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EFFECTIVENESS OF METHOD OF LOCI TECHNIQUE ON MEMORY OF CHILDREN WITH LEARNING DIFFICULTIES

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Abstract

Method of Loci (MoL) is a metacognitive strategy, which helps in associating known locations with the material to be learnt in a chronological order. This study was conducted to examine the effects of the MoL strategy on long term memory recall on students with learning difficulties.

Students were randomly assigned either to the experimental group (n = 15) that was taught topics using direct teaching and MoL to remember the events in a chronological order, or the control group (n = 15) was taught using only direct teaching. The MoL group showed a significantly higher recall as was hypothesized. Application of this strategy for students with learning difficulties is discussed in the light of past findings that postulate that the MoL strategy helps in organizing information for later recall.

Key words: *History, ICSE board, Fifth grade, Memory palace*

An intact cognitive function plays a vital role in the attainment of information. Memory is one of the cognitive functions that helps in encoding, storing, and retrieving information.It is a set of capacities that enable us to interact with incoming information in order to make sense of our environments (Reid 1980).

In a typical classroom set up, students are expected to process other information while retaining verbal instructions. This calls for the role of working memory, which is the mental workplace where some information is stored while some other information is processed concurrently.

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Baddeley (1986) defined, working memory as 'a system for the temporary holding and manipulation of information during the performance of a range of cognitive tasks such as comprehension, learning, and reasoning'.

Henry(2001) studied students aged 11 to 12 years and found that the students with learning disabilities could retain only one unit of information compared to the non learning disabled students who could retain three units. of information. Thus indicating, how children having problems with working memory are at a disadvantage in a typical classroom setting.

Given Working Memory consists of four components-central executive, phonological loop, visuo-spatial working memory and episodic buffer, it is of importance to understand which component experiences the most deficit. In order to find that out Swanson and Berninger (1996) noted that children with learning disabilities have a problem with working memory especially verbal and executive working memory. Swanson, (2000) theorized that working memory deficit is not entirely a capacity deficit, instead for some students with learning disabilities it is a strategy deficit. Though, students with LD are aware of the strategies they are unable to use these strategies spontaneously and consistently

A working memory deficit clearly puts those with learning disabilities at a significant disadvantage in the classroom (Dehn, 2008).

Studies have indicated that strategy training using rehearsal,imagery, and semantic coding strategies help in enhancing working memory (Caretti, Borella, & De Beni, 2007; McNamara & Scott, 2001; Turley-Ames & Whitfield, 2003). Autin and Crozet (2012) demonstrated the positive effects of metacognitive training among children with special needs (low achievers/learning difficulties)

Metacognitive strategies are known to facilitate better recall of information. These strategies are a group of methods implemented to help student understand their ways of learning by allowing them to "think" about their "thinking". Metacognition included knowing the following about one's self:

- ✓ Learning and memory capabilities
- ✓ Which learning tasks can realistically be accomplished
- ✓ Which learning strategies are effective and which are not
- ✓ Effective learning approaches (such as finding a quiet place to study)

- ✓ Modifying learning strategies for certain circumstances (such as taking notes if material is hard to remember)
- ✓ Awareness of present knowledge status (such as knowing if you need more help with a concept)
- ✓ Knowing effective strategies for retrieval of information stored in the brain (such as mnemonics)(Ormod, 2012)

Narang&Saini (2013) studied the impact of Metacognition on academic performance of rural adolescents in Ludhiana district. The sample comprised 240 rural adolescents (13-16 years) equally distributed over four grades (7th to 10th grade), two sexes, and two socio-economic groups i.e. middle and low socio-economic group. Metacognitive skills of the subjects were assessed using a self-structured Questionnaire adapted from Metacognition Inventory and Metacognitive Awareness Inventory. The aggregate percentage of marks obtained by them in the last school examination was procured from the concerned teachers to assess academic performance. Results revealed that the major proportion of subjects with high level of Metacognition also performed above average in academics. Further, analysis depicted that both the components of Metacognition viz. 'Knowledge of Cognition' and 'Regulation of Cognition' significantly contributed towards the academic performance of the adolescents.

