Metacognitive Awareness of Classs XI Students in relation to their Self-Regulation

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Abstract

Self-regulation is a highly adaptive attribute of human beings, and it helps the learners to plan and organise the task, set goals, and self-evaluate themselves at each step of task completion. Self-regulation has a strong association with different learning situations that are metacognitively guided. The current study examined the metacognitive awareness of Class XI students in relation to their self-regulation. The participants (n=240) were the students of five senior secondary schools of district Amritsar, Punjab. Metacognitive awareness inventory and self-regulated learning scale were used to assess the metacognitive skills and level of self-regulation among students. The relationship between metacognitive awareness was examined by using correlational and regression analysis. The difference between metacognition and self-regulation based on gender was examined by using a t-test for independent samples. The findings of the study indicated a significant and positive relationship between self-regulation and the metacognitive awareness of students. Focusing on gender, no significant differences were found in the metacognition and self-regulation of males and female students. The results of the present study are discussed in light of previous studies.

INTRODUCTION

We are living in the era of knowledge explosion, and this knowledge explosion has resulted in the obsolescence of information even before it is acquired by us. In such a situation, it is the responsibility of educators to prepare their students for life-long learning. Educators must follow a learner-centered approach

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at an early stage of education as it motivates the students to learn, and inculcation of this attitude will prepare them to regulate their learning in response to interpersonal and intrapersonal conditions. Dunlap (2008), "The ability to engage in lifelong learning is based on the development and successful application of two skills areas: Metacognition and self-directedness. Metacognition means active control over the cognitive processes engaged in learning". It is the combination of metacognitive knowledge and metacognitive regulation of one's cognitive processes (Schraw, 1997; Zabrucky, 1998; Schraw and Dennison,1994).

Metacognitive knowledge is associated with knowledge of the learner about themself and with those factors that might impact their performance in learning situations. Flavell (1979) described knowledge about cognition as knowledge about one's capabilities and limitations. Flavell (1979) further classified metacognitive knowledge into three parts: declarative knowledge (factual information that one knows about himself and his surroundings), procedural knowledge (knowledge about how to perform a particular task and follow various steps), conditional knowledge (knowledge about why to select a particular strategy, when to use this selected strategy and when not to use it).

Flavell (1979) described metacognitive knowledge in the context of cognitive experiences also. It describes perceptions of a people which they experience during the process of cognition. Metacognitive regulation is the monitoring of one's cognitive process and associated with the use of different strategies to plan the task, awareness about task performance, and evaluation of the task and selected strategies. Regulation of cognition consists of several different sub-elements: planning, selecting, monitoring, debugging strategies, and evaluation of strategies. Flavell (1979) and Schraw (1995) observed a close association between metacognition knowledge and metacognition regulation. Schraw (1998) discussed several empirical studies that showed that metacognitive knowledge facilitates metacognitive regulation and the knowledge monitoring process. In this context, research work done by (Schraw 1994, 1997) reported that metacognitive knowledge and metacognitive regulation are significantly related only to those learners who have high monitoring ability.

In cognitive psychology, researchers have also found a close association and relationship between metacognition and motivation, self-regulation, self-efficacy, critical thinking, and analytical ability. In this context, Marzano et al., (1988) stated that the more the students are aware of their cognitive process during learning, the more they control the matters such as the organisation of tasks, goals, critical thinking dispositions, and their attention. Metacognitive practices enhance the abilities of students to adapt their learning to new tasks

and contexts (Bransford et al., 1999; Palincsar and Brown, 1984).

Metacognition involves awareness about how we learn, why, and when to adopt a particular strategy, implementation, and evaluation of strategy. Metacognition enables an individual to select a particular strategy in a particular situation for a particular problem and retrieve that strategy in a similar but new situation. Metacognition is a set of multidimensional skills and these skills are empirically distinct from general intelligence (Schraw, 1998). In terms of metacognitive skills, self-regulated learners are efficient organisers. They plan the task, organise it well, set goals, and follow the process of self-evaluation at each step of task completion during the process of knowledge acquisition. Self-regulated learning entails cognition, metacognition, motivation, and critical thinking (Schraw, 2006).

Self-directedness or self-regulation is a highly adaptive attribute of human beings. It helps in the alteration of the responses which include cognitive, affective, and habitual patterns of human behaviour. In the field of educational psychology, efforts have been made by different educationists and researchers to define the concept of self-regulation. Self-regulation may be perceived as the degree to which students motivationally, metacognitively, and behaviourally participate in the learning process (Zimmerman and Reisenberg, 1997).

