An Active and Collaborative Learning Practice through Mind Mapping Using Jigsaw Activity of Class Room Based Interaction in Engineering Education

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Abstract:-In the current era of education, quality of the content delivery is considered as important as the course content, to attain the objectives of the course. Quality content delivery method influences the student and emphasis on active learning strategies. This paper describes collaboration of learning practices with specialized topics in stream line approach mind-mapping using jigsaw method. The jigsaw method is an effective way to increase student engagement through group work that facilitates peer-to-peer learning. Teams of students are assigned to investigate different aspects of the topics or issue. Assign the different problems/topics to each team. Once each team members thoroughly understands his/her team's aspect of the problem in content Based Learning using Mind-Mapping, then after, new groups are formed, with at least one representative from each original team. Each individual then explains his/her team's aspect of the problem to the new group. In this way, every student learns every aspect of the problem/topic. Each group expected to explain their aspects to other team members in Expert Team, then uses the combined information to evaluate a summary issue. In our study we have divided the five members as a team and batches and assigned the different problems of different topics to all the teams. Analyze the student's performance batch wise, formative assessment and summative assessment has performed. This approach can index that in one session all students are learned in cooperative learning with Mind-Mapping and each student in each group becomes an 'expert' on a smaller part of problems /topics.

Keypoints: - Active Learning Strategy, Content Delivery Method, jigsaw Method, Mind-Mapping.

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1. INTRODUCTION

Collaborative learning practices (CLP) are being implemented for the undergraduate students to promote group learning and team skills. A two hour CLP per hour is conducted every week for a course. The students start discussing and sharing the content in the CLP classes. At the end the student's ability is tested by using various assessment methods. This paper presents mind mapping technique using flow charts for teaching data structures course for improving the memory skills. This wills in turn helps in developing higher order critical thinking skills. The students are being explained about the content using mind mapping approach using the flipped classroom approach. It will helps in building the visualizing skills.

How difficult is it to update that content? After add input and shape a map to reflect the thinking, sharing the content can be mapping with pictorial representation. Generating specific content for a presentation still requires developing presentation content separate from its source. If we want to share only a portion of a map during a presentation with all associated sub portions of the presented portion of the topic. Mind-Mappings must become even better presentation media to truly capitalize on the value of interactive presentations.

In this paper we talk about Mind-Mapping using the Data Structure is a computer subject [1], which is hard to teach and learn, because it has the characteristics of various knowledge, strong theory and abstract. Therefore, we introduce mind mapping, the GUI-tool for knowledge organization and management into the Data Structure teaching. At first, the paper gives a formal expression to the mind mapping. Based on this, we propose the method to create a mind map based on iteration and the divide and conquer strategy with a practical example, and comparative learning based on mind map as well. The method does a great help to improve students' knowledge reorganizing and induction skills, and also helps students to understand

knowledge better. Finally, the validity of mind map in the Data Structure learning has been verified by the empirical analysis of the students' scores between two classes, one of which use Mind-Mapping and the other does not performed well.

A mind-mapping is a diagram used to visually organize information. A mind map is hierarchical and shows relationships among pieces of the whole [1]. It is often created around a single concept, drawn as an image in the center of a blank page, to which associated representations of ideas such as images, words and parts of words are added. Major ideas are connected directly to the central concept, and other ideas branch out from those. It is a spider form to describe the sub topics of the portion. Mind maps can be drawn by hand also, either as "rough notes" during a lecture, meeting or planning session, for example, or as higher quality pictures when more time is available. Mind maps are considered to be a type of spider diagram.

2. LITERATURE REVIEW

Collaborative Learning Technique is the practice that students are used to help them make the most of small group learning. A mountain of evidence shows that students who learn in small groups together exhibit higher academic achievement, motivation, and satisfaction than those who don't. Collaborative learning puts in building their own minds. Collaborative learning activities are effectively used in Mind-Mapping activity and Jigsaw activity.

