Comparative Study of Meta-cognitive Instruction and Cooperative learning Strategies in Promoting Insightful Learning of Students

Bushra Yasin[*], Shafqat Rasool[**] and Muhammad Azim[***]

Abstract

This research work deals with the higher level methods of teaching i.e. meta-cognitive instruction and cooperative learning strategies which are very essential while teaching the students for their understanding and to bring creativity in them. This is experimental research which consists of 2 experimental groups i.e. meta-cognitive instruction group and cooperative learning group. The population of this study was the mathematics students of secondary level. The researcher checked the level of insight of students by applying Aha effect observation sheet, took the pre test and post test based on mathematics subject, and Meta-cognitive Awareness Inventory (MAI) was filled from all the students of both groups. The data was analyzed with the help of paired sample t-test, one way analysis of variance, and post Hoc. The results of this study conclude that there was no noteworthy difference exists between respondents of each groups. Later treatment given to first experimental group based on meta-cognitive learning which helps the students of the same group performed comparatively significantly better than peers in rest of groups such as cooperative learning group. Learners must be instructed how to create furthermore, know about the techniques. Educators must improve their learners' meta cognitive mindfulness so as to improve their learning capacities.

Keywords: Meta-cognitive instruction, Cooperative learning strategies,

Introduction

Pakistan is a state where a huge portion of our education system depends on the typical lecture method for all subjects including science subjects for which Herbartian steps are taken to cover the content matter. Though there is a morsel change in this practice as regards science subjects such as mathematics because of the compulsory part of practical exam with theory partition. It has been attempted from numerous years to enhance

[*] Bushra Yasin , PhD Scholar, Department of Education, Government College University, Faisalabad, Pakistan, Email: byeducationist@gmail.com
[**] Dr. Shafqat Rasool, Assistant Professor, Department of Education, Government College University, Faisalabad, Pakistan.
[***] Dr. Muhammad Azim , Research Assistant, Department of Education, Government College University, Faisalabad, Pakistan

science subjects teaching and learning process. One such exertion has been made in this research work. An instructor can persuade the pupils to share their improvements, their thoughts for activity, their cognition in the course of that learning process. [1]

Flavell's Taxonomy of Meta-cognition depicted pervasive disagreement in previous psychological researches [2]. The earlier investigations had been carried out inside the system of cognitive and development psychology have given the future plans for more investigation in social cognitive and educational psychology [3]. Resulting endeavors to clear up the fluffy, obscure and uncertain nature of the idea of meta-cognition become beneficial, and the issues in misusing meta-cognition have been marginalized. There have been various examples of fruitful uses over a scope of dimensions, for example, moving a disc, moving a card, problem solving abilities related to statistics, mathematics, physics, and of any science subject [4], which depicts as, "not only in academic but also in professional areas" [5]. Since the 1970s and 1980s the comprehension of the components of meta-cognition has gained significant development. It is currently more than thirty years from the first presentation of term and findings from different researches have outlined the ideas of meta-cognition and meta-cognition theory.

Meta-cognition is seen as the superior level of mental processes which is learnt by someone and used to manage and manage one's insight or knowledge. As per Flavell (2002), it includes both meta-cognitive knowledge and meta-cognitive experiences. Meta-cognitive knowledge is tied in with "anything cognitive" and "anything psychological". [6] It includes a consciousness of one's thinking about cognitive abilities and activities, and full of affective conditions, and control over this learning so as to accomplish a particular objective. This data is alluded to as "declarative knowledge" "procedural knowledge" and "conditional knowledge". This knowledge likewise incorporates how to assess the viability of its application. Kluwe (1987) alludes to meta-cognitive procedural knowledge or executive processes which are those that scrutinize selection and use, and direct activities for resolving the issues. [7] These strategies include monitoring and coordinating other manners of thinking. [8] The method of these procedures will be examined next portion in this section. Thinking abilities are related with familiarity with one's particular cognitive and affective conditions. Meta-cognitive skills are recovered by dynamic monitoring of one's own psychological process. It can achieve modification in one's manners of thinking in that these can be coordinated into, disposed of from, or use to legitimize one's present meta-cognitive understanding. Thus, "they can cause one to

change goals" [9], and "to make decisions about how much further processing is necessary to achieve the goals" and effect the learner's performance in near future. [10] These investigations have endeavored to distinguish, by reflective process on his/her thinking processes, "components of meta-cognitive abilities" and "their development with age, and the possibility [that] meta-cognitive knowledge, abilities and strategies contribute to cognitive progress". [11]

