

Improving Metacognition in Middle School English Learners Using Collaborative Reading Comprehension

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Abstract

This research explores the framework of education in India, grounded in Article 21-A of the Constitution and the Right to Education Act of 2010, which emphasizes free and accessible education through evolving teaching methodologies that prioritize learner-centric and collaborative approaches. The study conducts a quasi-experimental investigation into collaborative reading comprehension as a means to enhance metacognitive skills among middle school students, focusing on developing their knowledge and regulation of cognition through team-based learning interventions. Both quantitative and qualitative methods have been used to study the impact of collaborative reading comprehension on metacognition – the knowledge of cognition and the regulation of cognition. The study shows that collaborative reading comprehension enhances the metacognition level of the students in learning English.

Key words: Metacognition, Collaborative Learning, Reading Comprehension, Learning abilities, Comprehension skills, etc.

Introduction

The present framework of education in our country is based on the rights preserved and protected in Article 21-A of the Indian Constitution, in accordance with the provisions of the Right to Education Act which came into effect on April 1, 2010. Given the government's emphasis on the importance of free and accessible education, the methods of teaching have been carefully reconsidered, especially in the current context of virtual or hybrid learning. Approaches that focus more on the learner rather than the teacher, and employ collaborative learning techniques, have been at the forefront of education for years, particularly in developed countries and increasingly in developing nations as well. This research delves into collaborative learning techniques in order to help participants enhance their metacognition, which is crucial for critical thinking and application. Hence, this is a quasi-experimental study on developing metacognitive skills through collaborative reading comprehension.

This study investigates the existing metacognition levels of middle school students in order to explore collaborative reading comprehension as an effective intervention to develop metacognitive skills among the students. The research focuses on the outcome collaborative reading comprehension has on the knowledge of cognition that comprises of declarative knowledge, procedural knowledge, and conditional knowledge, and regulation of cognition that comprises of planning, comprehension monitoring, information management strategies, debugging strategies and evaluation. The main purpose is to determine how collaborative or team-based learning can best facilitate the development of metacognitive abilities for quality learning. To this end, the researcher has developed an effective and suitable collaborative reading comprehension intervention to cultivate metacognitive skills while working in a group.

Review of Literature

Metacognition

The word "metacognition" comes from the Greek word "meta" meaning "above" and the Latin word "cognitio" meaning "to get to know". When combined, these two words refer to a higher level of knowledge about one's own thinking processes. Since the early 1970s the development of children's awareness of their own memory was given priority to result in increased attention. This phenomenon was termed 'metamemory' by John Flavell (Schneider, 1985). John Flavell and Ann Brown were the earliest to commence works on metacognition in the early 1970s (Van Kraayenoord, 2010). Since their time many have put forth different theories to understand the 'cognition about cognition' or self-regulation and information processing. Vygotsky is in one way a precursor to metacognitive theory. The basic proposition of his understanding of cognitive development was that children first learn from the society (Papaleontiou-Louca, 2008). Therefore, the other models include the models of Vygotsky and the neo-Vygotsky which were based on socio-cultural or situated learning. Others include Zimmerman's self-regulation model (Zimmerman, 1990). Prior to Flavell, Jean Piaget had developed his theory of cognitive development in children which comprises of four stages and his theory was extended upon by the neo-Piagetian thinkers.

When the term was first introduced, psychologists questioned whether it would actually be effective. However, today metacognition is no longer a subject of doubt, but rather a necessity.

As a result, there are many studies being conducted to understand, assess, and develop metacognitive abilities (Sternberg, 2009). Metacognition is a topic of interest to many because it bridges the gap between decision making and memory, learning and motivation, and learning and cognitive development (Nelson & Louis, 1994)..

The term "metacognition" may seem mysterious, but metacognitive acts are actually quite common (Dunlosky & Metcalfe, 2009). An individual's knowledge concerning their own cognitive processes is called metacognition, and the development of such awareness in children has become a topic of interest for many researchers (Brown & Smiley, 1977). The simplest definition of metacognition is "thinking about thinking." It refers to the evaluation and control of cognitive processes, involving conscious or voluntary control of thoughts, memories, and actions (Shimamura, 2000).

In recent decades of cognitive research, the discovery and theoretical amplification of metacognition has been a significant breakthrough (Martinez, 2006). Over the years, there have been numerous discussions about the precise meaning of metacognition. For over four decades now, the term has frequently appeared in the vocabulary of educational psychologists. Beyond the abstract nature of the concept, the wide range of interchangeable words used to refer to the same phenomena, such as self-regulation, executive control, and metamemory, add further confusion in arriving at a concrete definition (Livingstone, 2003). The scientific study and research on metacognition is often considered to have begun with the work of Joseph Hart (Van Overschelde, 2008). The emerging field of cognitive psychology in the 1960s and the post-Piagetian developmental psychology of the 1970s represent the two parallel roots of modern research on metacognition. From the cognitive psychology perspective, Hart was interested in the accuracy of people's judgments about their own memory. Developmentalists, on the other hand, were interested in whether improvements in a child's memory abilities were a function of their greater conscious understanding of the rules governing memory and cognition (Schwartz & Perfect, 2002).