Paris and Paris (2001) stated that self-regulation emphasise autonomy and control by the individual who plans, monitors, directs, and regulates action towards the goals of information acquisition, expanding expertise, and self-improvement. Self-regulation is defined as self-regulated thoughts, feelings, and actions for attaining academic goals (Zimmerman, 2002). Self-regulation is a self-directive process by which learners transform their mental abilities into academic skills and through these skills they achieve goals in academics and their life. Self-regulation is a process that students use to initiate, activate, and sustain their thoughts and motivate their behaviour and emotions to reach a goal (Zimmerman, 2002).

There are three components of the self-regulation process: (a) selection of goal (b) plan for action (c) a cybernetic cycle of behaviour which includes a series of activities. Goals, at the most general level, are centered around what a person 'wants to be or what to become in their life'. A plan of action is prepared by adopting a specific or general goal in life and it includes gathering relevant and context-related information, selection of appropriate strategies, and engagement in practical activities. During the behavioural practice, the cybernetics cycle of behaviour is followed by an element of control and this element is in the form of negative feedback control. But it does not mean that the

person will experience an unfavourable or bad situation, it means to act in response to some matched standard of behaviour. The element of control is followed only to reduce discrepancies. The cybernetic cycle of behaviour includes the processes from initiation of a task to the achievement of the goal. In the context of goal orientation, education researchers have studied various cognitive and affective factors of behaviour. They reported that goal orientation and belief about the importance of the task are positively related to cognitive, metacognitive, and self-regulatory strategies (Meece et al., 1988; Pintrich and De Groot, 1990).

Self-regulated students plan their activities in an effective way and adopt different strategies to set their goals. They motivate their emotions and behaviour to get success (Zimmerman, 2002). They manage resources, adopt different strategies, and monitor their level of progress. Self-regulated students evaluate the progress of their tasks regularly and are likely to achieve a higher level than those students who are dependent on their teachers. Self-regulated students are more proactive and receptive than others as they have a flexible attitude and they continuously adjust their strategies in response to their level of progress, social-emotional, and contextual conditions. They are diligent, resourceful, and ambitious to gain new information. They strategically approach education and when they encounter barriers in their learning process such as the lazy attitude of teachers, poor study conditions, or uncongenial school environment then they analyse the reasons for the non-occurrence of learning events as planned and revise their strategies to overcome the problem.

The term 'self-regulated learning' has a strong association with various forms of learning that are metacognitively guided and at least intrinsically motivated and strategic (Zimmerman,1990 and Winne, 1995). Self-regulated learner adopts suitable strategies to plan a task, regularly monitor, and also evaluate when and why to use a particular strategy for goal achievement. Zimmerman (1998) discussed three phases of self-regulation which include metacognition in itself. So, the self-regulation skills of learners determine the monitoring of metacognitive knowledge and metacognitive experiences.

Many researchers took the assumption of mindful use of regulatory processes specifically knowledge of cognition and regulation of cognitive may presage effective use of learning strategies (Flavell 1979; Dunlosky, 1998 and Hacker, 1998). Lee, Lim, and Grabowski (2010) advocated that when learning strategy prompted with metacognitive feedback, then it improved the academic performance of the learners. Sperling, Howar, and Staley (2004) found a positive correlation between self-regulation and three phases of self-regulation—metacognitive knowledge, academic strategy, and motivation. Isaacson and Fujita (2006) examined the relationship of metacognition

knowledge monitoring with self-regulated learning and academic success. The results of the study showed that high achieving students were more realistic in their goal achievement and more accurate at predicting their results.

The research work of Cera, Mancini, and Antonietti (2013) highlighted that lack of ability to self-regulate among students resulted in the inability of students to use appropriate cognitive strategies, as well as they, felt lack of interest in the activities of the school. Quality of student's regulation of activities helped them to become proactive and responsible as well as the development of metacognitive skills such as the selection of appropriate strategies.

Arslen (2014) found that metacognition was positively associated with self-regulation. The research work of Bol, Campbell, Perez, and Yen (2015) supported the effectiveness of self-regulatory skills to improve metacognition and enhance the level of achievement. Their study highlighted the importance of self-regulated learning skills to improve the metacognition of learners.

Further Oruc (2016) also presented similar findings of his research. He investigated the effects of learning with self-regulation on reading comprehension, attitude towards Turkish lessons, and metacognitive thinking skills and found that self-regulation significantly affects the reading comprehension and metacognitive thinking skills of students and research findings based on qualitative data showed that students in the experimental group used self-regulated learning skills while they study in the classroom.

Cetin (2017) reported that the total scores of student's self-regulation and metacognitive awareness were correlated with each other. Barokah, Budiyono, and Saputro (2020) studied the role of student's metacognition in solving mathematical problems based on gender differences and found significant differences in the metacognitive regulation of males and females in solving mathematical problems.

