CHAPTER-V

MAIN FINDINGS, CONCLUSION, DISCUSSION OF RESULTS, EDUCATIONAL IMPLICATIONS AND SUGGESTIONS FOR FURTHER STUDIES

After processing the data, obtaining and interpreting the results in previous chapter, the findings can be generalized to the extent of representatives of the sample and methodology employed in the study. In this chapter, the results are discussed to show how these findings are concurrent with some of the empirical studies already conducted in the field. At places, some of the observations did not concur with the findings of some investigators. In such cases, attempts have been made to fathom plausible reasons for these disagreements. Keeping the major findings in view, the educational implications of the study have been worked out. But these findings and implications do not fit in all the concerns of study. As such some suggestions have been given for the further research. This chapter is, therefore, devoted to focusing on findings, conclusions, discussion of the results, educational implications of the study and suggestions for further research.

The main findings in general and conclusions drawn on the basis of results and discussions indicate a wide range of implications and their potentials for further research.

5.1 MAIN FINDINGS

1. It was found that there is a positive and significant correlation between Metacognition and Problem solving ability. This shows that as the scores of Metacognition increases, the problem solving ability scores increases. Less score of problem solving ability shows less metacognition.

2. It was found that there is a positive and significant correlation between Metacognition and Self-esteem. This shows that as the scores of
Metacognition increases, the Self-esteem scores increases. Less score of self-esteem shows less metacognition.

3. It was found that there is a significant difference between the mean scores of metacognition among rural and urban senior secondary students. It may, therefore, be concluded that urban students have more metacognition in comparison to rural senior secondary students.

4. It was found that there is a significant difference between the mean scores of metacognition among male and female senior secondary students. It may, therefore, be concluded that male students have more metacognition in comparison to female senior secondary students.

5. It was found that there is a significant difference between the mean scores of metacognition among senior secondary students having high and low problem solving ability. It may, therefore, be concluded that students having high problem solving ability have more metacognition in comparison to the students having low problem solving ability.

6. It was found that there is a significant difference between the mean scores of metacognition among senior secondary students having high and low self-esteem. It may, therefore, be concluded that students having high self-esteem have more metacognition in comparison to the students having low self-esteem.

7. It was found that there is a significant difference between the mean scores of metacognition among male senior secondary students having high and low problem solving ability. It may, therefore, be concluded that male students having high problem solving ability have more metacognition in comparison to the male students having low problem solving ability.

8. It was found that there is a significant difference between the mean scores of metacognition among female senior secondary students having high and low problem solving ability. It may, therefore, be concluded that female students having high problem solving ability have more metacognition in comparison to the female students having low problem solving ability.
9. It was found that there is a significant difference between the mean scores of metacognition among male senior secondary students having high and low self-esteem. It may, therefore, be concluded that male students having high self-esteem have more metacognition in comparison to the male students having low self-esteem.

10. It was found that there is a significant difference between the mean score of metacognition among female senior secondary students having high and low self-esteem. It may, therefore, be concluded that female students having high self-esteem have more metacognition in comparison to the female students having low self-esteem.

11. It was found that there is a significant difference between the mean scores of metacognition among rural senior secondary students having high and low problem solving ability. It may, therefore, be concluded that rural senior secondary students having high problem solving ability have more metacognition in comparison to the rural senior secondary students having low problem solving ability.

12. It was found that there is a significant difference between the mean scores of metacognition among urban senior secondary students having high and low problem solving ability. It may, therefore, be concluded that urban senior secondary students having high problem solving ability have more metacognition in comparison to the urban senior secondary students having low problem solving ability.

13. It was found that there is a significant difference between the mean score of metacognition among rural senior secondary students having high and low self-esteem. It may, therefore, be concluded that rural students having high self-esteem have more metacognition in comparison to the rural students having low self-esteem.

14. It was found that there is a significant difference between the mean score of metacognition among urban senior secondary students having high and low self-esteem. It may, therefore, be concluded that urban students having high self-esteem have more metacognition in comparison to the urban students having low self-esteem.
self-esteem have more metacognition in comparison to the urban students having low self-esteem.

