A STUDY OF METACOGNITIVE SKILLS AMONG SENIOR SECONDARY STUDENTS IN RELATION TO SUBJECT STREAM AND VARIOUS DEMOGRAPHICS

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Abstract

The aim behind present experimental study is to perform detailed investigation to draw inference/ regarding levels of Metacognitive skills in; Senior Secondary Students of respective subject streams, i.e., Science, Humanities & Commerce. ; and few specific Demographics. Samples were collected from Senior Secondary Class Students available in various schools under educational boards such as Central Board of Secondary Education (CBSE) and Uttar Pradesh Madhyamik Shiksha Parishad (UPMSP) in Aligarh district, UP. Among plenty of Schools (Government and Private) available in the district sampling was done considering impact of specific demographics considered in study. Through random sampling, specific numbers of students were selected considering the ratio despite of the strength of respective stream. 500 senior secondary students comprising 254 boys and 246 girls belonging to Science, Humanities and Commerce stream were selected. The metacognitive skill scale developed by Madhu Gupta & Suman, (2017) used for collection of the data. To compare the different groups and to see the significant difference between groups Mean, Standard Deviation (S.D.) t-test and Analysis of Variance (ANOVA) were calculated with the help of Statistical Package for the Social Sciences (SPSS). The finding of the study revealed that there exist no significant difference in metacognitive skills of students based on Gender, i.e, in Boys and Girls, but there exists significant difference in metacognitive skills of senior secondary students on the bases of their stream selection (Science, Humanities & Commerce), habitat (Rural & Urban), board (UPMSP & CBSE) and types of schools (Government and Private).

Keywords: *Metacognition, Metacognitive Skills, Senior Secondary Students, Subject Choice*

1. Introduction

"Necessity is the mother of invention" and it is evident that more or less it was curiosity which came way before necessity. To be curious is in the nature of human kind and out of curiosity for new discoveries, easy and sometimes more accurate results, existing processes were refined time to time by think tanks, technocrats and established Psychologists, Educationist etc. To revise already derived definitions, derivations, theorems proper thinking for putting variables, quantities alongwith vision regarding expected results is required. In other words thinking, lots of thinking practice, repetition is required till final desired result. It may be a final process for an individual but in future someone else may bring out better revision in existing establishments by doing research, analysis etc. More or less this thinking about thinking will be continued. With time it is obvious that challenges towards existing thesis/concept/knowledge etc. of established Scholars shall be introduced by younger Scholars quoting Empirical aspect rather than epistemological reasoning. This shall involve thinking about thinking of one`s own actions and thinking about thinking of the other person while taking reference of the said person research. Such whole process comprising of steps such as Curiosity, thinking about thinking (own/some other), Comprehending the existing research, further additions, practice, self-correction etc. itself are Metacognitive Skills. Such skills are naturally present in individuals and in some cases they get developed with time and age. For example judgment of a Kindergarten Kid of lines inscribed in notebook (4 Numbers, 2 Outer Lines having Red Color and 2 Inner having Blue Color) while writing Capital Alphabets and small letters. From History reference about numerous studies could be taken in which it is mentioned that, Meta-cognitive skills are essence for quality actions in different aspects of life including education. In this introductory article it is highlighted that without curiosity, understanding, required apprehension, fore-sightedness and presumption of expected result how can an budding student engaged in studies can be turned into an established Scientist, Doctor, Engineer, etc. Career or; engaged in any co-curricular activities get a place among sport stars.

Flavell first introduced the concept of Metacognition in 1976. He defined it as the knowledge and dynamic monitoring of our own learning process and presented two components involve in metacognition i.e. Knowledge about cognition and Regulation of cognition. Knowledge about cognition deals with knowledge about the factors which might affects the performance and learning of an individual. Regulation of Knowledge

includes basically regulatory process and strategies used by the person in achieving the goal and in solving the problem or learning a new thing. Lai (2011) defined metacognition as a multi-dimensional set of skills which involves "thinking about thing". The skills related to regulatory process of behavior can be defined as metacognitive skills. "Constructivism has changed the traditional view of learning. Learning is considered as a constructive, self-regulated, goal-oriented, situated, collaborative and individually different process of knowledge building and meaning construction (Cort, 2000)". Students' knowledge and credence regarding their strategies has been a main concern in the educational sector. Majority of students do not have the potential of knowing the limits of their own learning and memory capabilities. The ability of knowing which learning strategies are effective, planning an approach to a learning task and using effective learning strategies to process and learning new materials seem to be lacking among the students. Gagne & Briggs and Wager (1988) thought that the purpose of instruction, no matter how it happens, is to support the learning process. Gourgey (1998) recommended that instruction must encourage students to generate and use their own strategies and self-questions. In order to design the curriculum in accordance with the student's learning level, it is important to arrange the learning events appropriate with the learning process that takes place inside of the students' brain during the learning. Thus, it is becoming crucial to inform students how to learn new information along with the information itself to enable them to be more successful. This awareness of students to execute the information and one's own cognitive process in learning is called meta-cognition.