Metacognition involves planning how to approach a given task, monitoring comprehension, and evaluation progress towards the completion of the task. Problem solving, mnemonics, self monitoring are some of the meta- cognitive strategies.

Mneumonics are memory devices that help learners recall larger pieces of information, especially in the form of lists like characteristics, steps, stages, parts, phases, etc. There are several types of mnemonics like chunking, pegword method, and the method of loci (MoL). The focus of the current study is the MoL technique.

The encoding stage of Loci method involves (1) selecting and memorizing a series of distinct locations (2) creating an image for each item to be remembered, or if applied to passages, for each cue-word correspondent to a concept and (3) placing images of the items in the selected loci location you mean?. In the recall phase, the images to be transformed into corresponding verbal items are found when mentally retracing the Loci pathway. When using the Loci method, subjects are required to imagine twice. First, they are required to adequately visualize

the location pathway. Then they have to imagine the items or cue-words and place them in the selected location.

Qureshi, et al. (2014) investigated whether MOL leads to better understanding of the topic among students. Students were divided into two groups: group one was taught insulin and diabetes mellitus through didactic lectures and a self-directed learning session, whereas group two was taught insulin and diabetes mellitus through didactic lectures and MOL. Memory palaces (imaginary locations) for insulin and diabetes mellitus were generated by students under supervision of the teacher. A questionnaire survey and open-ended questions were given to the participants. Group two, which underwent didactic lectures followed by a MOL interactive session, showed significantly improved performance on the assessments compared with group one, which had been taught through didactic lectures and a self-directed learning session. Qualitative analysis showed that all students found MOL to be a helpful technique.

The results suggested that mediation through MOL is an effective technique in learning physiology that can also be used in other disciplines related to medicine.

Chitel, et al. (2007) conducted an experiment to study the comparative effect of pegword method and method of loci on word recall. They had one group of students who were trained to use the pegword method versus the other group who did not receive any such training. On the other hand they had one group of students who were trained in method of loci and the other group who did not receive any training. The results showed that the recall scores of groups which received the training were significantly higher than the scores of the groups which did not receive any training.

All the above studies strongly indicate the need for training the students with learning or memory problems using appropriate strategies in order to enhance their memory recall and thereby contribute to their academic success.

Purpose of the study (209)

The current study aims to assess the effectiveness of the MoL method in enhancing the memory of children with learning difficulties.

In every class we come across students who comprehend whatever is taught but are unable to explicitly recall information. Thus these students perform sub optimally and are suspected of having learning difficulties. But such academic failures that happen due to children not being

aware of memory strategies can be avoided through effective training in using meta cognitive strategies.

Among the meta cognitive strategies, method of loci helps to remember the items to be learnt in a chronological order. Since History is the subject where items are to be retrieved in a chronological order, this study attempts to find the effectiveness of method of loci on enhancing memory (retrieval) in history in children with learning difficulties.

In a way, this method will encourage students to pursue higher education without being scared of academic failure.

Method

Sample 215 words

The sample required for the study were students with learning difficulties who scored less than 35 % in their unit I and Semester I examination in the subject of History.

Inclusion criteria were as follows:

1. Students from grade five following the ICSE board.
2. Students who scored less than 35% in the Unit I and Semester I examination held in the school.
3. Students whose scores fall between +/- 1 SD from the mean score in the pre test.

Exclusion criteria were as follows:

1. Students who scored above 35% in the Unit I and Semester I examination held in the school were not part of the study.
2. Students who were certified as having disability were not included.
3. Students whose scores did not fell between +/- 1 SD from the mean score in the pre test were excluded.

Procedure for selection

Initial stage: After the schools were selected, the teachers were asked to report those children who had secured below 35% in History. All those children were given the pre-test.

