science Interest Test (SIT) developed and standardized by L. N. Dubey and Archana Dubey (2006). Data of academic performance was collected from the result of 12th board exam conducted by Board of School Education Haryana. Significant and positive correlation of academic performance with metacognitive skills and scientific interest was observed. The result revealed significant effect of metacognitive skills and scientific interest on academic performance of senior secondary science students.

Keywords: Metacognitive Skills, Scientific Interest, Senior Secondary, Science Students

INTRODUCTION

Knowledge of science is the basic requisite of human development. It has become an integral part of our daily lives. It influences almost every aspect of daily life. The achievements of science have transformed our present society into a scientific society. Educationist considers metacognitive skills and scientific interest as the main determinant of learning and success in science. Academic performance or academic achievement is the extent to which a student, teacher or institution has attained their short or long-term goals. The level of academic performance plays an important role in the life of a student. Both secondary and senior secondary levels of education are of vital importance in this field. As academic performance is a multi-faceted and multi-dimensional phenomenon, there is many factors which directly or indirectly influence the academic performance of students. Two main factors chosen for the present study are metacognitive skills and scientific interest.

Metacognition involves meta and cognition, 'meta' means 'self-realization' and 'cognition' means 'mental-action'. It could be termed as a 'process' too. The process of attaining something or understanding something involving one's thoughts, experiences as well his senses. Every day we are involved in metacognitive activities. Metacognition leads us towards becoming successful learners. Metacognition concerns to knowledge and skills for organizing, guiding and controlling own thinking and learning process. Persons with good metacognitive skills are at the helm of their own learning process, through which they can carry out a learning task more effectively.

Flavell (1979) define metacognitive skills as "Metacognitive skills are strategies applied consciously or automatically during learning, cognitive activity and communication to manipulate cognitive processes before, during or after a cognitive activity."

According to Schraw and Moshman, (1995) "Metacognition is knowledge and cognition about cognitive phenomena". Metacognition circumscribes the understanding of learning strategies. Narang and Saini (2013)



examined the effect of metacognition on academic performance of rural secondary students. Results disclosed that most of scholars with top level of metacognition obtained above average marks in their examinations. Findings of the result also revealed that each part of metacognition considerably contributed towards the academic performance of the scholars.

The term 'interest' has its origination in the Latin word 'interse'. Interse mean to value or to concern something. Basically interest means liking towards particular work or object. According to Eysenck (1959), "Interest is a tendency to behavior oriented towards certain objects, activities of experiences, which varies in intensity from individual to individual." Crow and Crow (1963) stated that "Interest may refer to a motivating force that impels us to attend a person, a thing or an activity; or it may be an effective experience that has been stimulated by the activity itself". In other words, "interest can be the cause of any activity and result of participation of that activity." Scientific interest implies the individual's interest in science and scientific things. How much a student achieves in science field depends on his/her interest in science. Interest in specific field is main determinant or potential predictor of success in particular school subject. The scientific interest is incredibly essential for every student because it determines the performance of students in science and allied subjects. Hence students' academic performance in science could be enhanced through the development of interest in science subject. Bolarin (1988) investigated that pupils with high educational interest score, have good grade point averages or marks than with low interest scores. Educational interest can function as an important contributing factor and also responsible for enhancing smart memory of the students. The status of learning difficulty of scholars is decreased with high level of instructional interest for a specific subject that leads to improve academic performance in particular subjects. Omotade et al., (2016) tried to determine the correlation between attitude and interest of senior secondary students with academic performance in Biology. The findings of the result of data analysis indicated a major association between the students' attitude towards Biology and students' academic performance in Biology and the findings also stated the major association between the students' interest in Biology and students' academic performance in Biology.

OBJECTIVES OF THE STUDY

1. To study the relationship between academic performance and metacognitive skills of senior secondary science students.
2. To study the relationship between academic performance and scientific interest of senior secondary science students.
3. To study the effect of metacognitive skills on academic performance of senior secondary science students.
4. To study the effect of scientific interest on academic performance of senior secondary science students.
5. To study the combined effect of metacognitive skills and scientific interest on academic performance of senior secondary science students.

