CHAPTER V
SUMMARY, IMPLICATIONS AND
RECOMMENDATIONS

5.0  INTRODUCTION

This chapter presents a summary of the research conducted, implication of the study and recommendations for future research. The chapter begins with the rationale of the study, followed by statement of the problem, objectives and the formulated hypotheses. The delimitations and limitations are also reported. Population and sample along with the design and the procedure are clearly mentioned. Findings of the study and their implications, contributions of the study to the knowledge base and future recommendations are presented in a concise manner.

5.1  RATIONALE

Metacognition is an important concept in educational context as it is related to the learner’s awareness and regulation of the underlying cognitive processes. A preliminary survey of literature in the field of education revealed that very limited research has been conducted on metacognition and its relationship with various student-related factors such as: academic self-concept, hemisphericity and learning styles, particularly in Indian educational context. Considering the importance of metacognition in learning and academic achievements; and the limited research available in India, the present study has been undertaken.
5.2 STATEMENT OF THE PROBLEM

The purpose of the research was to investigate metacognition from educational perspectives. In this study, the phrase ‘educational perspectives’ is delimited to academic self-concept, hemispheric dominance, learning styles, academic achievement and gender of students. Based on the preliminary survey of related research, the research problem was identified and a statement of the problem was formulated for the present research.

‘A Study of Metacognitive Awareness and its Relation with Academic Self-Concept, Hemispheric Dominance, Learning Styles, Academic Achievement and Gender in Class Eleven Students.’

5.3 OBJECTIVES

The following objectives were delineated on the basis of the statement of problem of the study.

1. To study the relation between metacognitive awareness and academic self – concept.
2. To study the relation between metacognitive awareness and hemispheric dominance.
3. To study the relation between metacognitive awareness and learning styles.
4. To study the relation between metacognitive awareness and academic achievement.
5. To examine gender differences in metacognitive awareness.
5.4 RESEARCH HYPOTHESES

In order to realize the stated objectives, following research hypotheses were formulated.

**Hypothesis 1 [H1]:** There is significant positive correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and academic self-concept as measured by Academic Self Concept Scale (ASCS) in class eleven students.

**Hypothesis 2 [H2]:** There is significant positive correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and hemispheric dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Sub Hypothesis 2.1 [H2.1]:** There is significant positive correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and left hemispheric dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Sub Hypothesis 2.2 [H2.2]:** There is significant positive correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and right hemispheric dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Sub Hypothesis 2.3 [H2.3]:** There is significant positive correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and whole brain dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Research Hypothesis -3 [H3]:** There is significant correlation between metacognitive awareness as measured by Metacognitive Awareness
Inventory[MAI] and learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

**Sub Hypothesis 3.1 [H3.1]:** There is significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and active -reflective dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

**Sub Hypothesis 3.2 [H3.2]:** There is significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and sensation –intuitive dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

**Sub Hypothesis 3.3 [H3.3]:** There is significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and visual -verbal dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

**Sub Hypothesis 3.4 [H3.4]:** There is significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and sequential –global dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

**Research Hypothesis -4 [H4]:** There is significant positive correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory[MAI] and academic achievement as measured by cumulative percentage of marks [P] obtained in Xth standard annual examinations.

**Research Hypothesis -5 [H5]:** There is significant difference between metacognitive awareness as measured by Metacognitive Awareness Inventory[MAI] of male and female students of class eleven.
5.5 NULL HYPOTHESES

The following null hypotheses were formulated to test the research hypotheses.

**Hypothesis -1 [H0-1]:** There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and academic self-concept as measured by Academic Self Concept Scale (ASCS) in class eleven students.

**Hypothesis -2 [H0-2]:** There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and hemispheric dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Sub Hypothesis 2.1 [H0-2.1]:** There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and left hemispheric dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Sub Hypothesis 2.2 [H0-2.2]:** There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and right hemispheric dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.