Since, Metacognition is ever present in life and there is diverse involvement of Metacognitive skills in every aspect. Investigator (being a research scholar, Educationist) chose to conduct an experimental study for observing variation in Metacognitive skills in Senior Secondary Students belonging to the different Subject/Stream such as Science, Commerce & Humanities respectively. Investigator had an assumption regarding difference in levels of Metacognitive skills in Senior Secondary Students belonging to different subject streams and same was ascertained Students by experimental study.

There are mainly four meta-cognitive skills measured in the present study:

I. **Planning Skill:** Planning skill particularly in case of Students is the preparation of Time plan or schedule for study and to strictly perform adhering to the same

while utilizing resources (Classes, Text books and reference books, Group Discussions etc.) to achieve highest score in results.

II.   **Implementation Skill:**   Implementation Skill for student is to ascertain the genuine way of learning even by utilization of techniques like Yogic Math, other improvised techniques (online videos these days) and willing to adapt the techniques and determined to improvise him or herself while working (studying) persistently to attain the set goal. It also includes the capabilities to organize and execute the required actions.

III.   **Monitoring Skill:**   Monitoring skill in a Student simply refers willingness to keep a check, maintain a record or perform tests on himself or herself regularly. For honing such skills Student may refer sample question papers annexed with reference text books of reputed publications. Otherwise shall keep on working according to above two mentioned skills and check, perform and maintain record of performance of Unit tests, Exams conducted at School Half early, etc

IV.   **Evaluation Skill:**   Evaluation skill in reference to Student profile will be ability of one to judge or to analyze importance, or value of chapters (their weightage), marks wise distribution. To improvise this skill students can refer mock test papers, can refer old question papers of past years.

It is necessary to improve metacognitive skills in continuous manner to obtain the desired level of learning.

2.   Need and Significance of Study

Fortunately, there are plenty of researches and theses available based on advance ideas, despite that, majorly education systems are still practicing Education based on epistemological ideas of Metacognitive skills rather than empirical ones. It is observed that empirical application of Metacognitive skills is more appreciated in comparison to orthodox ideology by preachers/teachers and disciples. It is a fact that overindulgence of a follower/disciple in any existing method despite of its orthodox origin and rigid nature by default shall become a routine and it becomes very hard for follower to improve a process that one is already engaged in.

Why is it so that, in present Education system still at some Education Boards even during early schooling classes (such as Kindergarten and upto 5th Standard) no focus on improvising Metacognitive skills is considered.

Investigator wants to draw attention towards variation in Metacognitive skills due to various factors in Senior Secondary Students of different subject streams. Such thesis on one side ascertain the belief of investigator on which experimental study is being conducted and on the other hand highlights the existing practices which requires amendments, more focus on enhancing metacognitive skills which ultimately led to improvement in the disciples following them. Inference drawn by Investigator is based on the genuine inputs collected with such an motive that, such kind of experimental studies may encourage giving a second thought to nurture students with such an education based on empirical structure of concepts or methodology so that Metacognitive Skills get developed while having education in respective stream or subjects.

3. **Objective of the Study:**

1. To assess the Metacognitive Skills of Senior Secondary students.
2. To find out whether there exist any significant difference in Metacognitive Skills among students belonging to Science, Humanities and Commerce streams.
3. To compare the Metacognitive Skills of Boys and Girls of Senior Secondary classes
4. To compare the Metacognitive Skills of Senior Secondary students residing in Rural and Urban areas.
5. To find out whether there exist any significant difference in the Metacognitive Skills of Senior Secondary students of Government and Private school.
6. To find out whether there exist any significant difference in Metacognitive Skills of UPMSP and CBSE board Senior Secondary students.

4. **Hypotheses of Study**

$H0_1$ There is no significant difference between the Metacognitive Skills of Senior Secondary students.

$H0_2$ There exists no significant difference in Metacognitive Skills of Senior Secondary students belonging to the Science, Humanities and Commerce stream.

