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Improving Learning Environment using Metacognitive Strategies

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A B S T R A C T

The present day era is marked by globalization and advancement in technology which are the main driving forces of change and challenges in the socio-economic, environmental and technological landscapers. To meet the challenges of 21st century 'Metacognition' has been recognized as a critical skill to thrive and help students to succeed in their classroom and beyond. At its core, metacognition is a basic survival strategy, since it involves self-reflection on one's current position, future goals, potential actions and strategies. Thus, metacognition plays an important role in learning and achievement. It helps students in optimizing their problem solving experience by being aware of how one is engaging with the process of learning, interpreting the task at hand as well as what strategies are being selected and employed in achieving learning goals. With this thought of pursuit in mind the present study was conducted to investigate the relationship between the 'Metacognition and Learning Environment' among adolescents. The sample for the study was collected from the adolescents (aged 16-18 years) studying in the randomly selected Government Senior Secondary schools of Ludhiana and Moga districts of Punjab. Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison (1994) was used to investigate 'Metacognition' among adolescents along with its components and sub-components. Whereas, Dundee Ready Education Environment Measure (DREEM) developed by Roff*et al* (1997) was adapted for the purpose of assessing the student perceptions of their 'Learning Environment'. The findings of the study revealed that the 'Regulation of Cognition' component of metacognition and the overall metacognition were significantly and positively correlated with the 'student perceptions of learning' as well as 'student perceptions of atmosphere' dimensions of the Learning Environment. However, 'Knowledge of Cognition' component of metacognition and the overall metacognition were significantly and positively correlated with the 'student academic self-perceptions' dimension of Learning Environment. Thus, the results suggested that it was important to develop metacognitive skillfulness among students through intentional methods for enhancing their learning experiences and elevating students to a level of thinking beyond their current capabilities.

Introduction

The environment experienced or perceived by students and teachers of an institution is termed as the Learning environment of an institution. It helps in making students' learning more effective and comfortable. Engagement of the student is considered as the most crucial factor in comparison to other factors which impact the learning of students. Motivation further affects the participation of students. Various factors which further impact the motivation comprise of previous knowledge of student, preferred way of learning and favorable or unfavorable circumstances and the scenario in which the learning is taking place.

Metacognition is the new trend in the word of "educational psychology". The complex pronunciation of the word makes it sound frightening, but it is not a scary concept. Students regularly got involved in activities related to metacognition. It empowers them to be successful pupils and has positive and direct association with intellect of students. Metacognition is a thinking process of higher order which implicates active control over the cognitive processes that are engaged in the learning process. Sub-components of metacognition are planning, attitude towards a given learning task, comprehension monitoring, assessing, debugging strategies and evaluating progress towards the completion of a task. The critical role of metacognition in successful learning makes it more important to study metacognition and to regulate students teaching in schools so that the activities can be better applied to their cognitive resources through these metacognitive activities.

Metacognitive regulation is defined as "the activities an individual performed in order to learn and remember". These activities can control one's way of thinking and the way they learn. "Regulation of cognition" relates to knowledge about the way we plan a task, implementation of the plan, correcting errors and evaluate learning. "Information Management Strategies" are the abilities to utilize information in a better way. It is how a person organizes, elaborate, summarize things and focus on selected things. Debugging Strategies are those strategies that a person uses to correct comprehension and performance errors. Planning refers to plan how to solve a particular problem, setting goals, and allocating resources prior to learning and solving a problem. "Comprehension Monitoring" is the control of one's own learning and strategy use to planning, problem solving and achievement of goals Evaluation is the analysis of performance and strategy effectiveness after a learning episode.