HYPOTHESES OF THE STUDY

To achieve the objectives of the study following hypothesis were formulated:

1. There is no significant relationship between academic performance and metacognitive skills of senior secondary science students
2. There is no significant relationship between academic performance and scientific interest of senior secondary science students.
3. There is no significant effect of metacognitive skills on academic performance of senior secondary science students.



4. There is no significant effect of scientific interest on academic performance of senior secondary science students.
5. There is no significant combined effect of metacognitive skills and scientific interest on academic performance of senior secondary science students.

DELIMITATIONS OF THE STUDY

1. The study was delimited to 12th class students of Haryana state only.
2. The study was delimited to a number of 400 students only.
3. The study was delimited to science students only.
4. The study was delimited to 3 variables, two independent variables: metacognitive skills and scientific interest and one dependent variable: academic performance.

RESEARCH METHOD

As the present study is non-experiment in nature and Investigator has tried to acknowledge the current status of effect of independent variables i.e. Metacognitive skills and Scientific Interest on the dependent variable i.e. Academic Performance. Thus Descriptive Survey Method method is best suited for the conduction of this study.

SAMPLE

Sample: Data of 400 science students studying in senior secondary schools of Haryana state was selected by employing Multistage Random Sampling Technique Initially out of 22 districts of Haryana, ten were selected randomly then two government and two private schools were selected randomly from the lists of senior secondary schools of concern districts and in final stage ten students were selected randomly from each selected school so as to make a total sample of 400 students.

TOOLS USED

1. Meta Cognitive Skills Scale developed and standardized by Madhu Gupta and Suman (2017) was used to measure the metacognitive skills of senior secondary students.
2. Science Interest Test developed and standardized by L. N. Dubey and Archana Dubey (2006) was used to study the scientific interest of senior secondary students.
3. Academic performance was determined on the basis of marks obtained by senior secondary science students in 12th board exam.

STATISTICAL TECHNIQUES USED FOR ANALYSIS OF DATA

1. Pearson's Product Moment Correlation (r) was calculated to find out the relationship of metacognitive skills and scientific interest with academic performance.
2. Regression analysis was done in order to see the combined effects of independent variables (metacognitive skills and scientific interest) on dependent variable (academic performance).

ANALYSIS AND INTERPRETATION OF DATA

1. Relationship between academic performance and metacognitive skills of senior secondary science students.



Relationship between academic performance and metacognitive skills is studied by computing the Pearson’s Product Moment Coefficient of Correlation (r).

Table-1 Correlation of Academic Performance with Metacognitive Skills

Variables	N	Mean	S.D.	Coefficient of Correlation (r)	Level of Significance
Academic Performance	400	376.22	58.79	0.459	0.05 & 0.01 Significant
Metacognitive Skills	400	168.37	18.34		

N = 400, df = 398

It is depicted from table-1 that computed value of coefficient of correlation (r) between academic performance and metacognitive skills is 0.459. Computed r value when compared with the table value (df 398), it is found greater than table value at both 0.05 and 0.01 level of significance, so correlation (r) value is significant at both levels of significance. Therefore null hypothesis ‘There is no significant relationship between academic performance and metacognitive skills of senior secondary science students’ is rejected. It shows that academic performance and metacognitive skills have positive and significant relationship with each other, which indicates that increase in metacognitive skills leads to increase in academic performance. It clearly indicates that metacognitive skills are also a powerful determinant of academic performance of senior secondary students.

2. Relationship between academic performance and scientific interest of senior secondary science students.

Table-2 Correlation between Academic Performance and Scientific Interest

Variables	N	Mean	S.D.	Coefficient of Correlation (r)	Level of Significance
Academic Performance	400	376.22	58.79	0.344	0.05 & 0.01 Significant
Scientific Interest	400	51.12	7.50		

N = 400, df = 398

It is depicted from the table 2 that computed value of coefficient of correlation (r) between academic performance and scientific interest is 0.344. Computed r value when compared with the table value (df 398), it is found greater than table value at both 0.05 and 0.01 level of significance, so correlation (r) value is significant at both levels of significance. Therefore null hypothesis ‘There will be no significant relationship between academic performance and scientific interest of senior secondary students’ is rejected. It shows that academic performance and scientific interest have positive and significant relationship with each other, which indicates that increase in scientific interest leads to increase in academic performance. It clearly indicates that scientific interest is a determinant of academic performance of senior secondary students.