Psychologist John Flavell conceptualized metacognition as an individual's "knowledge of their cognition" and defined it as "knowledge and cognition about cognitive phenomena" (Akin, Abaci, & Cetin, 2007). In other words, metacognition is "knowledge about knowledge" or "thinking about thinking". Metacognition also involves the ability to manage and regulate one's cognitive processes in relation to specific goals and targets (Favieri, 2013). It is an important capacity for learner autonomy, as it allows individuals to plan, monitor, and evaluate their own performance and learning processes (Kallio, et al., 2017). Ultimately, metacognition can be defined as the ability to monitor, evaluate, and make plans for one's own learning, which is a key component of autonomous, self-directed learning (Sigmund & Howard, 1996).

Metacognition is a complex perception associated with higher-order thinking that aids a student's learning process by enabling them to understand, analyse, and control their thought processes (Bernard & Bachu, 2015). It is very often associated with the work of John Flavell, who conducted extensive research on children's theory of mind. Flavell found that children are quite limited in their knowledge about their own cognitive phenomena, and therefore struggle to monitor their memory, comprehension, and other cognitive aspects (Flavell, 1979). This led Flavell to propose the concept of "metacognition" to describe a higher level of cognitive knowledge. In general, metacognition comprises awareness and control of various cognitive processes, such as planning, monitoring, repairing, revising, summarizing, and evaluating.

Essentially, metacognition allows us to learn awareness of our own comprehension processing and develop strategies to support it (Karbalaee, 2011). Ann Bown distinguishes between Knowledge of Cognition and Regulation of cognition. Knowledge of cognition is understood to comprise of declarative knowledge, procedural knowledge, and conditional knowledge. Regulation of cognition comprises of planning, comprehension monitoring, information management strategies, debugging strategies and evaluation (Brown, 1977). These dimensions could vary with the use of different terminologies. The Metacognitive Awareness Inventory by Schraw and Dennison was developed on the basis of this composition of metacognition.

Collaborative learning

In India, individual learning is often the preferred approach in schools over collaborative learning. The assumption is that in a group setting, some students may not actively participate or contribute to the overall learning process, and instead rely too heavily on their peers rather than fully utilizing their own potential. However, proponents of collaborative learning argue that this approach can be optimal for student learning.

Collaborative learning is based on social constructivist theories that were put forth by many like Piaget. The limitations of Piaget's work paved way a number of thought-provoking ideas for researchers and educators. Some of the most prominent ideas put forth are those of Soviet psychologist Lev Vygotsky's zone of proximal development, the more recent writings of Jerome Bruner on scaffolding, and Albert Bandura's social learning theory. They differ with Piaget in that the learning is taken to be a socially constructed process in opposition to the more individualistic orientation of Piaget (Fleer, 1990). The social interactions play an important role in the development of child cognition even before the child begins to critically think from the inside (Papaleontiou-Louca, 2008). Vygotsky reiterated a number of times that human is made up of material stuff such as the nervous system, muscles, glands etc. and these are determined by the heredity. However, social environment is extremely powerful in melding and functioning according to pre-established goals (der Veer, 2007). The social setting in which primarily includes the child's parents, teachers, or friends play the role social negotiators. Much of the cognitive development get internalized in the child through the social experiences. The schema of development according to Vygotsky is first social, then egocentric, followed by inner-speech. This is in contrast with the behaviourists schema where vocal speech is the first, then whisper, followed by inner-speech. "It also contrasts with Piaget's thought where the sequence is from 'nonverbal autistic thought through egocentric thought and speech to socialized speech and logical thinking" (Vygotsky, 1994).

Collaborative learning encompasses a variety of educational methods and approaches in which students and teachers work together towards a shared intellectual goal. It is an overarching term that typically involves students working in small groups of two or more, collectively searching for understanding, solutions, or meanings, or creating a joint product (Smith & MacGregor, 1992). Some common collaborative learning techniques include peer-teaching, peer-evaluation, writing groups, problem-based learning, group discussions, group projects, and collaborative concept-learning activities.

Collaborative learning is considered one of the best strategies for developing metacognition among learners. It occurs when two or more individuals work together in a group, sharing knowledge and learning from each other's unique perspectives.