According to Sindhwani and Sharma (2013) metacognitive skills enables the individuals to observe them learning and help them to plan and direct the way of learning. Also, these skills make it easy to select the appropriate method to do the learning task. That's why, students who implement metacognitive skills can fix their goals, control the things to learn, and can use different ways of learning and can alter the strategies they need as per their plan and way of learning. A study conducted by Huitt (1997) metacognitive skills empower the students to answer the questions like "Am I aware of this subject, topic, and issue?" "Do I have required information that i need to know?" "Am I aware of reliable sources from where I can get some information?" "How much time will I need to learn this?" "What are some strategies and tactics that I can use to learn this?" "Did I understand what I just heard, read or saw?" "How will I know if I am learning at an appropriate rate?" "How can I spot an error if I make one?" "How should I revise my plan if it is not working to my expectations/satisfaction?"

Cognitive Apprenticeship by Collins *et al* (1991) implied that a successful teaching is based on several components of the learning environment some of which are, the contents taught, methods of teaching used, prioritizing of learning activities and the sociology of learning.

Mostly the teachers respond to queries of the students in or out of the class, but generally the students are not welcomed when they express their confusions or apprehensions, rather the teachers stay focused on the correct answers and that too being scientifically correct (Tobias 1990, Steele and Aronson 1995). Hashweh (1996) believed that teachers with constructive mindset were more helpful for students as compared to the teachers with traditional beliefs, in elaborating properly on the ideas and conceptions in the minds of students. This indicated that the teachers help students in using cognitive strategies in school environment. Pintrich (2002) was of the view that the discussion on using metacognitive knowledge ought to be part of the syllabi of classroom helps to develop communication among the students to talk openly about their own cognition and learning levels.

Perkins and Salomon (1989) revealed that students learn to monitor and direct their own progress, asking questions such as “What am I doing now?” “Is it getting me anywhere?” “What else could I be doing instead?” This type of general metacognitive level helps students avoid persevering in unproductive approaches.

A positive classroom environment not only make learners happy, they also enjoy their school time. Educators work together in a systematic way to fulfill their objectives (Chrispeels 1992). Peterson (1988) stated that if the learning environment places high value on achievement, the educators will try to achieve that goal by seeking ways to improve skills and techniques that foster achievement. For some years there has been evidence of a growing breakdown of schooling which has resulted in a culture of non-learning in many schools. The Daily Dispatch (25 June 1998) reported that "non-racial matric examinations and non-racial results hide the truth of the performance of specific racial groups."

The classroom has an "ethos" that influences learners as a group. This ethos includes patterns of learner and educator interaction, which may be influenced by the organization of learning space, involvement in classroom activities and learners’ behaviour. The classroom environment can be presented as the ·context' of the classroom dealing with patterns of behaviours, or interactions. Man is a learner who is constantly trying to improvise his capability of dominating the earth, by controlling and adapting to it (Van Aswegen 1979). Learning is a fundamental requisite for a good life. Earning the knowledge, skills and attitudes, are a must that will help a person to survive and to actualize in the society. Learning gives cognitive insight and the necessary knowledge to determine the behaviour for realizing a desired goal (Kalunger 1984).

Azevedo and Cromley (2004) concluded that all the students have the lack of ability to regulate and organize certain key strategies during their learning. However, a presence of a tutor who assists them in establishing their goals and in order to achieve them, helps using effective strategies for regulating their learning, thereby improvising their learning. They also found that the students who were given a charter of goals to guide their learning were less effective at regulating their own learning.

In another study held by Schunk and Zimmerman (1994) the self-regulated readers

were found good at anticipating and predicting information, looking for information relevant to their goals, jumping forward/back to look for particular information. They also stated that such readers successfully make use of cognitive and metacognitive strategies and they are always engaged in self-regulated learning as well, knowing what to do, how to do, when to do. These learners plan very well and know how, when and where to use the strategies. In order to develop such habits and strategies, the best way is to train students regarding the use of the metacognitive strategies and establish an intrinsic motivation in them. For that purpose, teachers should explain and model effective cognitive and metacognitive strategies and help students monitor their progress.

Theodosiou and Papaioannou (2006) examined the relationship between achievement goals, motivation environment, frequency of sport and exercise involvement and students' metacognitive processes in physical education. They suggested that on the one hand metacognition acts as a mediator between mastery environment and task orientation and on the other hand between the frequency of sport and exercise involvement.