Meta-cognition can be examined in individuals from an extensive variety of age groups, from youthful to grown-up students. For instance, "even kindergartners can accurately monitor their knowledge". [8] Contrasts in meta-cognition with girls and boys are not significant statistically. [12] For instance, Carr and Jessup inspected primary level pupils' utilization of meta-cognition in tackling numerical questions. [13] They discovered that both male and female were equivalent in the utilization of meta-cognitive facts. Furthermore, as age grows so is the sum of knowledge stocked inside memory and precision in scrutinizing this knowledge, inferring that the knowledge and meta-cognitive practices grows as people matures. A few research reports uncovered the fact that meta-cognitive skill is "fallible". Grown-ups likewise youth frequently misinterpret their own particular capacity in respect to their real performance. [14]

Meta-cognitive skills and processes seem to assume key role in each people venture. Nevertheless, one ought to be careful about giving critical issues formed on vague understanding. The rationale is that fragmented or imprecise knowledge may degrade the criteria of evaluation. Likewise imprecise or deficient control and regulation of meta-cognitive commitment can prompt unsatisfactory outcomes or lack of success. Pressley et. al., (1998) recognize that the more precise someone's meta-cognitive knowledge, the more prominent the achievement in learning. [15] Fragmented or erroneous meta-cognitive knowledge and also lacking benchmarks utilized in comprehension monitoring frequently prompts deficient or erroneous encoding. [16] Firstly, these may result in inadequate content knowledge, errands or techniques, which results in futile decisional power. Secondly, they result in the failure of students to identify issues and troubles as they happen and thwart them from understanding incoming data and information that negates what is earlier stored in memory. Subsequently, this causes in-active planning, ineffectual solution of problem and disappointing presentation that prompt absence of self efficacy, attention and inner stimulation which are the strong components for progress.

Cooperative learning is very hot topic nowadays that mostly researchers do their research in the field of education. Cooperative learning is defined as "learning position in which two or more students are working mutually to fulfill a common job. [17] The usage of cooperative learning is helpful and useful in the process of teaching and learning. But one question arises in mind, between many cooperative learning strategies which one plays a vital role in promoting student achievement and content literacy? Schools have pressure to develop the skills and competency in the students which enable them to achieve high scores in the standardized tests, and it has raised many questions such as which is the effective style to teach social studies subject. [18] Teachers may decide between lecture method, teacher centered approaches and active or cooperative learning styles. Literacy is a usual part of social studies and for the successful literacy progress the instructor of social studies has an effective role. The content of social studies textbooks often prefers student learning activities. [19] A great challenge arise because of the size and volume of the subject matter for teachers of social studies is that how to adapt the texts according to the needs of students.

In Cooperative learning a learning atmosphere provides to the learners in which two or more of them work together to fulfill a common task. [17] The Office of Education Research Consumer Guide gives a brief but comprehensive sketch of cooperative learning. Learning can be defined as a relatively permanent change in attitude or behavior as a result of past experience, either produced accidently or through teaching. Learning is a process through which a person adopts various traits, habits, knowledge and skills of life. As a long life process learning changes the entire behavior which brings improvement in our relationship with environment. Learning is important but everyone holds different views about causes, processes and consequences of learning. All theorist, researchers and practioners have their own definition of learning. [20]

Wolfgang Kohler (1887) a German psychologist defined a learning theory named as Insightful learning. [21] This Theory concerned with the nature of perception that how a student receives a thing as a whole. Gestalt psychologists interpret the learning process as purposive, exploratory and creative instead of trial and error method or a simple stimulus response mechanism. The word "insight" describes the perception of student about the whole situation and his/her intelligence response to the proper relationships. Insightful learning gives more meaning and goal orientation to the learning process.