**Sub Hypothesis 2.3 [H0-2.3]:** There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and whole brain dominance as measured by the Styles of Learning and Thinking (SOLAT) in class eleven students.
Hypothesis 3 [H0-3]: There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

Sub Hypothesis 3.1[H0-3.1]: There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and active -reflective dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

Sub Hypothesis 3.2 [H0-3.2]: There is no correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and sensation –intuitive dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

Sub Hypothesis 3.3[H0-3.3]: There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and visual -verbal dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

Sub Hypothesis 3.4[H0-3.4]: There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and sequential –global dimension of learning styles as measured by Index of Learning Styles (ILS) in class eleven students.

Hypothesis -4 [H0-4]: There is no significant correlation between metacognitive awareness as measured by Metacognitive Awareness Inventory [MAI] and academic achievement as measured by cumulative percentage of marks [GPA] obtained in Xth standard annual examinations.
**Hypothesis -5 [H0-5]:** There is no significant difference between metacognitive awareness as measured by Metacognitive Awareness Inventory[MAI] of male and female students of class eleven.

### 5.6 BASIC ASSUMPTIONS

The study is based on the following basic assumptions:

1. Metacognition consists of two components: knowledge of cognition and regulation of cognition.

2. Metacognition functions at both conscious and automated levels. ‘Metacognitive awareness’ is concerned with the conscious level operations and are accessible to the person.

3. ‘Academic self-concept’ exists at two levels: General and local (task- or domain-specific knowledge). The general level of academic self-concept is considered in this study.

4. Four dimensions of learning styles as described by Felder and Silverman’s model are used to learn in educational situations.

5. The percentage of marks [P] obtained by students in their examination are assumed to be indicators of academic achievement.

6. Participants of the study responded to the questionnaires truthfully.
5.7 DELIMITATIONS

The researcher is aware of the wide scope of the subject area, hence, the study was delimited to:

1. Geographical location of Roorkee city, Uttarakhand, India.
2. Schools affiliated to Central Board of Secondary Education [CBSE].
3. Students from English Medium schools.
4. Class Eleven students.

5.8 LIMITATIONS

A brief discussion of the limitations is presented in this section.

1. This study being a correlational research, the cause-effect relations among the variables studied could not be inferred.
2. The data for the present study was collected from verbal self-reports and not on direct observation of the selected variables.
3. Students from English medium schools may not represent the average Indian student.

5.9 POPULATION AND SAMPLE

Population for the present study consists of all class eleven students enrolled in English medium schools affiliated to Central Board of Secondary Education [CBSE Board] during the academic year 2009-2010 in Roorkee City, Uttarakhand, India. The age group is from 15-17 years. CBSE Board is a central government initiated K-12 Education in India.
Selection of the sample for the present study was done in two stages. The first stage was the selection of schools. There are 14 CBSE English medium schools in Roorkee city. Using a simple random without replacement (‘WOR’ - no element can be selected more than once in the same sample) method, six schools [one-third of total population of schools] were selected.

In the second stage of sampling, students were selected from each selected school to be included in the sample. With the permission of the class teacher, every alternate student’s name in the class attendance register was collected and coded to be included in the sample. This method of selection has ensured that each student had an equal chance of selection. In this manner the data was collected from 350 respondents. When the collected data of the 350 respondents was checked for missing values and outliers, 24 cases were discarded. As a result the final sample has been reduced to 326.

5.10 RESEARCH DESIGN

A descriptive, correlational research design was used to study objectives 1 to 4 that examine relations between metacognitive awareness and selected variables, i.e., academic self-concept (ASC), hemispheric dominance (HD), learning styles (LS) and academic achievement (AA). A two-group design was used to study objective 5 that examines gender differences (GD) in metacognitive awareness (MA) of students.

5.11 TOOLS USED

On the basis of the research objectives and hypotheses the following four standardized self-report instruments were selected to measure the selected variables.
1. Metacognitive Awareness Inventory [MAI] developed by Schraw and Dennison (1994).