So, it becomes pertinent from the above findings to investigate out the relationship between metacognition and learning environment.

Location

The sample for the present study was located in the urban and rural areas of randomly selected two districts of Punjab i.e. Ludhiana and Moga. The selection of sample for the present study was made from thirteen Government Senior Secondary Schools of urban and rural areas of Ludhiana and Moga districts of Punjab.

Sample selection

The sample comprised 400 adolescents in the age range of 16-18 years living in intact families drawn from randomly selected Government Senior Secondary Schools in urban and rural areas of Ludhiana and Moga districts. An equal number of males (n=100) and females (n=100) were selected from both rural as well as urban areas of Ludhiana and Moga.

Research instruments

The standardized research instruments as elaborated below were used to collect information as per the objectives of the study. Prior to collection of data all the tools/scales were translated into Punjabi vernacular, pre-tested in the field and modified in line with the objectives of the study.

Metacognitive Awareness Inventory (MAI)

Developed by Schraw and Dennison (1994) This inventory effectively covers various aspects of metacognition in-depth and was used to obtain scores for individual areas of metacognition, such as monitoring, planning, comprehension monitoring and evaluation. Cronbach alpha coefficient is 0.79 which satisfy the reliability criteria.

Dundee Ready Education Environment Measure (DREEM)

Developed by Roff*et al* (1997) was adapted for the purpose of assessing student's perceptions of their classroom environment. This scale is a 50-item measure answered on Likert-type questions. It includes student perception of his:

Learning and teachers
Academic self-perception
Learning atmosphere and
Social self-perception

Collection of data

The adolescents were approached in their school premises only after seeking the permission from the respective Principals of the selected schools. From each school a required number of adolescents were selected randomly. The adolescents thus selected from the selected schools constituted the final sample of 400.the respondents were examined to assess their metacognition and learning environment. The tests were organized in small groups. The copies of the metacognitive awareness inventory and learning environment questionnaire were distributed and necessary instructions were given.

Statistical analysis of data

Frequency and percentages were worked out to find the distribution of the respondents according to their levels of metacognition and learning environment. Karl Pearson's Coefficient of Correlation was used to measure the degree of linear relationship between metacognition and learning environment among adolescents.

The data in the table about metacognitive level of adolescents revealed that on parents revealed that a significant number of males (33.50%) and 23 per cent of female adolescents had low level of metacognition whereas 36.50 per cent of males and35.50 per cent of females were moderately skillful in metacognition and 30 per cent ofmales and significantly higher percentage of females had high level of metacognition.

When it comes to locale-wise distribution of respondents as per their level of metacognition it was observed from the data in the table that major number of urban respondents had high level of metacognition as compared to the 29 per cent of rural respondents who had high level of metacognition. Further it was analyzed from the data in the table that 35.50 per cent urban respondents were moderately skillful in metacognitive skills comparatively 39 per cent of rural respondents had moderate level of metacognition. 32 per cent of rural respondents had low level of metacognition and only 22 percent urban respondents had low level of metacognition.

Data presented in the Table 2 revealed that there were significant gender differences in the distribution of respondents at 'low', 'moderate' as well as 'high' level of perceptions regarding overall learning environment. It was evident from the data higher proportion of males (50.50) as well as females (35.50) experienced moderate level of learning environment.it was observed from the table that 31.50 per cent of males and 38 per cent of females had low level perceptions of their learning environment. Also, only 18 per cent males and 26.50 per cent female respondents denoted the high level of learning environment. It was observed that females felt that their learning environment was excellent and believed that they were well adjusted in the school and enjoyed their stay at school.

Correlation between different dimensions of learning environment and components of metacognition among adolescents

Table 3 symbolizes the relationship between metacognition and the two components of metacognition with dimensions of learning environment among adolescents. The data presented indicates that metacognition ($r=0.20$; $p\leq0.05$) and one of its component i.e. 'Knowledge about Cognition' ($r=0.17$; $p\leq0.10$) had a significant positive correlation with the 'student academic self-perceptions' dimension of learning environment. A significant negative correlation was also observed between metacognition ($r= -0.19$; $p\leq0.05$) and one of its components

'Regulation of Cognition'(r= -0.17; p≤0.10) with 'student perceptions of teachers'. However, no significant correlation was observed between the student social self-perceptions and metacognition as well as its two components.