5.2 CONCLUSION

Metacognition is an effective tool in learning process. Most conceptualizations of metacognition have in common that they take the perspective of "higher-order cognition about cognition." There is a higher order agent overlooking and governing the cognitive system, while simultaneously being part of it. This is the classical homunculus problem or Comte's paradox: One cannot split one's self in two, of whom one thinks whilst the other observes him thinking. The issue whether cognition and metacognition can be disentangled is not merely an academic one. In fact, metacognition draws on cognition. It is very hard to have adequate metacognitive knowledge of one's competencies in a domain without substantial (cognitive) domain-specific knowledge, such as knowledge about relevant concepts and theories in a domain, about intrinsic difficulties of a domain and about what is irrelevant. In terms of metacognitive skills, one cannot engage in planning without carrying out cognitive activities, such as generating problem solving steps and sequencing those steps. Similarly, one cannot check one's outcome of a calculation without comparing the outcome with an estimation of it, or recalculating the outcome in another way. If metacognition is conceived as (knowledge of) a set of self instructions for regulating task performance, then cognition is the vehicle of those self-instructions. These cognitive activities in turn are subject to metacognition, for instance, to ongoing monitoring and evaluation processes. This circular process of metacognitive and cognitive activities makes it hard to disentangle them in the assessment of metacognition.

Occasionally, metacognition can be observed in students' verbalized self instructions, such as "this is difficult for me, let's do it step-by-step" or "wait, I don't know what this word means." Metacognition, however, is not always explicitly heard or seen during task performance. Instead, it has often to be inferred from certain cognitive activities. For instance, doing things step-by-step may be indicative of planned behavior, although self-instructions for planning are not explicitly verbalized.
Future research has to differentiate far more precisely between explicitly verbalized metacognitive knowledge and self-instructions, cognitive activities that are indicative of metacognition and purely cognitive activity.

In this study, metacognition was taken as dependent variable and problem solving ability and self-esteem were taken as independent variables. This study shows that problem solving ability and self-esteem has direct influence on metacognition on senior secondary students. It is found that the students who have high problem solving ability show greater metacognition. On the other side researcher conclude that the students who use greater thinking ability i.e. thinking beyond thinking and thinking about thinking in their study or routine life are more able to solve their problems. Whereas the students who have fewer problems solving ability are not able think beyond thinking and are not able to solve their problem with ease. It is also found that the students have high self-esteem shows high metacognition and the students having low self-esteem shows low metacognition. Finally, researcher concludes that if the problem solving ability and self-esteem of the students will be developed in the classroom while teaching-learning process then they may increase their metacognitive ability.

5.3 DISCUSSION OF THE RESULTS

The present study was conducted on adolescent students with respect to metacognition abilities in relation to their problem solving abilities and self-esteem. In the present, study metacognition and problem solving ability were studied as interrelated and there was found a positive correlation between metacognition and problem solving ability. This shows that as the scores of problem solving ability increases, the score of metacognition also increases. It means that the students who have high problem solving ability having high degree of metacognition in their life. The finding of the study revealed positive and significant relationship between metacognition and problem solving ability. It shows that there is positive significant relationship between metacognition and problem solving ability which shows that problem solving ability directly influences metacognition ability among senior secondary students. The students having high problem solving ability have better metacognition and vice-versa. The studies of Lesh (1982), Silver (1982) and Schoenfeld (1982) regard
metacognitive actions as the 'driving forces' in problem solving, influencing cognitive behaviour at all phases of problem solving. Some research studies have also reported success in making young children become more aware of their regulation during problem solving (Clements, 1990). Specifically, there is evidence that students trained in learning to monitor and control their own cognitive processes for solving problems do better than untrained students (Cardella-Elawar, 1992). A study was done in the year 2003 by Rajagopal Ponnuam on the Impact of Metacognition and Problem Solving Strategies among Low-Achievers in History, investigates the impact of metacognitive strategies among lower achievers in secondary schools. Much has been said about the use of thinking strategies in the teaching of History. However, until now, little emphasis has been given to the use of metacognitive strategies in the teaching and learning of History. A teaching task accomplished in the classroom is not a signal that learning has taken place. If learners are to be afforded the opportunity to regulate their own learning, then a metacognitive theory of learning has to be developed in order to redefine the outcome of learning.