"The abilities of the whole group contribute to the learning of each individual. In collaborative learning, students acquire factual knowledge equally well both individually and in small groups, but the group that worked collaboratively performs better in critical thinking exercises than the group that worked independently" (Schmidt, 2010).

Collaborative learning is regarded as a key skill that students need to learn in our changing world. "The need to connect with other people and work alongside them is part of our increasingly flat world. As global citizens, the next generation will need to have a sensitivity to other cultures as well as the ability to collaborate with them. To meet this need, teachers in our schools need to incorporate collaborative learning into their classrooms" (Schmidt, 2010). When teachers do incorporate collaborative learning into their instruction, students greatly benefit from developing critical thinking, problem-solving, and social skills that are vital for their current and future development (Schmidt, 2010).

Reading comprehension

Reading comprehension is one of the strategies used in this exploratory study of collaborative learning to enhance metacognitive skills. Very often, children struggle to fully understand the messages conveyed through written texts, which can have adverse consequences for their learning and development. It is important to recognize the metacognitive skills that underlie the ability to read for meaning (Clarke, Truelove, Hulme, & Snowling, 2014).

There are two key aspects of reading comprehension: comprehension monitoring and hypothesis formation and evaluation. Comprehension monitoring helps address four types of comprehension failures - failure to understand particular words, sentences, the relationships between sentences, and how the text fits together as a whole. Hypothesis formation relates to making predictions and interpretations (Collins & Smith, 1980). These two aspects have a significant impact on metacognitive skills. Fielding and Pearson contend that providing opportunities for peer and collaborative learning is one of the successful ways of improving reading comprehension, as it can lead to positive social outcomes for students of all abilities (Fielding & Pearson, 1994). Therefore, reading comprehension is utilized as a strategy within collaborative learning to enhance metacognitive skills.

Research Methodology

This research project explores the use of collaborative learning strategies to enhance metacognitive skills. It employs a quasi-experimental and exploratory approach, with a focus on evaluating the effectiveness of using reading comprehension as the key intervention.

Sample and Sampling

The research was conducted at a school located in the Ghatkesar municipality, east of Hyderabad. The sample consists of 44 students between the ages of 12 and 14, including 26 boys and 18 girls, drawn from the eighth grade. The dependent variable in this study is metacognition, which encompasses both the knowledge about cognition and the regulation of cognition. The independent variable is the collaborative learning approach with reading comprehension.

Research tools

This research study aimed to explore the effectiveness of collaborative learning design in developing metacognition and enhancing learners' autonomy and learning abilities. The study was carried out over a period of seven months, from September 2019 to March 2020. In the present study, the researcher utilized four key tools to measure the development of metacognitive skills and their impact on learning abilities and learning autonomy among the participants. These included questionnaires such as the Metacognitive Awareness Inventory and Collaborative Learning Opinionnaire. Additionally, the researchers employed level tests (entry, middle, and exit) to assess the impact of the collaborative learning interventions. Other qualitative tools used in the study were semi-structured interviews and the researcher's diary. The combination of quantitative and qualitative methods allowed the researchers to gain a comprehensive understanding of the effects of the collaborative learning design on the development of metacognition and learner autonomy.

Research design

A passage was selected from the English reader. To enhance comprehension certain suggestions were given and after that reading comprehension involves the reading of a passage. A sample of the CRC worksheet is placed in the appendix.

Preparation	Pre-Intervention	Intervention	Post-Intervention
Formation of groups Induction	Metacognition Awareness Inventory Knowledge about Cognition Regulation of Cognition Collaborative Learning Opinionnaire	Entry Level test Phase I Session 1 – Reading Comprehension	Metacognition Awareness Inventory Knowledge about Cognition Regulation of Cognition Collaborative Learning Opinionnaire
		Session 2 – Reading Comprehension	
		Session 3 – Reading Comprehension	
		Mid-Level Test Phase II Session 4 – Reading Comprehension	
		Session 5 – Reading Comprehension	
		Session 6 – Reading Comprehension	
		Exit Level Test	

Research preliminaries

Instruction for Collaborative Reading Comprehension

Instructions prior to the intervention is necessary and therefore before starting the CRC the following instructions were given: Read the passage carefully, underline new and difficult words, define and derive the meanings of those words, then re-read the text. Identify the important words and concepts, and capture a summary of the passage. After that, read the questions and respond accordingly.

Design of Collaborative Reading Comprehension

There are three activity check involved in reading comprehension. After a thorough reading and discussion, the group will have to answer five multiples choice questions, will have to use five words to make sentences of their own, and mark the sentences true or false. The activity check is graded to encourage healthy competition among the groups so that they can learn better.