Research Objectives

Based on the findings of the previous research studies, the present study aims to examine metacognitive awareness of Class XI students in relation to self-regulation. Accordingly, the following are the objectives of the present study:

- To study the relationship between self-regulation and metacognition of Class XI students.
- To study whether self-regulation predicts the metacognitive awareness of Class XI students.
- To study the differences in self-regulation of Class XI students based on gender.
- To study the differences metacognitive awareness of Class XI students based on gender.

Research Hypotheses

Keeping in mind the objectives of the study, the following hypotheses are framed:

H1. A significant relationship will exist between self-regulation and metacognitive awareness of Class XI students.

H2. Self-regulation will significantly predict the metacognitive awareness of Class XI students.

H3. There will be no significant difference in the self-regulation of Class XI students based on gender.

H4. There will be no significant difference in the metacognitive awareness of Class XI students based on gender.

Methodology

Research Design and Sample

The present study falls under the domain of descriptive research. A sample of 240 students (males and females) was selected by using purposive sampling technique. The participants (N=240) were students of Class XI, and they were selected from five CBSE (Central board of secondary education) schools. Participants were selected by taking due permission from the principals of the schools.

Measures

Metacognitive Awareness Inventory (MAI)

To assess the metacognitive awareness of students, the metacognitive awareness inventory developed by Schraw and Dennison (1994) has been used. The investigators modified the language in the context of students' knowledge of the English language (English as the second language). It consists of 52 items in all and is divided into two subparts: Metacognitive knowledge (17 items) includes three sub-components: declarative knowledge, procedural knowledge, and conditional knowledge. Metacognitive regulation (35 items) includes five sub-components: information management strategies, planning, comprehension, debugging strategies, monitoring, and evaluation. Each statement has two options: true and false. Students are supposed to tick the option which they thought is appropriate. The coefficient of the reliability of the inventory was 0.85.

Self-regulated Learning Scale (SRL)

A self-regulated learning scale (Gupta and Mahtani, 2008) was used. This scale has 48 items and is classified into six dimensions. There are 40 positive and 08 negative items on the scale. The scale includes 5 sub-dimensions—self-awareness, planning and goal-setting, self-motivation, self-control, self-evaluation, and self-modification. The reliability of the scale is established with the help of the split-half method and the test-retest method by the authors. The coefficient of reliability of the scale is 0.88 and 0.98 respectively.

Administration of the Tools

The investigator contacted to the principals of the schools. Informed and written consent was taken from the principals. A rapport was established with the students before the administration of the test. The purpose of administration of tests was explained to students. Difficult terms and sentences were translated in the regional language of the students. The MAI scale and SRL scale were administered during the first period in every school. Information regarding confidentiality of responses was provided to students before the beginning of the procedure by the investigator. Participants did not receive any reward for their responses.

Analysis and Interpretation

Descriptive and inferential statistics were used to analyse the data, and hypotheses of the study were also kept in mind. The results are presented as follows:

Correlational analysis

To examine the relationship between self-regulation and metacognitive awareness of Class XI students, Pearson's correlation method was used.

The calculated value (r = 0.347) in correlational analysis indicates a positive and significant relationship between self-regulation and metacognition, and it is greater than the critical value (0.34 > 0.14) at 0.05 level of significance. Further to find the variance between variables, the linear regression analysis was applied to study the prediction of self-regulation on the metacognitive awareness of students.

The estimated regression weights, beta, t-value, and p-value for the predicator variable are mentioned in Table 2. It is observed from the Table that Self-regulation is a significant predictor of metacognitive awareness (β=0.348, p<0.00). The predictor variable (self-regulation) accounted for 12 per cent (R2=0.12) of variation in the metacognitive awareness of students. Table 2 reveals that metacognitive awareness is positively associated with self-regulation. The β coefficient (β=0.348; t=5.718, p<0.00) of self-regulation is contributed to the variance.

Table1
Relationship between Self-regulation and Metacognitive Awareness

Variables	Mean	SD	Coefficient of correlation	P-value
Self-regulation	151.42	23.73	0.347	.0001
Metacognitive awareness	36.4	5.06		

*Significant at 0.01 level of significance (p<0.01)

Table 2
Results for the Regression Analysis Taking Metacognitive Awareness as an Outcome Variable and Self-regulation as a Predictor Variable

Predictor variable	Outcome variable	R2	β	t	SIG (p-value)
Self-regulation	Metacognition	.12	.347	5.713*	.000

*Significant at 0.01 level of significance (p<.01)

Student t-test (Independent samples)

Further, to compare the mean scores of self-regulation based on gender (males and females), a t-test (Independent sample) was applied. The results obtained are shown in Table 3. The statistical analysis of data indicates that the calculated t-value between mean scores of self-regulation of males and females is 1.33 and less than the critical ratio (1.33< 1.64) at 0.05 level of significance. It can be inferred that no significant differences exist in the self-regulation of male and female students.