The findings of the study revealed significant difference among male and female students regarding metacognition abilities. It was found in the present study that the male students have high metacognition than the female students. But the study of Rani and Punita (2013) revealed that gender has no significant impact on the metacognition of undergraduate students, but the study of Sharei, Kazemi and Jafari (2012) represent meaningful difference between males and females in three variables; in fact, the performance of male students was better than females in metacognitive capabilities and problem solving.

In the present study, it was found that there is a significant difference between the mean metacognition scores of urban and rural senior secondary students. Urban students were found to have better metacognition as compared to rural students. It means that the boys are doing more thinking than the girls students. It means that the education or the learning environment of the students is more concentrating on thinking of the students who are learning in urban area schools. Our findings are in consonance with the findings of Rani and Punita (2013) who also found significant difference in metacognition between rural and urban students. According to them
urban students differs significantly from their rural counterparts. It seems that students need to be metacognitively aware of the need to use strategies, knowledgeable about strategies and motivated to use those strategies. Without such awareness, strategy instruction seems futile.

On the basis of result of present study, it was concluded that there exist a significant difference in metacognition abilities among students having high and low problem solving abilities. The students having high problem solving abilities were found better in metacognition as compared to the students having low problem solving abilities, which is in consonance with the study of Mayer and Wittrock (1996) who posit that the main idea in such thinking programmes is that with direct instruction in thinking skills (behaviours and thoughts), the problem solver is influenced in their representation of a problem and the planning and monitoring of problem solving solutions. Doomekamp (2001) stated that students’ metacognitive skills can be developed using tools that can effectively visualize the problem-solving process, such as concept maps. Kinchin and Hay (2005) mentioned that through drawing concept maps, students can organize, reorganize, and assimilate conceptual knowledge they learn, and their learning will become meaningful if new concepts are connected to existing ones.

The findings of the presented revealed that the students having high self-esteem having better metacognition abilities as compared to the students having low self-esteem. Although this is an underexplored area of research, there is evidence that teachers can have a positive or negative effect on motivation and self-esteem. They can influence both the goals that students set (learning or performance goals), as well as their commitment to those goals. Praising effort and strategic behaviours, and focusing students through feedback on learning goals, leads to higher metacognition abilities than praising ability or intelligence. The latter can result in a learned-helplessness orientation (Dweck, 1999). As Black and Wiliam (1998) note, feedback that draws attention away from the task and towards self-esteem can have a negative effect on attitudes and performance. In other words, it is important that students understand that feedback is an evaluation, not of the person but of the performance in context. Self-esteem can be disengaged from what others opinion and
is a general valuation about myself in different areas like identity, appearance, properties, my role among peers. Self-esteem is built through the experiences in life but also from our life events. Self-esteem is treated in several important theories about motivation and behaviour like self-efficacy, perceived competence and explanations about success and failure. The own ability improves through support and encouragement from the surrounding and gives the courage to try in life. Self-ability is a specific concept and has central importance in general own ability and confidence to your own ability to handle stressful situations (Bandura, 1997). The difference between self-esteem and self-ability could be described, as self-ability to be about the individual’s evaluation of the probability for a specific ability in a specific situation or within a specific area, will obtain a desired outcome. Self-esteem is a general evaluation about self-value (Lindwall, 2011). Due to Kaver (2009) is self-esteem as well as self-ability not a constant properties, it varies over time, in different contexts and between different situations. Self-perception is important for the individual’s social and cognitive development and several studies have shown that it is related to quality of life. While Kilinc (2013) found medium level of relationship between self-esteem and metacognitive awareness in upper secondary level students.