3. Effect of metacognitive skills and scientific interest on academic performance of senior secondary science students. (Individually, combination of two)



In order to check the effect and percentage contribution of metacognitive skills and scientific interest on academic performance multiple regression analysis method was used. For the present study scores of academic performance were taken as criterion and scores on metacognitive skills and scientific interest were taken as predictor.

Table-3 Regression Analysis to study the effect of Metacognitive Skills and Scientific Interest on Academic Performance

S. N.	Models	R	R Square	Percentage contribution	F	p value	Level of Significance
1	Predictors (Constant) Metacognitive Skills	0.459	0.210	21%	105.965	.000	0.05 & 0.01 Significant
2	Predictors (Constant) Scientific Interest	0.344	0.118	12%	53.314	.000	0.05 & 0.01 Significant
3	Predictors (Constant) Scientific Interest & Metacognitive Skills	0.482	0.232	23%	59.943	.000	0.05 & 0.01 Significant

p value ≤ α level (α = 0.01 or 0.05) - Significant
 p value > α level (α = 0.01 or 0.05) - Not Significant

Effect of Metacognitive Skills on Academic Performance of Senior Secondary Students

It is depicted from table-3 that computed value of F for metacognitive skills is 105.965. Computed F value when compared with the table value (df 1/398), it is found greater than table value at both 0.05 and 0.01 level of significance, so the F value is significant at both levels of significance. It shows that academic performance has a significant and positive regression with metacognitive skills. Value of R Square (0.210) indicates that metacognitive skills explain 21% of variability of academic performance i.e. 21% of academic performance is influenced and determined by metacognitive skills.

Illustration of table-3 finding of effect of metacognitive skills on academic performance of senior secondary students in form of pie chart is given in figure 1:

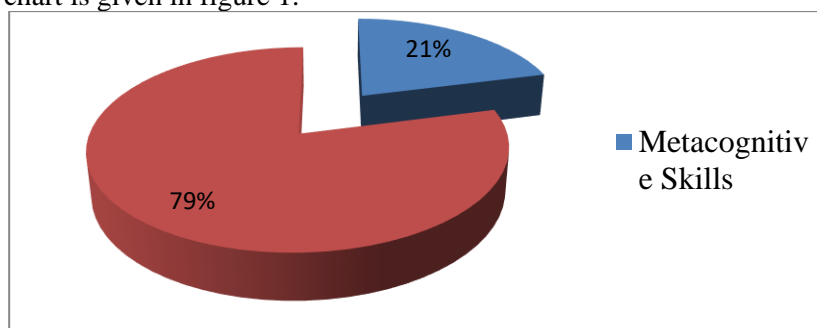


Figure-1 Percentage contribution of Metacognitive Skills in determining Academic Performance

Effect of Scientific Interest on Academic Performance of Senior Secondary Students

It is depicted from the above table-3 that computed value of F for scientific interest is 53.314. Computed F value when compared with the table value (df 1/398), it is found greater than table value at both 0.05 and 0.01 level of significance, so the F value is significant at both levels of significance. It shows that



academic performance has a significant and positive regression with scientific interest. Value of R Square (0.118) indicates that scientific interest explain 12% of variability of academic performance i.e. 12% of academic performance is influenced and determined by scientific interest.

Illustration of table-3 finding of effect of scientific interest on academic performance of senior secondary students in form of pie chart is given in figure 2:

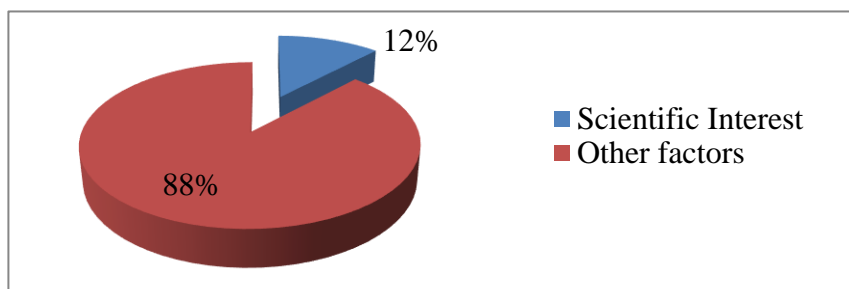


Figure-2 Percentage contribution of Scientific Interest in determining Academic Performance

Study of combined effect of metacognitive skills and scientific interest on academic performance of senior secondary science students.