The Objectives of Collaborative Reading Comprehension

The goal of the study is to ensure that there is enough collaboration among the participants and hence the objectives of CRC are as follows: To help the group stay focused on the task and set goals, to be conscious about time, to learn from one another through examples given by others, to translate the information into their own words, to break down the passage and analyse it, to consider various options in answering the questions, to pause periodically and think through the content, to reconsider their assumptions based on group discussions, and to summarize the passage for themselves. As a result of this, it is hypothesised that there will be a change in the metacognition of the students, in the knowledge of cognition and regulation of cognition.

The Participants

The participants’ Demographic Profile was collected after they gave their consent.

Age Distribution			
Participants	Age	Frequency	Percent
Students	12 Years	6	13.6
	13 Years	30	68.2
	14 Years	5	11.4
	15 Years	2	4.5
	16 Years	1	2.3
	Total	44	100

Gender Distribution			
		Frequency	Percent
Valid	Female	18	40.9
	Male	26	59.1
	Total	44	100

Pre-Intervention

As mentioned in the research design, the intervention has three parts, including the pre and post interventions.

Administration of Pre-Metacognition Awareness Inventory

Schraw and Dennison developed the Metacognitive Awareness Inventory (MAI, 1994) to assess the metacognitive awareness of the students. The scale comprised of 52 items with ‘yes or no’ questions for the purpose of rating. However, the researcher modified version which includes a five Likert scale, and excluded two questions which might be confusing for the students.

Administration of Pre-Collaborative Opinionnaire

The Collaborative Learning Awareness questionnaire was employed to find out the understanding and awareness of collaborative and group learning method. The questionnaire comprised of 20 items where the participants need to give their responses appropriately.

Intervention

Formation of groups and induction

Formation of groups is very crucial for the intervention. Every care has to be taken so that there is enough and effective collaboration in all the groups. Eight groups were formed based on previous tests, teachers' consent, and gender. An induction session is held on various occasions, especially when those who newly join a job, to help get acquainted with what is required of them so that the output is as expected.

Entry level test

The entry level test is necessary to know the level of learning skills of the participants before the intervention. For this test, a text from the select class eight English reader was extracted as the whole chapter was lengthy. This text is short passage on social issues taken from Unit II and Chapter C, titled 'Save our Soul'.

Intervention – Phase I

After the entry level test, the intervention had three sessions of collaborative learning activity based on reading comprehension. Session one of the first phase of collaborative learning began by giving the participants a text extracted from 'Treasure Within I' from class eighth English Reader, to read together in each group. This passage is the biography of Mr. Hafeez, who was not very good at school. The CRC activity worksheet which was completed by each group had multiple choice questions, making sentences of their own using five words that were suggested, and sentences to be marked true or false. After about ten days, the second session of the first phase of collaborative learning was conducted. The participants were enthusiastic to involve in the intervention. The passage was selected from class eighth English reader, titled 'Treasure Within II'. This passage is a continuation about the biography of Mr. Hafeez who was not very good at school but went on to become a famous architect. The participants were asked to answer five multiple choice questions, use the five suggested words to frame sentences of their own, and mark five of the sentences as true or false. Roughly ten days later the final session of the first phase of collaborative learning was conducted. For this session the passage chosen was titled 'They Literally Build the Nation' from the class eighth English Reader. This passage is about the civil engineers who construct almost all the architectural structures need by the nation. This passage was selected as it will generate a lot of discussion as they read the text. After a thorough reading of the text, they had to answer five multiple choice questions, frame sentences with five words that were suggested, and mark the five sentences as true or false.

Middle level test

After the first phase of collaborative learning activities, using the design that was developed, about a fortnight later, middle level test was conducted to see the understanding and learning proficiency of the participant when compared to the level test that was conducted prior to the intervention. For the middle level assessment, a text from the class eighth English Reader was used. Text consists of about a thousand words and it was titled 'Reaching the Unreached' and this was used for individual reading comprehension. Individual reading comprehension includes five multiple choice questions, five words to frame sentences of their own, and five sentences to mark whether true or false.

Intervention – Phase II

After the first phase of intervention, with about a month gap in between, the second phase was initiated. The participants were happy to be involved in the second phase as well.

The second phase has three sessions from sessions four to six. The fourth session of collaborative learning intervention began with an extract from text 'I Can Take Care of Myself'. This passage is of a mother rat who wanted to find a suitable mate for her daughter so that she can live happily. After reading the passage the participants were asked to answer five multiple choice questions, frame sentences using five words that were suggested, and mark five sentences as true or false. The fifth session of collaborative learning involved an extract from a lesson from the English text book, 'Dr. Dwarakanath Kotnis'. This is a brief biography of Dr. Kotnis a medical doctor. The collaborative reading comprehension had to be done by the students by answering five multiple choice questions, had to make five sentences with the given phrases and had to mark five sentences as true or false. The last of the collaborative learning sessions had to do with comprehending an extract from the English text book, 'The Dead Rat'. This story is about a boy by the name Ratnanka who was from an impoverished family and his father had deserted them. The reading comprehension involved five multiple choice questions, they had to write five sentences using the given five phrases, and mark five sentences as true or false.