$H0_3$ There is no significant difference between the Metacognitive Skills of Boys and Girls of Senior Secondary classes.

$H0_4$ There exists no significant difference between the Metacognitive Skills of Senior Secondary students residing in Rural and Urban areas.

$H0_5$ There is no significant difference between the Metacognitive Skills of Government and Private school students of Senior Secondary classes.

H0₆ There is no significant difference between the Metacognitive Skills of Senior Secondary students belonging to UPMSP and CBSE Board.

5. Methodology

5.1 Design of the Study

In present study descriptive survey method has been used for collecting the data from sample.

5.2 Population and Sample

The population of this study includes all senior secondary students of government and private schools belongs to UPMSP and CBSE Board with three type of stream i.e. Science, Humanities, Commerce located in Aligarh district of Uttar Pradesh. Through simple random sampling a sample of 500 students were taken from Aligarh district. These students were selected from Government and Private schools affiliated to UPMSP and CBSE board from rural and urban areas of the district.

5.3 Tool: Meta-Cognitive Skills Scale:

Data related to metacognitive skills gathered from Meta-Cognitive Skill Scale developed by Dr. Madhu Gupta and Suman in present study. It is a Likert Type five point scale. It consists of 42 items. Reliability of the scale has been measured by Test-Retest Method and Split-Half method. The coefficient of correlation through the test-retest method was 0.763. Split-Half Reliability was found 0.949 which has been measured by Spearman-Brown Prophecy Formula.

5.4 Statistical Techniques

Mean, Standard Deviation (S.D.), t- test and Analysis of Variance (ANOVA) were calculated for the analysis of present study.

6. Analysis and Interpretation of Data

Objective 1: Metacognitive Skills among Senior Secondary Students

The sample of the study has been classified in seven categories on the bases of metacognitive skills i.e. Very High, High, Above Average, Average, Below Average, Low and Very Low. The frequency and percentage of students in each group is given below:

Table 1: Distribution of Senior Secondary Students on their Metacognitive Skills

S.N.	Level of Metacognitive Skill	Number of Students	Percentage of Students
1	Very Low	24	4.8%
2	Low	14	2.8%
3	Below Average	52	10.4%
4	Average	142	28.4%
5	Above Average	161	32.2%
6	High	80	16.0%
7	Very High	27	5.4%
Total		500	100%

Above table no 1 discloses that out of 500 students, 24 (4.8%) students have very low metacognitive skills, 14 (2.8%) students have low metacognitive skills, 52 (33.4%) students have below average metacognitive skills, 142 (28.4%) students have average metacognitive skills, 161 (32.2%) students belongs to above average, 80 (16.0%) students have high metacognitive skills and 27 (5.4%) students have very high metacognitive skills among secondary school students. It is clear from the above table that majority of the students have above average and average metacognitive skills while very few percent of students have very low and very high metacognitive skills.

Objective 2: Metacognitive Skills of Senior Secondary Students belonging to different educational Streams.

In order to study metacognitive skills of the senior secondary students belonging to different streams (Science, Humanities & Commerce) Mean, S.D. and F-test have been employed on the data. The detail of each group is given below:

Table 2: Mean and Standard Deviation of Science, Humanities and Commerce Senior Secondary Students on their Metacognitive Skills

Stream	Sample Size	Mean	Standard Deviation
Science	179	161.55	28.78
Humanities	120	151.16	34.24
Commerce	201	164.82	25.60
Total	500	160.37	29.439

The above table 2 inferred that the Mean score and S.D. of Science students is 161.55 and 28.78 respectively, Humanities students' Mean score and S.D. is 151.16 and 34.24 respectively and Commerce stream students Mean score is 164.82 and their S.D. is 25.60. on the basis of these scores it is clear that Commerce stream students have higher metacognitive skills in comparison of Science and Arts.

Table 3: Difference between Science, Humanities and Commerce stream students on the basis of Metacognitive Skill

Source of Variances	Degree of Freedom	Sum of Squares	Mean Square	F- Value
Between Groups	2	14403.76	7201.88	
Within Groups	497	418058.53	841.16	8.562*
Total	499	432462.28		

(*Significant at 0.01 level of significance)

Analysis of Variance (ANOVA) was administrated to the data to determine whether there is the difference in choice of stream exists with respect to metacognitive skills. It is clear from the table 3 that the value of 'F' is 8.562 which is greater than the table value of 'F' at 0.01 level of significance. Hence the Null Hypothesis is rejected. Thus, there is a significant difference found between the metacognitive skills of senior secondary students on the basis of stream (Science, Humanities & Commerce) choice.