Further, a significant positive correlation was also seen in the 'student perceptions of learning' with the metacognition(r=0.17; p≤0.10) as well as 'Regulation of Cognition'(r=0.16; p≤0.10) component of metacognition. Metacognition (r=0.22; p≤0.05) as well as 'Regulation of Cognition'(r=0.22; p≤0.05) component of metacognition also showed significant positive correlation with 'student perceptions of atmosphere'. So, it could be divulged from the data presented that knowledge about the way students' plan, implement strategies, comprehension skills and applying metacognitive strategies helped adolescents to perceive their own learning and atmosphere in a better way but has negative impact on their perceptions about their teachers and vice-versa. However, metacognition as well as its components 'Regulation of Cognition' and 'Knowledge about Cognition' component was not found to be significantly related to overall learning environment.

A metacognitive strategy refers to methods used to help students in order to understand the way they learn. These are the processes designed for students to 'think' about their 'thinking'.These are some of the metacognitive strategies to promote metacognition among learners.

Understanding the concept of metacognition

To use the metacognitive strategies and skills in a good way, it is imperativeto understand the concept of metacognition. Metacognition is the recognition and understanding of own thoughts. Students having good knowledge of their thoughts would able to work on how they can solve their problems efficiently. Interactive teaching in the class allows learners to reflect on their own learning processes and strategie**s.**

For stdents

Asking self-reflective questions in theclass can help students to introspect their knowledge about the topic taught and better comprehension.

These are some sample of self-reflective questions, like, *Does this answer make sense given the information provided?What strategy did I use to solve this problem that was helpful?*

How does this information conflict with my prior understanding?How does this information relate to what we learned last week?What is confusing about this topic? What conclusions can I make?

Think aloud: Thinking aloud about the concept promote reading comprehension and problem solving metacognitive skills. It helps a learners tit enables a person to consciously monitor and reflect upon their learning. This tacticcan do wonders when teacher while teaching read a story or problem loudly and stopsperiodically to verbalize thoughts of students. It permits students to follow thinking process of the teacher and to create their own strategies and processes for better understanding of what they are trying to comprehend.

Self-reflection: Highlight the importance of personal reflection during and after learning experiences. Boosting learners to critically analyze their own assumptions and how this may have influenced their learning.

Figure out how you learn: Every person and student has its own way to learn things, if flash cards worked for one does not mean it will work for others too. So, it is important to figure out what learning strategies work best for you. It might be different depending on what type of material (e.g. chemistry vs. history), but it will be helpful to be open to trying new things.

Wrap up lessons: The Science Education Resource Center (SERC) at Carleton College suggested that using wrappers can help to develop metacognition among students. It assists in building self-monitoring skills, which are further divided into three areas: lecture, homework, and exam wrappers. The students are required to share their thoughts regarding important points a teacher taught during class, assess their own abilities to complete homework assignments, or evaluate their own performance on exams.

Strategic study: Research has suggested that students performing self-assessment of the exam and their own study habits can learn more and better than the who does not go for self-assessment. Many of these techniques can be easily adopted in the classroom teaching in order to improve their students' study habits and abilities to reflect and learn independently.

Autonomous learning: When learners have some domain knowledge, encourage participation in challenging learning experiences. They will then be forced to construct their own metacognitive strategies.

Access to mentor: People learn best while interacting with peers who are slightly more progressive. Promote experiences where novices can observe the proficient use of a skill and then gain access to the metacognitive strategies of their mentors.

Solving problems with team: Cooperative problem solving can enhance metacognitive strategies by discussing possible approaches with team members and learning from each other.

Provide opportunities for making errors: When learners are given the opportunity to make errors while in training, such as during simulations, it stimulates reflection on the causes of their errors.