Objectives of the Study

The objectives of the study were to:

1) Identify the effect of meta-cognitive instruction in promoting insightful learning of science students.
2) Investigate the effect of cooperative learning strategies in promoting insightful learning of science students.
3) Compare the effects of meta-cognitive instruction and CL strategies in promoting insightful learning of science students.

Design of Study

The research was carried out by using true experimental design having pre and post tests design with two experimental groups. The two experimental groups were comprised on first group for meta-cognitive instruction and second group for cooperative learning techniques. The both groups first administered a science achievement test and a meta-cognitive awareness test (MAT) as pre-test and the results were compared in order to study the equivalence of the groups. The promotion in insightful learning of the students was observed using Aha effect. The experimental groups of the study were based on the following design;

Meta-cognitive Instructions

IDEAL is the approach of identifying, defining and exploring, acting and looking Meta-. IDEAL is synonym of all the strategies applied to solve problems and think efficiently and effectively. [22]

Cooperative Learning Strategies

In this method a group of four to six students are given a task about specific contents. The participants of CL group individually reads the book at the end of lesson delivered by the teacher, all other procedures were the same. The students were asked to discuss with their pair before sharing to the whole class and explaining questions to them.

Aha Effect for Measuring Insightful Learning

A popular ‘’Aha effect’’ is strange experience that occurs in the minds of people while solving or thinking upon the solution of problem. Following four main features of insight are listed according to the ‘’Aha effect’’;

1) Suddenness
2) Ease
3) Positive affect
4) The feeling of being right

Population of the Study

The population of this study was all the students of 9th class enrolled in subject mathematics in girls' high schools within the Punjab province and the accessible population of this study was all the students of 9th class enrolled in subject mathematics in superior girls' high school district Jhang.

Sample and Sampling Technique

The researcher selected sample by using random sampling technique and the sample for this study was all the mathematics students of 9th class section A enrolled in superior Girls High School, Satellite Town Jhang. They had 69 girls in one class. The researcher took that class as the sample and divided the sample in two groups on the base of randomization of students.

Instrumentation

The science achievement test was developed by the researcher. The researcher had gone through the 9th class text book of Punjab Text Book Board. Blooms taxonomy was used as guiding principal for selecting question according to first four levels of this taxonomy. Schraw and Dennison (1994) developed and standardized an instrument to measure meta-cognitive awareness.

Experiment Procedure

To overcome threats to internal validity two equivalent groups were formed by the researcher one was given treatment of Meta-cognitive Awareness Test (MAT) and other was cooperative learning group (CL). Pretest of science achievement was conducted of all these groups to ensure equivalence and also compare effect of the treatment in posttest. The three 45 minute classes were taught by the same teacher.

The participants of CL group individually reads the book at the end of lesson delivered by the teacher, all other procedures were the same. The students were asked to discuss with their pair before sharing to the whole class and explaining questions to them. Similarly the students of MI group also followed the same procedure with the difference that they were taught by meta-cognitive strategy.

Methods of Data Analysis

The obtained data was analyzed by using descriptive statistics, t-test, and paired sample t-test, one-way Analysis of Variance (ANOVA) to find out differences between mean scores of control and treatment groups while

responding for posttest scores by taking pretest scores as covariate variable.

Ho1: There is no significant effect of meta-cognitive instruction in promoting insightful learning of science students.

Table 1: Pretest-posttest paired sample t-statistics for meta-cognitive group based on Biology test

Groups	N	Mean	SD	T	Df	Sig
Pretest	30	29.00	5.572	-9.069		19
Posttest	30	36.30	5.768	.001*		

*p < 0.05 (2-tailed)

As shown in above Table No. 1, a paired samples t statistics was applied to compare pretest and posttest scores of meta-cognitive group participants. It was found that there was significant difference exists between responses given by respondents in mathematics test conducted in both pretest (M=29, SD=5.572) and posttest scores (M=36.30, SD=5.768) where t(19) = -9.069, p=0.001. The results suggest that treatment given to meta-cognitive group participants truly helped them to perform better than the way they responded in pretest. It further suggests that if the respondents are given chance to learn using meta-cognitive based learning strategies it leaves positive effects on the level of students learning.

Ho2: There is no significant effect of CL strategies in promoting insightful learning of science students.