It is depicted from the table-3 that computed value of F for metacognitive skills and scientific interest is 59.943. Computed F value when compared with the table value (df 2/397), it is found greater than table value at both 0.05 and 0.01 level of significance, so the F value is significant at both levels of significance. Therefore null hypothesis ‘There is no significant combined effect of metacognitive skills and scientific interest on academic performance of senior secondary science students’ is rejected. It shows that academic performance has a significant and positive regression with metacognitive skills and scientific interest. Value of R Square (0.232) indicates that both metacognitive skills and scientific interest combinedly explain 23% of variability of academic performance.

Individual contribution of metacognitive skills is 21% and it is increased to 23% by combining with scientific interest. It means scientific interest accounts for 2% additional variance by interacting with metacognitive skills.

Illustration of table-3 findings of combined effect of metacognitive skills and scientific interest on academic performance of senior secondary students in form of pie chart is given in figure 3:

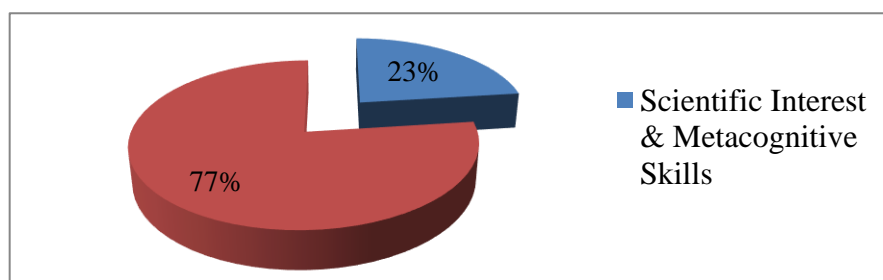




Figure-3 Percentage contribution of Scientific Interest and Metacognitive Skills in determining Academic Performance

FINDINGS

- Significant and positive relationship was found between academic performance and metacognitive skills.
- Significant and positive relationship was found between academic performance and scientific interest.
- Significant effect of metacognitive skills on academic performance of senior secondary school students was found. In this study it was also found that 21% of academic performance is influenced and determined by metacognitive skills and it is interpreted that metacognitive skills is the significant predictor of academic performance of senior secondary science students.
- Significant effect of scientific interest on academic performance of senior secondary school students was found. In this study it was also found that 12% of academic performance is influenced and determined by scientific interest and it is interpreted that scientific interest is the significant predictor of academic performance of senior secondary science students.
- It was found that there is a significant combined effect of metacognitive skills and scientific interest on academic performance of senior secondary school students. In this study it was also found that 23% of academic performance is influenced and determined combinedly by metacognitive skills and scientific interest. Individual contribution of metacognitive skills was 21% and it was increased to 23% by combining with metacognitive skills. It means metacognitive skills accounted for 2% additional variance by interacting with scientific interest.

CONCLUSION

A significant and positive relationship was also recorded between academic performance and metacognitive skills. It concluded that metacognitive skills is a determinant of academic performance of senior secondary science students. It is also concluded that there was a significant and positive relationship between academic performance and scientific interest. It was concluded that scientific interest is also a powerful determinant of academic performance of senior secondary science students.

It was concluded that there was a significant effect of metacognitive skills and scientific interest on academic performance of senior secondary school students. Academic performance was influenced and determined by metacognitive skills 21% and scientific interest 12% individually and separately. The 23% of academic performance is influenced and determined interactively by metacognitive skills and scientific interest.

It is recommended that teacher should create such programs that enhance students' metacognitive skills and interest in science, which improves the academic achievement of the students.

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