4. Styles of Learning and Thinking [SOLAT] developed by Torrance et al. [1988].

5. A Personal Data Sheet (PDS) is used to collect background demographic information.

5.12 DATA COLLECTION

Four standardized self-report instruments (reported in Section 3.6) were used to measure the variables selected. In addition, a Personal Data Sheet [PDS] was used to collect basic demographic data of the respondents.

The researcher visited the selected CBSE higher secondary schools to take prior appointment with the Principal / Head of the institution. The purpose of the study was explained to the school principals/ head of the institution and the permission was obtained to conduct the study. With the help of the class teachers the sample was selected from each school.

A letter of Informed Consent was issued to each participant student and their approval was taken before conducting the study. The administration of the instruments on the sample was done in class room setting. A non-threatening and cooperative atmosphere was created in the setting by first explaining the purpose of study. After explaining the purpose of study, the survey booklet was given to each of the participants. The participant students were requested to give their responses to the
questionnaires. It was ensured that the entire procedure was the same for every group. The investigator was always present and available for any clarifications sought by the participants during the administration.

5.13 DATA ANALYSIS

- Kolmogorov- Smirnov test was applied to test normality of data.
- Descriptive Statistics were generated for the data obtained on all variables.
- Cronbach alpha reliability coefficients of the four standardized tools used were computed to test reliability for the present sample.
- Pearson’s product moment correlation coefficient was used to test hypotheses 1 to 4, which were proposed to test the correlations of metacognitive awareness with academic self-concept, hemispheric dominance, learning styles and academic achievement.
- Significance of difference between means of two groups [male and female] t-test was used to test hypotheses 5, which was proposed to measure the differences between boys and girls on metacognitive awareness.

Graphs Plotted:

- Histogram and Q-Q plots were also generated for the data obtained on all variables.

5.14 FINDINGS OF THE STUDY

On the basis of the findings the conclusions of the study drawn were:

- There is a positive correlation between Metacognitive Awareness and Academic Self Concept of the students.
There is negative and almost negligible correlation between left-brain dominance and metacognitive awareness and its components. These negligible correlations were also observed to be insignificant.

Statistically insignificant and negative negligible correlations were also observed between right-brain dominance and metacognitive awareness and its components.

Results also indicate there are positive correlations between whole-brain dominance and Metacognitive awareness and its components. These correlations were found to be statistically significant.

There are eight learning styles, and in the study it was found that all the learning styles except visual learning styles and verbal styles none of them showed a significant correlation. Visual learning styles is positively significant correlated and verbal learning style is negatively significant correlated.

These results indicate the visual-verbal dimensions of learning style may have a contributory role than other dimensions of learning style in Metacognitive awareness.

The results indicate that there are positive correlations between academic achievement and metacognitive awareness and its components. These correlations were found to be statistically significant.

Obtained t-values also manifest than female students scored significantly more than male students on all the three measures i.e., knowledge of cognition, regulation of cognition and metacognitive awareness. The findings also indicate that females have better metacognitive awareness than males.
5.15 DISCUSSION ON THE RESULTS

Mandelman et.al (2010) study, they have proposed that Academic self – concept is not only shaped by external input but metacognition may constitute a second source of input in forming self-concept. This proposition is found to be true in the present study. There is a positive relation between academic self concept and metacognitive awareness. Dermitzaki (2005), Panaoura, Gagatsis and Demetriou (2009) study confirmed that when students are provided opportunity to self –monitor, they can enhance self regulation (planning, monitoring, evaluation) and consequently their performance. When performances improve, the academic self concept also improves. Self regulation is a part of metacognitive awareness and hence teachers must teach the students metacognitive strategies and assist them to improve in their performance. Schraw and Moshman(1995) has pointed that helping students with procedural knowledge improves there problem solving performances. Further Schraw and Moshman suggest teacher must model and provide the rationale for various metacognitive strategies to enhance their metacognitive awareness.