Exit level test

Exit Level check was administered at the end of the collaborative learning intervention. It is an individual performance test where the participants have to complete the reading comprehension. An extract from the English text book by the title 'Compering' was chosen. This extract is about how a person would conduct a school program.

Post Intervention

The post-intervention occurred after the end of the intervention. It includes post MAI test, Collaborative Learning Opinionnaire followed by Semi-structured interview for selected sixteen learners, two from each group. The researcher also maintains reflective journal.

The Post test MAI is the same as pre test MAI. This test scale was administered to find out if there is any difference to the Pre-test result as to have the idea about that changes that have taken place during the collaborative learning. The Collaborative Learning Opinionnaire was administered after the intervention to see if there is any change in their opinion on collaborative learning after the intervention.

Semi-structured interview and Researchers' Diary

Sixteen participants, representing all the eight groups, were chosen to get more information into their experience through the process of collaborative learning and the skills they were able to sharpen for better learning. Researchers' diary was maintained throughout the research to note the progress among the students.

Analysis and interpretation

A. Level Tests

The first test was conducted prior to the intervention to see the performance of the participants so as to compare it with the performance during and after the intervention. Below is the statistical comparison and analyses of the tests:

Entry level and Mid-level tests

Table 1 below is the paired sample t-test for the entry and the mid-level tests to show the difference in learning process before and during the collaborative learning intervention.

Paired Samples for Entry and Mid						
Measure	Levels	Mean	Std. Deviation	df	t	p
Pair 1	Entry	17.7841	4.00348	43	-7.677	.000
	Mid	21.5682	3.48350			

When we compare the entry level and mid-level data, there is a significant difference in the scores for entry-level ($M = 17.78$, $SD = 4.00$) and score for mid-level ($M = 21.56$, $SD = 3.48$); $t(43) = -7.68$, $p=0.000$. The probability value being 0.000 is significant at 5% level, as it can be observed that the value of mid-level is greater than the value of entry-level. This is a clear inference that collaborative learning has impacted the learning process of the students significantly.

Mid-level and Exit-level tests

Table below is the paired sample t-test for the mid and the exit-level tests to show the difference in learning process during the collaborative learning intervention and after the collaborative learning intervention.

Paired Samples Statistics						
Measure	Levels	Mean	Std. Deviation	df	t	p
Pair 1	Mid	21.5682	3.48350	43	1.322	.193
	Exit	20.8409	3.82278			

When we compare, there was significant difference in the scores for mid-level ($M=21.56$, $SD=3.48$) and score for exit-level ($M=20.84$, $SD=3.82$); $t(43) = 1.32$, $p=0.193$. The probability value being 0.193 is not significant at 5% level, as it can be observed that the value of exit Level is less than the value of mid-Level. The inference is quite clear that there has been no significant impact of collaborative learning at the exit-level when compared with the mid-level test.

Entry and Exit-level tests

Table below is the paired sample t-test for the entry and the exit-level tests to show the difference in learning process during the collaborative learning intervention and after the collaborative learning intervention.

Paired Samples Statistics						
Measure	Levels	Mean	Std. Deviation	df	t	p
Pair 1	Entry	17.7841	4.00348	43	-6.119	.000
	Exit	20.8409	3.82278			

When we compare, there was significant difference in the scores for entry-level ($M=17.78$, $SD=4.00$) and score for Exit-Level ($M=20.84$, $SD=3.82$); $t(43) = -6.11$, $p=0.000$. The probability value being 0.000 is significant at 5% level, as it can be observed that the value of exit-level is greater than the value of entry-level.

Level Tests – Summary

The participants were excited about collaborative learning but this does not guarantee that there will be significant increment in their learning. Hence at least three tests are mandatory to capture the growth of learning. The three tests, prior to intervention, during intervention, and after intervention are necessary to conclude on the impact on learning.

B. Collaborative Reading Comprehension

Prior to the intervention, a pre-intervention collaborative activity based on reading comprehension was conducted to see how the students would involve themselves without the interventional guidelines. Then the intervention consisted of two phases and the data for these are analysed.