Table 4: t-value of Science, Humanities and Commerce stream students on the basis of Metacognitive Skill

Stream	t-value	Degree of Freedom	Level of Significance
Science and Humanities	2.83	297	Significant at 0.01 level
Science and Commerce	1.17	378	Not Significant at 0.05 level
Commerce and Humanities	4.06	319	Significant at 0.01 level

It is clear from the above table 4 that the metacognitive skills of Science & Humanities have a significant difference. Commerce and Humanities student also showed a significant difference in metacognitive skills but Science and Commerce students don't show any significant difference in metacognitive skills. Thus the null hypothesis that "There exists no significant difference in Metacognitive Skills of Senior Secondary students belonging to the Science, Humanities and Commerce stream" is rejected. Findings of the study showed that there exist significant differences.

Objective 3: Metacognitive Skills of Senior Secondary School Students with respect to their Gender

This section deals with the study of significant difference between the metacognitive skills of girls and boys. The Mean, S.D. and t-test has been employed on the data. The details are given below in the table.

Table 5: Mean, Standard Deviation and t-value of Boys and Girls Senior Secondary Students

Gender	Sample Size	Mean	Standard Deviation	t-value
Girls	246	162.27	27.29	1.42*
Boys	254	158.53	31.32	

(*Not Significant at 0.05 level of significance)

The above table 5 showed that the mean score and S.D. of girls are 162.27 and 158.53 respectively and the Mean score and S.D. of boys are 158.53 and 31.32 respectively. The t-value of metacognitive skills between Boys and Girls is 1.42 which is not significant at 0.01 level of significance. So, we accept the Null Hypothesis that "There is no significant difference between the meta-cognitive skills of Boys and Girls of senior secondary classes".

Objective 4: Metacognitive Skills of Senior Secondary Students based on Their Habitat

In order to study whether the metacognitive skills of senior secondary students vary with the area of their living, the Mean and S.D. of the scores of the metacognitive skills of rural and urban area is calculated. To know whether there is a significant difference between the metacognitive skills and locality of students, the t-test has been administered. The values thus obtained are tabulated below:

Table 6: Mean, Standard Deviation and t-value of Rural and Urban Senior Secondary Students

Locality	Sample Size	Mean	Standard Deviation	t-value
Rural	165	154.48	34.753	3.164*
Urban	335	163.27	26.004	

(*Significant at 0.01 level of significance)

The above table 6 shows that the mean score and S.D. of students living in rural areas are 154.48 and 34.753 respectively and mean score and S.D. of urban students are 163.27 and 26.004 respectively. The t-value of metacognitive skills between Rural and Urban area (residence) is 3.164 which is significant at 0.01 level of significance. So, we reject the Null Hypothesis and conclude that there exists a Mean difference between the Rural and Urban areas students on the basis of metacognitive skills.

Objective 5: Metacognitive Skills of Senior Secondary Students belonging to Government and Private Schools.

This section deals with the significant difference between the metacognitive skills of Government and Private schools students. The Mean, S.D. and t-value has been calculated to find out the difference between the metacognitive skills of both groups. The values thus obtained are tabulated below:

Table 7: Mean, Standard Deviation and t-value of Senior Secondary Students belongs to Government and Private Schools

Type of School	Sample Size	Mean	Standard Deviation	t-value
Government School	313	156.96	28.912	3.385*
Private School	187	166.07	29.506	

(*Significant at 0.01 level of significance)

The Mean and S.D. of Government school students on the metacognitive skills are 156.96 and 28.912 respectively and Mean and S.D. of Private school students are 166.07 and 29.506 respectively. The difference between Government and Private school were tested through the t-test. The t-value on both groups was found to be 3.385 which is significant at 0.01 level of significance. So, we reject the Null Hypothesis that "There is no significant difference between the Government and Private school students on the basis of metacognitive skills." Metacognitive skills of government and private school students also have a significant mean difference. The mean score of private school students were higher from government school students. It means private school students also showed higher metacognitive skills in comparison to government school students.

Objective 6: Metacognitive Skills of Senior Secondary Students belonging to UPMSP and CBSE Board.