Stage 1: Out of the 40 students who were administered the pre-test, 30 students were randomly selected by the investigator. The names of the students were written on a chit of paper. The names were called out randomly. As the names were being read out, the students were placed in the experimental or control group.

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Final Sample: Final sample comprised of randomly assigned 30 students with 15 each in the experimental and control group.

Instrument

The tool was developed keeping in mind Bower's (1970) list of principles that improve the workings of the method of loci technique.

In the present study method of loci was introduced and practiced using 5 History chapters. The format of each of the session was as follows:

1. Pen down the 15 locations in the experimental setting in a chronological order.
2. Read a given passage.
3. Underline cue words from the passage
4. Associate the cue words to be remembered and the cue locations
5. Use visual imagery to form associative links.
6. Use interactive images to link the cue word and its cue location.
7. During recall, list the locations to cue memory.

The test consisted of a gist of the chapter in History already assessed in the first term. Worksheet consisting of objective questions based on the passage given was prepared. Students were given the worksheet after they read the passage. They were asked to read the given passage carefully to answer the questions which would be asked based on the passage. One mark each was allotted for the correct answer. There was no negative marking for the wrong answers/spelling errors.

Procedure for Data Collection

Pre test: The pre test consisted of a passage from the History text book which was already assessed in the 1st term. After scoring the test, 10 children whose scores fell in the +/- 1 SD from the group mean were listed down. Their names were written on chits and as the names were read from the chit they were randomly placed in either the controlled group or the experimental group.

Treatment: A total of 6 sessions were planned for the students. Each session of the treatment phase consisted of one and half hours.

Design

The pre-test post-test equivalent group design was adapted for this study.

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Equal numbers of students were randomly assigned to the Control group and Experimental group. A pre-test was administered prior to the application of the treatment and a post test after the treatment period was administered to both groups.

In present study the threat of statistical regression was controlled as the students were not selected on the basis of extremely high or extremely low scores. The students were selected on the basis of set criteria +/-1 SD from the group mean.

Interaction effect of testing that is the use of a pre-test may sensitize individuals by making them more aware of concealed purposes of the researcher and may serve as a stimulus to change. This threat was controlled by randomly assigning students to control and experimental group.

Hawthorne effect that is reactive effects were negated by the provision of a control group which also participated in the pre-test and post-test.

Quantitative analysis of the data was carried out.

1. An uncorrelated t test was used to determine significance of difference between the experimental group and the control group at the pretest.
2. The paired t test was used to determine significance of difference between the means of the experimental group at the pre-test and post test.

Results and Discussion

In the present study, students from Grade 5 studying in ICSE board and who scored below 35% in History during the first Unit and Terminal examination were given the pre test. Then they were randomly placed in the experimental and control group. The experimental group was given training in the Method of Loci to enhance their memory. The effectiveness of the intervention was measured and the results are discussed below:

The data has been analyzed quantitatively using t-test. The results obtained has been summarized into tables and also graphically represented to emphasize relationship between scores obtained. Findings of the research have been summarized and based on the results; the hypothesis is retained.

The chapter is divided into the following sections:

- Analysis of the scores obtained by the experimental group on the pre-test and post-test.
- Analysis of the scores obtained by the experimental group and control group on the post-

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test.

4.1 Analysis of the scores obtained by the experimental group before and after the training in the Method of Loci.

Table 4.1: The t-ratio obtained by the experimental group on the pre-test and post-test.

Experimental group	No	Mean	SD	Df	t-value	Significance	p-value
Pre-test	15	3.46667	0.5164	14	7.36	<0.01	0.00001
Post-test	15	4.86667	0.74322				

As can be seen from table 4.1 the mean of the experimental group for the pre test is 3.46667 while the mean for the post test is 4.86667. The standard deviation of mean for the pre test is less than the standard deviation of the mean in the post test. Thus indicating that there was a change, in the data points of the experimental group for the pre test and post test. The associated t-value for the mean paired difference of pre test and post test in the experimental group is 7.36 is statistically significant (t-7.36, df=14,p=0.00001;p<0.01).