Organize your thoughts Using concept maps or graphic organizers is another great way to visualize material and see the connections between the various concepts you are learning. Creating your concept map from memory is also a great study strategy because it is a form of self-testing.

Concept maps were originally developed to enhance meaningful learning. A concept map is a way of representing relationships between ideas, images or words. Concept maps are a way to develop logical thinking and study skills by revealing connections to the big ideas or the key concepts you are trying to teach. Concept maps will also help students see how individual ideas relate to the larger whole or the bigger picture. Checklist, Rubrics and Organizers are great for solving word problems. These organizational tools support learners in the decision-making process because they serve as an aid for planning and self-evaluation. Typically they ask what students know and need to know to arrive at an answer, and emphasize the need to reread the problem and self-check responses.

Reading comprehension Truly comprehending reading involves students actively engaging with a text and accurately deciphering the layers of meaning. It is very important for students to develop solid reading comprehension skills because

statistics show that people who have low reading comprehension ability suffer in academic, professional, and personal pursuits.

Summon your prior knowledge

Before reading a textbook or attending a lecture, look at the topic that is being covered and ask yourself what you know about it already. What questions do you have? What do you hope to learn? Answering these questions will give context to what you are learning and help you start building a framework for new knowledge. It may also help you engage more deeply with the material.

Table.1 Assessment of Metacognitive Skillfulness among adolescents

Levels of Metacognition	Males		Females	
	(f)	%	(f)	%
Low	67	33.50	46	23.00
Moderate	73	36.50	71	35.50
High	60	30.00	83	41.50

Table.1 Assessment of Metacognitive Skillfulness among adolescents

Levels of Metacognition	Urban		Rural	
	(f)	%	(f)	%
Low	44	22.00	64	32.00
Moderate	71	35.50	78	39.00
High	85	42.50	58	29.00

Table.2 Gender-wise Distribution of level of Perceived Learning environment among adolescents

Levels of Perceived Learning environment	Males		Females	
	(f)	%	(f)	%
Low	63	31.50	76	38.00
Moderate	101	50.50	71	35.50
High	36	18.00	53	26.50

Table.3 Correlation between different dimensions of learning environment and components of metacognition among adolescents

(n=400)

Dimensions of Learning Environment	Components of Metacognition		Overall Metacognition (r)
	Component-I Knowledge about Cognition (r)	Component-II Regulation of Cognition (r)	
Student perceptions of learning	0.09	0.16*	0.17*
Student Perceptions of Teachers	-0.12	-0.17*	-0.19**
Student Academic Self-perceptions	0.17*	0.14	0.20**
Student Perceptions of Atmosphere	0.11	0.22**	0.22**
Student Social Self-perceptions	-0.01	0.02	0.01
Overall Learning Environment	0.09	0.13	0.14

r = correlation coefficient
*p≤0.10, **p≤0.05

Take notes from memory

Many students take notes as they are reading. Often this can turn note taking into a passive activity, since it can be easy to fall into just copying directly from the book without thinking about the material and putting your notes in your own words. Instead, try reading short sections at a time and pausing periodically to summarize what you read from memory. This technique ensures that you are actively engaging with the material as you are reading and taking notes, and helps you better gauge how much you're actually remembering from what you read; it also engages your recall, which makes it more likely you'll be able to remember and understand the material when you're done.

Conclusions of the study are as follows:

In this paper, the efforts were made to find out the role of metacognition and its relationship with the perceptions of adolescents towards their learning environment. it is believed that the learners from each sphere be it medical science, basic science as well as applied sciences at all levels will be benefitted from the role of implementing metacognitive strategies in their learning environment. It is recommended that actively teaching metacognitive strategies and skills to the students, trainers and discussing the role of metacognition in learning enhancement, reasoning and enhancement of performance personally and professionally. It is anticipated that teachers all over the world will be able to use some of the techniques highlighted in this paper to help biomedical students and learners to enhance their knowledge, learning as well as self-assessment.

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