Reading Comprehension – Paired Samples Statistics						
Measure	Levels	Mean	Std. Deviation	df	t	p
Reading Comprehension	Pre-intervention	7.5682	1.03199	43	-3.187	.003
	Phase I	8.1136	.98160			
Reading Comprehension	Phase I	8.1136	.98160	43	1.148	.257
	Phase II	7.9205	1.06172			
Reading Comprehension	Pre-intervention	7.5682	1.03199	43	-2.194	.034
	Phase II	7.9205	1.06172			

Reading Comprehension – Pre-intervention and Phase I

When we compare, there was significant difference in the scores for Pre-intervention and (M=7.56, SD=1.03) and score for Phase I (M=8.11, SD=0.98); $t(43) = -3.18, p=0.003$. The probability value being 0.003 is significant at 5% level, as it can be observed that the value of Phase I is greater than the value of Pre-intervention.

Reading Comprehension – Phase I and Phase II

When we compare, there was significant difference in the scores for Phase I (M=8.11, SD=0.98) and score for Phase II (M=7.92, SD=1.06); $t(43) = 1.148, p=.257$. The probability value being 0.257 is not significant at 5% level, as it can be observed that the value of Phase II is less than the value of Phase I.

Reading Comprehension – Pre-intervention and Phase II

When we compare, there was significant difference in the scores for Pre-intervention (M=7.56, SD=1.03) and score for Phase II (M=7.92, SD=1.06); $t(43) = -2.19, p=0.034$. The probability value being 0.034 is significant at 5% level, as it can be observed that the value of Phase II is greater than the value of Pre-intervention.

Collaborative reading comprehension – Summary

The analysis of the data shows that there was a significant change in the learning efficiency of the students after the first phase of intervention. The second phase data showed that the mean value was higher the first phase but it was not significant.

However, the data of the second phase was significantly higher than the pre-intervention. Therefore, it can be concluded that the collaborative learning has enhanced the learning efficiency of the students.

C. Metacognition

The following statistics gives the findings and interpretation about the impact of collaborative learning on enhancing the metacognition skills. The analyses of the enhancement of metacognition skills are examined from the two dimensions; the first being the knowledge of cognition, and the second being the regulation of cognition. When a learner has the knowledge of cognition he essentially knows about the task, how to do the task, and why or when he should be doing the task. Knowing about the task is declarative knowledge, knowing how to do the task is procedural knowledge, and knowing when and why to do a task is conditional knowledge. When the knowledge of cognition is firm, it leads to the proper regulation of cognition wherein the learner is able to plan, monitor and evaluate the task.

a. Knowledge of Cognition

The below table shows the pre and post values of the three dimensions of knowledge about cognition: declarative, procedural, and conditional.

Paired Samples Statistics						
Measure	Test	Mean	Std. Deviation	df	t	p
Declarative Knowledge	Pre-test	31.23	2.932	43	-3.463	.001
	Post-test	33	3.3963			
Procedural Knowledge	Pre-test	15	1.75208	43	-1.492	.143
	Post-test	15.5455	1.92238			
Conditional Knowledge	Pre-test	15.6136	1.91949	43	-2.998	.004
	Post-test	16.4091	1.2997			

The difference in the mean for the pre and post values of declarative, procedural, and conditional knowledge show enhancement. Paired sample two tailed t-test was done to see the significance level in the three dimensions. The findings are presented below:

Declarative Knowledge

There is significant difference in the scores for pre declarative knowledge ($M = 31.23$, $SD = 2.93$) and score for post declarative knowledge ($M = 33$, $SD = 3.39$); $t(43) = -3.46$, $p = 0.001$. The probability value being 0.001 is significant at 5% level, as it can be observed that the post value of declarative knowledge is greater than the pre value of declarative knowledge.

Procedural Knowledge

There is little difference in the scores for pre declarative knowledge ($M = 31.23$, $SD = 2.93$) and score for post declarative knowledge ($M = 33$, $SD = 3.39$); $t(43) = -3.46$, $p = 0.001$. The probability value being 0.001 is not significant at 5% level, as it can be observed that the post value of procedural knowledge is greater than the pre value of procedural knowledge.

Conditional Knowledge

There is significant difference in the scores for pre conditional knowledge (M = 15.61, SD = 1.91) and score for post conditional knowledge (M=16.40, SD = 1.30); $t(43) = -2.99, p = 0.004$. The probability value being 0.004 is significant at 5% level, therefore it can be observed that the post value of declarative knowledge is greater than the pre value of conditional knowledge.

Pre and Post Knowledge of Cognition

Paired Samples Statistics						
Measure	Test	Mean	Std. Deviation	df	t	p
Knowledge of Cognition	Pre-test	61.8409	5.20261	43	-3.705	.001
	Post-test	64.9545	4.93188			

When we compare, there was significant difference in the scores for pre knowledge of cognition (M=61.84, SD=5.20) and score for post knowledge of cognition (M=64.95, SD=4.93); $t(43)=-3.7, p=0.001$. The probability value being 0.001 is significant at 5% level, as it can be observed that the post value of knowledge of cognition is greater than the pre value of knowledge of cognition.