The present study also pointed that there is a strong relation between academic achievement and metacognitive awareness. Metacognitive awareness is a concept essential for successful learning because it helps the individuals to manage their cognitive skills (Schraw and Dennison 1995 Schraw 1998) and it is necessary “for concepts of everyday reasoning and those assessing scientific thinking and social interactions (Schneider 2008). Metacognitive mechanism can help in mastering a new body of text material (Nelson and Narens 1994)
and thus assist in the performance of a student which is normally reported as the academic achievement. A positive correlation between metacognition and academic achievement has also been reported by Landine and Stewart, (1998); Young and Fry, (2008); Mevarech,and Amrany,(2008); Kusumoto (2009); Dixit, (2011); Shokrpour, Zareii, Zahedi and Ragatbakhshi, (2011).

It has been already noted that there is relationship between academic self-concept and academic achievement and in the present study it was found out there is a strong positive relation between these two variables and metacognitive awareness. A triangular relationship between these variables can definitely improve the classroom climate as well as provide an environment of enhanced learning and engagement on task behavior. A general enhanced self concept result in better formation of a balanced personality of the student.

No relation was found with RHD and MA as well as LHD and MA. This needs further validation, but the positive relation of whole brain orientation and metacognitive awareness is interesting for consideration. Hence brain based learning in classroom is needed and metacognition shows positive relation towards whole brain orientation.

When gender was studied in the context of metacognitive awareness it was found females have a better metacognition than males. Metacognition develops in children and it is known that development is faster in females and they attain maturity faster than males this can be one possibility for the females to do better. More studies are required in this direction.
5.16 IMPLICATIONS OF THE RESEARCH

The findings of the study provide information to school personnel, administration, and policy makers about the complex relationships between academic self-concept, hemisphericity, learning styles, academic achievement and metacognitive awareness.

Overall, this research shows that metacognitive awareness is an important construct in higher secondary education; as high levels of metacognitive awareness are associated with high levels of academic self-concept and academic achievement of students. This information may be helpful for educators in planning appropriate curriculum, instructional methods and educational policies that promote metacognitive learning in science and commerce fields of study at higher secondary level of education.

This study also brings out the importance of whole-brain or integrated thinking in metacognitive awareness. Based on this information, instructional programs may be incorporated to develop integrated or whole-brain thinking and thus promote metacognitive awareness in students.

The results of this study show female students having high levels of academic self-concept and metacognitive awareness than male students. The implications of these unexpected findings are two-fold. First, the existing educational policies should be implemented to encourage female students to continue their higher education. Second, social and educational support should be provided to encourage female students to maintain high levels of academic self –
concept, metacognitive awareness and academic achievement beyond higher secondary educational levels. The present study, therefore, has implications for both researchers and educators.

5.17 CONTRIBUTIONS TO THE KNOWLEDGE BASE

The findings of the present study regarding the positive correlation between academic self-concept and metacognitive awareness, as well as metacognitive awareness and academic achievement provide would point toward the predictive value of the metacognitive awareness in academic achievement. The findings of the study would also contribute to the scientific knowledge of gender differences regarding metacognition. The findings regarding the positive correlation between whole–brain orientation and metacognitive awareness would provide empirical evidence to support the view that metacognitive learning involves integrated information processing–orientations in complex learning tasks, rather than left- or right–brain oriented processing. Therefore, the findings of the present study would contribute to theoretical knowledge base of metacognition from educational perspectives, especially in Indian context.

5.18 RECOMMENDATIONS FOR FUTURE STUDY.

The findings and the limitations of the research gives certain directions that future research is recommended on the following lines:

1. The present study was conducted only on class eleven students. A replication of the across grades will be more helpful in understanding of metacognition especially in India.
2. More aspects of metacognitive awareness such as monitoring and evaluation can also be investigated especially with respect to gender differences.

3. The comparison between various educational streams or specialized subjects can also give better insight about the metacognitive knowledge and regulation patterns possessed by the students.
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