Thus the hypothesis that there will be a significant difference between the pre-test and post-test scores of the experimental group is retained. This implies that there was a significant difference between the scores of the pre test and post test of the experimental group in training in method of loci.

The result of the current study is depicted in the graph depicted below.

Fig. 4.1.1 Mean scores of the pre and post test of the experimental group

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Fig. 4.1.1indicates the mean score in the pre and post test of the experimental group. The mean score of (3.47) in the pre test is lower than the mean score of (4.87) in the post test. The difference is due to the training in method of loci which improved the scores of the students in the post test.

The findings were in congruence with the following studies:

Fontana et al (2007) study compared the relative effects of mnemonic strategies and direct instruction on academic performance. Keywords with interactive illustrations were alternated with direct instruction procedures to teach world history to studentsThe results revealed no significant differences on immediate unit tests, although the difference was seen on the cumulative delayed recall tests.

Moè.A & De Beni (2005) in a study showed that method of loci is effective when the pathway was subject-generated because of the greater involvement of imagery and with an expository passage.

4.2 Analysis of the scores obtained by the experimental group and the control group on the post test

Table 4.2.: The t-ratio obtained by the experimental group and the control group on the post-test.

Group	No.	Mean	SD	Df	t-value	Significance	p-value
Experimental	15	3.46667	0.74322	28	8.39	< 0.01	0.00001
Control	15	2.6	0.73679				

As can be seen from table 4.2 the mean of the experimental group in the post test is 3.46667 while the mean of the control group in the post test is 2.6. The standard deviation o f mean for the control group is slightly less than the standard deviation of the mean of the experimental group, indicating that the data points of the control group are closer to the mean. The associated t-value for the mean difference of the experimental and control group is 8.39 which is statistically significant (t-8.39, df=28,p=0.00001;p<0.01).

Thus the hypothesis that there will be a significant difference between the post-test scores of the experimental group and the control group is retained. This reiterates that the difference that was found between the post test scores of the control group and experimental group was

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significant due to the intervention that was received by the experimental group.

The results of this study is graphically depicted below

Fig. 4.2.1Mean scores of the post test of the experimental group and control group

Fig. 4.2.1 indicates the mean score in the post test of the experimental group and the control group. The mean score of the control group (2.6) in the post test is lower than the mean score of the experimental group in the post test (3.47). The difference is due to the training in method of loci which improved the scores of the students in the post test.

The results are in congruence with the studies done in the past.

Chitel, et al (2007) conducted an experiment to study the effect of pegword method and method of loci on word recall. The results showed that the recall scores of groups which received the training were significantly higher than the scores of the groups which did not receive any training.

Bower (1972) study showed that the group that formed interactive images recalled 80% of the words Compared to the other group that did not use interactive images recall 33% of the words.

Kemp, et al (1985) conducted two experiments, in which the visibility of the loci was varied, investigated the method of loci. Results of the experiments showed recall to be unaffected by whether the loci were visible (i.e., physically present) during both learning and recall phases or invisible (and hence imagined) during both phases. Recall was adversely affected, relative to these groups, if the loci were visible during learning but not during recall.

During the intervention phase it was seen that students took longer time to form images for chapters that involved description of an era or types of government because it was abstract, but took less time for chapters that involved life history of a famous personality because it was

concrete.

This is supported by the following studies

Maxwell, Carney, Buchanan,& Deal (2014) who investigated whether the mnemonic technique used to remember names of individuals called face-name mnemonic necessarily needs generating concrete words with the names and faces. It was found that participants remembered significantly more with concrete keywords. Consistent with Paivio's dual coding hypothesis, concrete keywords have more encoded information (i.e., both visual and verbal cues) that ultimately results in better face-name recall.