To recapitulate, there has been a significant change in the results of the pre and post outcomes of knowledge about cognition done by the metacognitive awareness inventory. While there has been a significant level of increase in the efficacy of declarative and conditional knowledge, the procedural knowledge has not been significant. However, on the whole the knowledge of cognition has increased significantly as seen in the above analysis and chart.

b. Regulation of Cognition

The below table shows the pre and post values of the three dimensions of knowledge about cognition: planning, comprehension monitoring, information management, debugging strategies, and evaluation.

Regulation of Cognition Paired Samples Statistics						
Measure	Test	Mean	Std. Deviation	df	t	p
Planning	Pre-test	26.2727	3.46654	43	-2.749	.009*
	Post-test	28.2500	3.57722			
Comprehension Monitoring	Pre-test	27.0682	2.54629	43	-3.576	.001*
	Post-test	28.7045	2.28829			
Information Management	Pre-test	35.2955	3.99173	43	-2.632	.012*
	Post-test	37.0227	3.38594			
Debugging	Pre-test	15.7045	2.37800	43	-4.099	.000*
	Post-test	17.4091	1.51455			
Evaluation	Pre-test	22.5909	2.73069	43	-3.556	.001*
	Post-test	24.2500	2.79638			

Planning

When we compare, there was a significant difference in the scores for pre planning (M=26.27, SD=3.47) and the score for post planning (M=28.25, SD=3.58); $t(43)=-2.75, p=0.009$. The probability value being 0.009 is significant at 5% level, therefore, it can be observed that the post value of planning is greater than the pre value of planning.

Comprehension Monitoring

When we compare, there was a significant difference in the scores for pre Comprehension Monitoring (M=27.07, SD=2.54) and the score for post Comprehension Monitoring (M=28.70, SD=2.28); $t(43)=-3.58, p=0.001$. The probability value being 0.001 is significant at 5% level, therefore, it can be observed that the post value of Comprehension Monitoring is greater than the pre value of Comprehension Monitoring.

Information Management Strategies

When we compare, there was a significant difference in the scores for pre Information Monitoring Strategies (M=35.30, SD=4) and the score for post pre Information Monitoring Strategies (M=37.02, SD=3.38); $t(43)=-2.63, p=0.012$. The probability value being 0.012 is significant at 5% level, therefore, it can be observed that the post value of pre-Information Monitoring Strategies is greater than the pre value of pre-Information Monitoring Strategies.

Debugging Strategies

When we compare, there was a significant difference in the scores for pre-Debugging Strategies (M=15.17, SD=2.38) and the score for post Debugging Strategies (M = 17.40, SD = 1.51); $t(43) = -4.1, p = 0.000$. The probability value being 0.000 is significant at 5% level, therefore, it can be observed that the post value of Debugging Strategies is greater than the pre value of Debugging Strategies.

Evaluation

When we compare, there was a significant difference in the scores for pre Evaluation (M=22.59, SD=2.73) and the score for post Evaluation (M=24.25, SD=2.80); $t(43)=-3.56, p=0.001$. The probability value being 0.001 is significant at 5% level, therefore, it can be observed that the post value of Evaluation is greater than the pre value of Evaluation.

Pre and Post Regulation of Cognition

Paired Samples Statistics						
Measure	Test	Mean	Std. Deviation	df	t	p
Regulation of Cognition	Pre-test	128.9091	11.00701	43	-2.328	.025*
	Post-test	133.6591	10.83479			

When we compare, there was a significant difference in the scores for pre Regulation of Cognition (M=128.91, SD=11.01) and the score for post Regulation of Cognition (M=133.56, SD=10.83); $t(43)=-2.33, p=0.025$. The probability value being 0.025 is significant at 5% level, therefore, it can be observed that the post value of Regulation of Cognition is greater than the pre value of Regulation of Cognition.

Pre and Post Metacognition Awareness

Paired Samples Statistics						
Measure	Test	Mean	Std. Deviation	df	t	p
Metacognitive Awareness	Pre-test	190.7500	15.16901	43	-2.954	.005
	Post-test	198.6136	14.93274			

When we compare, there was a significant difference in the scores for pre Metacognitive Awareness Inventory (M=190.75, SD=15.17) and the score for pre Metacognitive Awareness Inventory (M=198.61, SD=14.93); $t(43)=-2.95$, $p=0.005$. The probability value being 0.005 is significant at 5% level, therefore, it can be observed that the post value of pre–Metacognitive Awareness Inventory is greater than the pre value of pre–Metacognitive Awareness Inventory. To recapitulate the analysis of regulation of cognition, all its dimensions have shown significant increase in efficiency, viz., planning, comprehension monitoring, information management, debugging strategies, and evaluation. This clearly shows that collaborative learning does enhance the developing of metacognition skills using reading comprehension.