A study was done in the year 2008 by Shipra Nagar, Shubhangna Sharma and Goldy Chopra on Self Esteem among Rural Adolescent Girls in Kangra District of Himachal Pradesh, it is conducted with an aim to know the self-esteem of adolescent girls and the factors affecting in Kangra District of Himachal Pradesh. Results indicated that majority of the girls had average scores of self-esteem. Self-esteem scores were found to be positively correlated with the educational status of the girls. Here in this study, significant difference was found between the mean metacognition scores of rural and urban/male and female senior secondary students having high and low metacognition. Both the rural and urban senior secondary students have different kind of self-esteem. The mean metacognition score of male students is greater than the metacognition score of female students with high self-esteem. The mean self-esteem score of urban students is lesser than that of rural students. It shows that the urban students have more self-esteem than rural students and also found a significant difference between the mean self-esteem scores of male
and female senior secondary students. Both the male and female senior secondary students have different kind of self-esteem. The mean self-esteem score of male students is higher than that of female students. It shows that the male students have greater self-esteem than the female students. They give respect to their self. In the year 2011 a study was done by Thomas Anderson on Relationship of Self-efficacy, metacognition and performance have shown that the relationship between self-efficacy and performance is partially mediated by metacognition (e.g., Bouffard-Bouchard, Parent, & Larivee, 1991; Kanfer & Ackerman, 1989).

Bandura and Wood (1989) found self-efficacy influenced performance directly and indirectly through its effects on analytical strategies, suggesting a mediating effect of metacognition in the relationship between self-efficacy and performance. The implications of these findings drive the purpose of this study to investigate the relationships among self-efficacy, metacognition and performance. This study aimed to understand whether metacognition was a partial or complete mediator in the relationship between self-efficacy and performance. The hope is that the present research would contribute to the existing body of research on the relationship between learning variables of self-efficacy, metacognition and performance and would add to existing research showing the mediated effect of metacognition in the relationship between self-efficacy and performance. Strong correlations were expected among self-efficacy, metacognition and performance. Metacognition was expected to partially mediate the relationship between self-efficacy and performance as students with strong faith in their ability to successfully complete a task are likely to utilize metacognitive strategies to this end. Here in this study the relationship of problem solving ability with metacognition and self-esteem with metacognition were studied and it is found that there is positive and significant relationship between problem solving ability and metacognition & self-esteem and metacognition. Finally, in this study it can be said that there is positive and significant relationship between metacognition with problem solving ability and self-esteem. The metacognition score of high and low problem solving ability is found significant and in respect to self-esteem it is again significant. The metacognition scores of male and female students having high and low problem solving ability is also found significant.
The metacognition scores of rural and urban students having high and low problem solving ability was also found significant. Similarly, the metacognition scores of male and female students having high and low self-esteem were found significant. The metacognition scores of rural and urban students having high and low self-esteem is also found significant. With all these results it is clear that problem solving ability and self-esteem are directly related to the metacognition. Those students have high problem solving ability and self-esteem shows high metacognition and vice-versa.

Hence, it can be said that adolescence is a key stage in human development, incorporating physical, social, hormonal and psychological changes (Lerner & Steinberg, 2004). While a small number of studies have examined how awareness of others’ mental states (mentalising) develops during adolescence, little was known about how awareness of one’s own task performance (metacognition) changes with age in a paradigm in which performance and confidence can be dissociated. In the current study, we show that metacognitive ability improves with age over the course of adolescence. We suggest that a gradually improving ability to be aware of one’s own thoughts and behaviour during this period may confer particular benefits for development including the emergence of high level cognitive competencies.

5.4 EDUCATIONAL IMPLICATIONS OF THE STUDY

Students who apply productive metacognitive, problem solving ability and self-esteem skills show better learning when working with interactive learning environments. It will always be difficult, when researching literacy, to determine exactly which factors caused which outcomes and to gauge the extent of this impact – because the affective, cognitive and metacognitive components of the reading process are tangled in such a complex web. Nonetheless, future research could improve upon the design of the current study. Ultimately it was impossible to determine the impact of the various components of this intervention teaching, which included planned teaching about metacognition, incidental teaching of strategies and revision of previously taught strategies. The small groups the students practiced strategies in and the texts linked to the Inquiry topic were not chosen with this study as the first priority, but rather were selected to try and simultaneously address other curriculum obligations. Such is the nature of a dynamic action research project that had to take
place within the time and structural limitations of classroom and level teaching commitments and project submission dates.

The metacognitive thinking strategies in this study did prove that it had a significant predictability. The results of the study successfully demonstrated that successful problem solvers think in a structured manner and this study to certain degree was able to quantify this structure.