It was observed by the investigator that the students in the experimental group could remember all the 15 items in a chronological order that was used to introduce the Method of Loci even on the last day of the intervention. Though the students had learnt and rehearsed the list of words only on the first day, they could remember the list even on the last day. This was in congruence with the following studies:

Groninger (1971) showed that the group of students who used method of loci could retrieve word lists up to 25 items better than the group that used grouping as a method to learn the word lists.

Ross & Lawrence (1968) showed that college students trained in using the method of Loci could recall up to 38 of 40 words after one presentation.

Initially it was observed by the investigator that the some of the students were not very keen about trying out the Method of Loci, when they realized that it has to be used for the lessons taught in the class. But as the sessions progressed and the students got a hang of how to use the Method of Loci, they were very much involved in making the associations between the locations and the cue words.

When the discussion was done about how they were associating the locations and the cue words, the atmosphere was filled with enthusiasm and energy where everyone was trying to make weird associations as much as possible as instructed by the investigator during the training.

During the post test it was observed that the students in the experimental group were excited and motivated to share the Method of Loci with the students in the control group. But since they were instructed not to share the strategy with the control group till the post test was over,

they did not discuss it with the students in the control group. As soon as the post test was over, they asked the researcher whether they can share the strategy with the other students in the control group and were seen explaining the method of loci to the students in the control group. This behaviour in the children from the experimental group indicated an increased motivation towards learning. Similar behaviour was seen in a research conducted by Qureshi, et al. (2014) in which the students who received training in the Method of Loci showed better recall than students who received only didactic lectures. Qualitative analysis showed that after the intervention students using the method of loci had an increased level of motivation and stimulated a better attitude towards learning.

Thus there was not only a marked improvement in the memory scores due to the training in method of loci in the experimental group compared to the control group. But there seemed to be an increased level of motivation towards learning.

Implications for Practice

Repeated failures cause burnout and decreased motivation. Since they do not have any guidance to improve their memory skills, these children are suspected of having learning problems and at times may end up getting labeled as having learning disability. They continuously obtain low grades, which force them to either stop further education or choose any field which is available. So they end up making wrong career choices. To avoid such situations there should be training in appropriate mnemonics right from smaller classes, so that such children find it easier to study and retrieve the information. Research have shown there are working memory deficit in children with learning difficulties and this deficits leads to problems in retrieval of information. So it becomes very important to teach these students metacognitive strategies. Meta cognitive strategies help in associating the material to be learnt in a better way, thus enhancing memory.

A survey was conducted by Karpicke et al. (2009) to investigate whether students practice recall after studying textbook chapter or reread it and if they did practice recall was it because they knew it was a strategy to enhance learning. The results showed that majority of students repeatedly read their notes /textbook while few engaged in self testing/retrieval practice while studying. The investigators concluded that students do not engage in recall because they experience illusions of competence while studying that is thinking that they know much more

than they actually do. So teachers should make the students understand the importance of recall (meta cognitive technique), so that the students learn effectively.

Conclusion

The conclusions drawn from the research was that before the intervention both the groups, namely the experimental and control group were similar to each other in their performance on the pre test. After the intervention the experimental group showed signs of improvement in their post test performance as compared to the controlled group.

Students in the control group showed no significant improvement in their performance in the post test. Their performance at the post test was similar to that at the pre test.

At post test, the students in experimental group showed significant improvement compared to the pre test. The students were not impulsive in selecting responses. They were seen to look around for locations.

Training in Method of Loci can be concluded to help enhance memory skills in students with learning difficulties.

Instruction in Meta cognition is important because it affects the acquisition, comprehension, retention and application of learned material (Hartman, 1998).

Metacognition enables self-control over thinking and learning as students consciously and actively work through a problem become aware of their comprehension, and monitor their progress.

Proper instruction should be given and sufficient training should be provided so as to practice the strategies in the class. Hence the children should be given ample opportunity to develop proper metacognitive skills in class.

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