In order to find out whether metacognitive skills of senior secondary students differ in respect to the board of study, the Mean and S.D. of the scores on the metacognitive skills of UPMSP and CBSE board have been calculated. To know whether the students of UP board and CBSE board have a significant difference or not the t-test has been employed on the scores. The values thus obtained are tabulated below:

Table 8: Mean, S.D. and t-value of Senior Secondary Students belongs to UPMSP and CBSE Board

Board	Sample Size	Mean	Standard Deviation	t-value
UPMSP	266	156.27	29.522	3.514*
CBSE	234	165.43	28.580	

(*Significant at 0.01 level of significance)

Above table 8 shows that the Mean and S.D. on the metacognitive skills of Uttar Pradesh Madhyamik Siksha Parishad (UPMSP) students are 156.27 and 29.522 and that of Central Board of Secondary Education (CBSE) students are 165.43 and 28.580 respectively. The t-value of UPMSP and CBSE students is 3.514, which is significant at 0.01 level of significance. So, we reject the Null Hypothesis that, "There is no significant difference between the meta-cognitive skills of Senior Secondary students belonging to CBSE and UPMSP Board." On the bases of mean score of both groups it is clear that the students of CBSE have higher metacognitive skills in comparison of UPMSP students. It means the UPMSP affiliated schools should pay more concern to improve the metacognitive skills of students.

7. Discussion

The main purpose of the present study was to analyze the differences in metacognitive skills of senior secondary students belonging to different types of board, schools, stream, habitat, and gender. A sample of 500 students of XIth and XIIth class took part in the study. Findings of the study revealed that the majority of students have above average metacognitive skills. It is also clear that metacognitive skills have a significant relationship with stream. The metacognitive skills of Science and Humanities have a significant difference. Commerce and Humanities student also showed a significant difference in metacognitive skills but Science and Commerce students did not showed any significant difference in metacognitive skills. Commerce students have a higher mean score on metacognitive skills and Humanities students have a lower mean score on metacognitive skills. Science stream students have high metacognitive skills in comparison of Arts but lower from Commerce students. In contrast, it was found in previous research conducted by Nongtdu & Bhutia, (2017) that the majority of students have average metacognition and Science students have a high metacognition as compared to Arts and Commerce stream students.

The findings of the study also revealed that on the basis of gender there was no significant difference found between the metacognitive skills of boys and girls students. Prior research reports inconclusive findings regarding the differences in metacognition according to gender. For instance, some study supports the findings that there is no significant difference between the metacognitive skills of boys and girl students (Jaleel & Premchandran, 2016; Kaur & Kaur, 2016). Nevertheless, the Nongtdu & Bhutia (2017) found that female students have higher metacognitive skills in comparison to boys.

It was also found in study that metacognitive skills of rural and urban area students differ significantly. The mean score of urban area students is higher in comparison of rural area students. This shows that urban students have higher metacognitive skills in comparison of rural area students. The study of Nongtdu & Bhutia (2017) also supports the findings but Jaleel & Premchandran, (2016) found insignificant difference between the metacognitive skills of rural and urban students.

Metacognitive skills of government and private school students also have a significant mean difference. The mean score of private school students were higher from government school students. It means private school students also showed higher metacognitive skills in comparison to government school students. In study the significant mean difference is also found between the CBSE and UPMSP board student on their metacognitive skills. CBSE board students showed higher metacognitive skills in comparison to UPMSP board students. UPMSP and Government school students have lower metacognitive skills in comparison of Private and CBSE school students.

The results of the study can improve the education system and have a great use in practical life. Study of the metacognitive skills of the students can reveal the working of their mind. What do they think and reflect? How to control and regulate their own behavior and thinking process? In what way do they take the things in their day to day life? Answers to these questions can be found through the study of metacognitive skills.

8. Conclusion

Indian Education System has a rank in top order among World different Education Systems but, somewhere there are various lapses in existing policies adapted at respective institutions which are still based on Epistemological criterion rather than Empirical feature of Metacognition (metacognitive skills).

In order to plant concept of Metacognition among students Primary classes are the best stage. Incase it is not being considered than adolescence period is a very crucial period and is also very important to develop the metacognitive skills in students. From the findings of study it is clear that there is no significant difference between the boys and girls in metacognitive skills. Teachers should use effective teaching method to develop metacognitive skills without giving any special treatment to girls and boys in the classroom. UPMSP and government schools should pay more consideration to curriculum and teaching method and try to improve the metacognitive skills of students. The curriculum of the different types of board should also be focused and based on the metacognitive skills. There should be

uniformity in the curriculum of different types of board and school type. It is also clear from the findings of the study that locality influences metacognitive skills. For improving the metacognitive skills the counseling sessions should also be provided to students and parents. And the teacher parents meeting should be held on a daily basis for the progress and all-round development of the students.

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