In our study, it was found that there is a significant relationship between metacognition & self-esteem and metacognition and problem solving ability of students in relation to their locality gender. Lecturers should prepare some sort of checklist for the students at the beginning of the lesson. Students should be monitored and rewarded for organizing their thoughts in congruence with this checklist. This checklist should include components of the metacognitive thinking strategies that have been discussed above. This researcher is certain if this is done at an early stage and repeatedly until their execution becomes a natural behavior.

The intervention period of the current study was also too short to allow for independent mastery of the metacognitive strategies taught. Future studies investigating the impact of self-esteem and problem solving ability on metacognition would benefit from a longer implementation period. This would increase opportunities to personalise scaffolding; to incorporate elements of cross-age peer tutoring that would allow at-risk readers to experience a heightened sense of accomplishment; and to increase the likelihood of students developing automaticity of skills and strategies.

Future research is warranted because the students’ level of engagement was heartening and within the short timeframe of the intervention, they demonstrated their growing awareness of the importance of constructive self-talk to both efficacy and achievement. In addition, both the researcher’s observations of the at-risk students’ and the improvements in their pre and post scores hold promise for future studies. The task ahead for researchers is to improve the study design and methods of data collection, to ensure that the learners’ journeys can be closely monitored and accounted for.
In our study, it was found that students having high self-esteem and high problem solving ability were found better in metacognition. Teachers should take heed of this discovery. Students should be psychologically prepared particularly at the younger age, to escalate their self-esteem and problem solving ability to enhance their metacognition.

This study was able to demonstrate that self-esteem and problem solving ability is one of the predominant factors in the students’ metacognition. Teachers and lecturers should be encouraged to allocate significant amount of their time to promote the desire for acquiring their subject matter. This will tantalize the students’ interest and at the same time motivate the students to acquire these information and skills voluntarily.

Overall this study will help the teachers to design the teaching methodology on the basis of problem solving ability and self-esteem for the students. It will also help in developing ones own awareness of their learning. Higher-order thinking skills are what teachers are striving for in the classroom, so this study will help in the development of HOTS among students. It will help in monitoring and regulation of cognitive processes. Low achieving students can improve their learning skills with metacognitive skills. This way the teacher will have a deeper understanding of the type of metacognitive skill that will fit the student’s learning style. Individuals can learn how to better regulate their cognitive activities. Those with greater metacognitive abilities tend to be more successful in their cognitive endeavors. Self-esteem is critical for individuals to think about and be able to take advantage of strengths and for learning from mistakes (metacognition). As teachers we can be instrumental in creating a classroom environment which nurtures and supports students developing self-esteem. This can be achieved by modeling to students that mistakes are part of the learning process for students. It is important to empower and skill students to assess their achievements in a positive productive manner. This creates autonomous learners. Students need to be encouraged to develop support systems both within and outside of the classroom so that they feel confident to take risks in their learning. This research will help to maximize the use of problem solving approach for developing metacognition among students.
5.5 SUGGESTIONS FOR FURTHER STUDIES

- This study can be applied on a large sample of senior secondary students of government and private schools students.
- This study can be applied on a large sample of disabled students of rural and urban schools students.
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- Research can be conducted to study the effect of EQ or IQ on Metacognition level among secondary school students.
- Correlation between Metacognition & Academic achievement with respect to general intelligence can be explored.
- Correlation between Metacognition & Performance with respect to specific intelligence among college students can be studied.
- Correlation between Stress & Adjustment with respect to Metacognition among college going students can be examined.
- Effect of Metacognition on the personality traits among graduate and undergraduate students can be explored.
- Relationship between self-concept, self-esteem, mind-map and Metacognition among urban and rural students can be examined.
- Correlation between Self-esteem and attitudes with metacognition can be examined.
- Relationship between Cognition and metacognition in respect of metacognition among school going students can be explored.
- Significant difference between XII grade students & the undergraduate student’s with respect to metacognition and problem solving ability can also be seen.
- The study can also be done on the same topic on graduate and Post graduate students on different universities.
- Nature of human behavior with relation to studying styles can be effectively studied.
• The study can be done to know the relevance of brainstorming and brain sketching with leadership trait in their professions choices.

• The study can be done to examine the effectiveness of social quotient in the modification of Self-esteem and professional ethics.

• The study of brainstorming in relation to metacognition and problem solving ability of the stuents can be explored.