Table 3
Results for the t-test Between Variables Self-regulation, Metacognition, and Gender

Variables	Male (124)		Female (116)		t-value
	Mean	***SD***	***Mean***	***SD***	
Self-regulation	153.42	23.44	149.32	24.01	1.33*
Metacognitive awareness	36.25	4.93	36.46	5.13	0.33*

*not significant at 0.05 level of significance.

Further, to test the differences in the mean scores of metacognitive awareness of males and females, a t-test for the independent samples was applied. Table 3 shows that mean scores of metacognitive awareness obtained for variable gender (males and females) are 36.25 and 36.46 respectively and the calculated t-value (0.33 < 1.64) is less than the table value at 0.05 level of significance. Hence, it is inferred from the analysis that no significant differences exist in the metacognitive awareness of male and female students.

Discussion of Results

The present study sought to determine the metacognitive awareness of Class XI students in relation to self-regulation. The results of the study are discussed in light of previous studies related to metacognitive awareness and self-regulation.

The results of the study revealed that a significant and positive relationship existed between metacognitive awareness and self-regulation of students. Most relevant

to the present study, Shahmoradi and Askarian (2015) reported a significant and high correlation between metacognition and self-regulation, and the study also showed a significant and positive relationship between all the sub-dimensions of metacognition and self-regulation. Linda Bol et al., (2015) suggested that training in self-regulated learning improves the metacognitive awareness of students in developmental math courses. Oruc, Ayse, and Ali (2016) found self-regulated learning significantly increased the metacognitive skills of students in the learning process.

Focusing on differences in metacognitive awareness and self-regulation of Class XI students based on gender, the results of the present study seem to go in the same way as the other studies have found. Hong, Peng, and Rowell (2009) examined differences in the student's homework self-regulation and found male and female students did not differ in homework self-regulation. Haron, Mustafa, and Alias (2010) examined the influences of gender on emotional self-regulation and reported that gender is highly correlated with emotional self-regulation and females had higher self-regulation as compared to males. Further, Hashempour, Ghonsooly, and Ghanizadeh (2015) reported no significant differences between males and females students regarding self-regulation and metacognitive awareness in English translation studies. Sajja (2019) found no statistically significant difference between the self-regulation of males and females.

About differences in the metacognition of males and females, the present study reported no significant differences in this regard. Jaleel and Premchandran (2016) found no significant differences exist in the metacognitive awareness of secondary school students based on gender. Misu and Masi (2017) found no significant difference between the metacognitive awareness of males and females based on mathematical ability. But contrary to this, Lilina and Lavinia (2011) reported that generally both girls and boys use their metacognitive skills in the learning process and found that significant differences existed between boys and girls on the following aspects—use of prior knowledge in problem-solving and in planning a task, knowledge about one's strengths and weaknesses, selection of various strategies and monitoring of the task. Vinitha and Indu (2015) also reported a significant difference in the metacognitive awareness of boys and girls of secondary school students.

Findings of the Study

The main findings of the study are:

- A significant and positive relationship exists between metacognitive awareness and self-regulation of Class XI students.
- Self-regulation is a significant predictor of metacognitive awareness.

- No significant difference is found between metacognitive awareness of Class XI based on gender.
- No significant difference is found between the self-regulation of Class XI based on gender.

Conclusion

To sum up, the present study indicated a significant and positive relationship between self-regulation and metacognitive awareness of Class XI students. It explains that the students, who possess abilities like self-awareness, self-control, and self-modification, are metacognitively guided and can regulate their tasks in a systematic and structured way. They are capable enough to select appropriate strategies to carry out a task and evaluate their performance at regular intervals. The findings of the study also indicated that no significant differences existed in the metacognition and self-regulation of Class XI students based on gender. Both the gender selects suitable strategies to plan and design the learning-oriented task. They are aware of their thinking processes and execute their plans in an organised way. From the results, it is concluded that self-regulation plays a significant role in predicting the metacognitive awareness of students and determines the monitoring of metacognitive knowledge and metacognitive experiences.

Declaration of Conflicting Interests

The author(s) declared no prospective conflicts of interest concerning any issue related to authorship of research work or publication of this research article.

Ethical Approval

All the procedure of data collection was performed following the ethical standards. Written consent was obtained from the principals of the schools and informed consent was obtained from the students who participated in the study.

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