Table 2: *Pretest-posttest paired sample t-statistics for Cooperative Group based on Mathematics test*

Groups	N	Mean	SD	T	Df	Sig
Pretest	30	31.21	3.630	-8.014		18
Posttest	30	40.63	3.933	.001*		

*p < 0.05 (2-tailed)

As shown in above Table No. 2, a paired samples t statistics was applied to compare pretest and posttest scores of cooperative group participants. It was found that there was significant difference exists between responses given by respondents in mathematics test conducted between both pretest (M=31.21, SD=3.630) and posttest scores (M=40.63,

SD=3.933) where t(18) = -8.014, p=0.001 which is less than assumed level of alpha i.e. 0.05. The results reflect that treatment was given to cooperative group participants based on cooperative learning strategies, therefore, respondents performed better than the way they performed in pretest.

Ho3: There is no significant difference between the pre-test and pos-test results of meta-cognitive instruction in promoting insightful learning of science students.

Table 3: *Analysis of variance between both groups based on pretest scores*

Source	Df	SS	MS	F	Sig.
Between Groups	3	.236	.118	1.046	.358
Within Groups	57	6.418	.113		
Total	60	6.654			

In above Table No. 3, the results of one way analysis of variance (ANOVA) showed that there was insignificant difference exists, in pretest, between responses of both groups such as Meta-cognitive and Cooperative based on meta-cognitive inventory tool where, F(2, 58) = 1.046, p = .358. The calculated value p is greater than assumed level of alpha which was 0.05.

Ho4: There is no significant difference between the pre-test and pos-test results of cooperative learning strategies in promoting insightful learning of science students.

Table 4: *Analysis of Variance between both groups based on posttest scores*

Source	Df	SS	MS	F	Sig.
Between Groups	3.372	3	1.686	15.8	.001*
Within Groups	6.083	57	.97		
Total	9.456	60			

In above Table No. 4, the results of one way analysis of variance (ANOVA) showed that there was significant difference exists, in posttest, between responses of both groups such as Meta-cognitive and Cooperative based on meta-cognitive inventory tool where, F(2, 58) = 15.8, p = .001. The calculated value p is less than assumed level of alpha which was 0.05.

Conclusion

Meta-cognition is a solid indicator of educational achievement and critical thinking capacity. [23] On the off chance that learners trust they know everything for the test, they will presumably end their examining. The will for changing and the want for advancement in instructors originate from the need of 'spurring' learners, who appear to have lost their enthusiasm for science. The meta-cognitive procedures, which can propel learners and give them the chance to learn, comprehend and perceive the data got in class and in their ordinary life. [24] This will make the learners to be increasingly freer in confronting new circumstances. Instructors ought to enable the learners to look for comprehension by investigating and researching on their abilities with instructors as facilitators.

From this research we can induce that meta-cognitive guidelines can expand their meta-cognitive mindfulness and create in them an inspirational frame of mind towards learning. Learners must be instructed how to create furthermore, know about the techniques. Educators must improve their learners' meta-cognitive mindfulness so as to improve their learning capacities. "The more learners think about powerful learning methodologies, the more noteworthy their meta-cognitive mindfulness and the higher their classroom achievement is probably going to be". [25]

Recommendations

1) From the discoveries of the investigation, the higher auxiliary learners adapt better by the utilization of metacognitive systems. Thus there is a need to change the training techniques and methodologies received in higher optional dimension.
2) Customary techniques for encouraging science are not perfect with accomplishing reasonable learning and higher-request intellectual aptitudes. A noteworthy motivation behind science training ought to be to create instructional rehearses for creating logical thinking aptitudes, basic reasoning and basic leadership limit. Since meta-cognition is an inalienable segment in creating psychological aptitudes, learners and educators must be instructed how to create meta-cognition. State level scholastic bodies should create meta-cognitive aptitude improvement exercises.
3) Course readings are overwhelmed by decisive learning (certainties, definitions and portrayals) though procedural (knowing how, knowing why) and situational information ought to be accommodated profound examination forms. Course book

ought to be structured by bringing up important and intriguing issues and stressing applications and critical thinking. Meta-cognitive procedures ought to be consolidated in course book.

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