D. Collaborative Learning Opinionnaire

Prior to the intervention the researcher wanted to know whether the learners were aware of or were introduced to collaborative learning. Therefore, an opinionnaire was designed to know the opinion on collaborative learning strategy from the individuals. The purpose of this was to statistically analyse if there was any change in their opinion after the six phases of collaborative learning. Any significant increase in their opinion on collaborative learning would clearly indicate that there was a significant change in the attitude and use of collaborative strategy increase their learning performance.

Paired Samples Statistics						
Measure	Opinion	Mean	Std. Deviation	df	t	p
Collaborative Learning	Before Intervention	62.9091	14.64275	43	-2.817	.007
	After Intervention	69.7727	10.37632			

When we compare, there was significant difference in the scores for pre Collaborative Learning (M=62.90=91, SD=14.64) and score for post Collaborative Learning (M=69.77, SD=10.38); $t(43)=-2.81$, $p=0.007$. It can be observed that the post value of Collaborative Learning is greater than the pre value of Collaborative Learning, and the probability value being 0.007 is significant at 5% level.

E. Semi-structured Interviews and Researcher’s Diary

Semi-structured Interviews

Participants' reflections on the intervention process underscored a significant experiential transformation, characterized by heightened engagement and active learning paradigms. The interviews elucidated a profound shift in participants' cognitive and interpersonal dynamics, with respondents expressing an unequivocal enthusiasm for future implementations of collaborative learning strategies. Moreover, the qualitative data transcended mere academic skill acquisition, highlighting the intervention's ancillary social benefits. Participants explicitly emphasized the interpersonal dimensions of collaborative learning, noting its potential for facilitating meaningful social interactions and fostering a more integrated learning environment. The unanimous sentiment suggested that collaborative learning not only enhanced subject comprehension but also cultivated important social competencies through structured collaborative experiences.

Notably, participants demonstrated a remarkable receptivity to the collaborative learning approach, unanimously expressing intent to incorporate these strategies in future educational contexts. This attitudinal disposition underscores the potential transformative impact of collaborative pedagogical interventions on learner engagement and educational methodology.

Researcher's Diary

The researcher's reflexive diary entries provided a comprehensive phenomenological account of the collaborative learning intervention's dynamic progression. Initial observations indicated a gradual and incremental enhancement of individual participant engagement in reading comprehension within the group context. This emergent pattern of involvement was particularly evident in the transformation of group interactions, which evolved from initial tentative and subdued exchanges to increasingly robust and substantive discursive interactions. Temporal analysis revealed a significant reduction in task completion duration as the intervention progressed, suggesting an increasingly sophisticated collaborative mechanism. The researcher documented a marked improvement in inter-participant coordination and cooperative strategies, particularly during the transition between intervention phases. This progression was characterized by a qualitative shift from perfunctory participation to voluntary, intrinsically motivated contributions. A notable trajectory of psychological transformation was observed, with participants demonstrating an escalating sense of collective efficacy and collaborative enthusiasm. The comparative analysis between the intervention's initial and concluding stages unveiled a pronounced augmentation in participants' motivational states, manifested through heightened cognitive and emotional investment in the collaborative learning process. These qualitative observations provide critical insights into the intricate dynamics of collaborative learning, illuminating the complex interplay between individual agency and collective knowledge construction. The researcher's nuanced documentation suggests that collaborative learning interventions can catalyze significant attitudinal and behavioral modifications within group learning environments.

Conclusion

The intersection of cognitive and social constructivist paradigms has consistently underscored the critical role of collaborative learning in educational developmental processes. Collaborative learning emerges as a pivotal mechanism for the cultivation of metacognitive capabilities among developing learners. This research explores the nuanced relationship between collaborative reading comprehension and the enhancement of metacognitive competencies, specifically targeting the domains of cognitive awareness and cognitive regulatory mechanisms. The research methodology employed a comprehensive mixed-methods approach, synthesizing quantitative and qualitative data to elucidate the efficacy of collaborative learning interventions. Empirical analyses reveal a statistically significant augmentation of participants' metacognitive skills following the implementation of collaborative reading comprehension strategies. While the theoretical premise of collaborative learning as a catalyst for metacognitive development is not novel in educational scholarship, this study distinguishes itself through its specific focus on reading comprehension as the primary collaborative learning modality. The findings contribute to the extant literature by providing empirical validation of the intricate mechanisms through which collaborative learning approaches can systematically facilitate the refinement of metacognitive skill acquisition among English learners.

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