Forming student teams can be an effective teaching strategy for several reasons. First, it allows the instructor to support students in learning a valuable skill that employers continually rank as critical to workplace success: how to work together and support each other in learning and discovery. Second, becoming effective and productive team members allows students to develop their independent learning skills by working individually on a portion of a group that makes them accountable not only to the instructor but also to team members. And finally, integrating teamwork into a course can result in adding structure to out-of-class time and increasing student accountability for their learning. Obviously, team-based learning is not appropriate for all content, but it can usually be adopted in some form in any course.

A. Collaborative Learning as a Group Discussion Platform.

In this Activity students can sit as a group and can share their ideas and content of the portion. Every member of the group is learning about a portion of the topic and individual thought of the topic. Student's can elaborate in different ways about the topic. In each and every group, students can share strengths and also develop their weaker skills. They develop their interpersonal skills. They learn to deal with conflict. When cooperative groups are guided by clear objectives, students engage in numerous activities that improve their understanding of subjects explored.

3. PROPOSED SYSTEM

A. *Interactive Discussion:*

Many of us think of presentations as lectures. Someone stands at the front of the room, often behind a podium, projecting slide after slide onto a screen. The flow of Mind-Mapping un action is unidirectional from the instructor to the students Even if the presenter engages the audience in a dialog, the results of the interaction is not easily edited during presentations. All of us are asked to present information regularly. We just do not think about them as presentations. Most of the time, we distribute printouts or project source files onto a screen. We use documents, spreadsheets, and Gantt charts to share the information. This limitation ultimately represents a great loss. Presentations have a limited ability to incorporate feedback Mind-Mapping edictally to advance team efforts. New presentations must be developed and new meetings must be called to present the information you could have developed and shared Mind-Mapping edictally.

B. *Jigsaw Cooperative Learning Activity*

1. The jigsaw classroom is very simple to use. If you're a teacher, just follow these steps:
2. Divide students into 5- or 6-person jigsaw groups. The groups should be diverse in terms of gender, ethnicity, race, and ability.
3. Appoint one student from each group as the leader. Initially, this person should be the most mature student in the group.
4. Divide the day's lesson into 5-6 segments. For example, if you want history students to learn about Eleanor Roosevelt, you might divide a short biography of her into stand-alone segments on: (1) Her childhood, (2) Her family life with Franklin and their children, (3) Her life after Franklin contracted polio, (4) Her work in the White House as First Lady, and (5) Her life and work after Franklin's death.
5. Assign each student to learn one segment, making sure students have direct access only to their own segment.
6. Give students time to read over their segment at least twice and become familiar with it. There is no need for them to memorize it.

7. Form temporary "expert groups" by having one student from each jigsaw group join other students assigned to the same segment. Give students in these expert groups time to discuss the main points of their segment and to rehearse the presentations they will make to their jigsaw group.
8. Bring the students back into their jigsaw groups.
9. Ask each student to present her or his segment to the group. Encourage others in the group to ask questions for clarification.
10. Float from group to group, observing the process. If any group is having trouble (e.g., a member is dominating or disruptive), make an appropriate intervention. Eventually, it's best for the group leader to handle this task. Leaders can be trained by whispering an instruction on how to intervene, until the leader gets the hang of it.
11. At the end of the session, give a quiz on the material so that students quickly come to realize that these sessions are not just fun and games but really count.

4. PERFORMANCE EVALUATION

Formative evaluation is the modifier "formative" clearly implies, is intended as an evaluation that is capable of influencing the on-going development of an innovation. Such Mind-Mapping active evaluation is concerned with assessing the merits of the innovation and implies some form of the finall judgment using the summative assessment. In this practice we assess the students in TWO ways, before mind-mapping the status of the students can be analyzed using the formative assessment. In this case we found that some of the students poor in subject. We gave the other topic and asked them prepare using Mind-Mapping; at the time of presentation we found that some of the students improved something good in their performance. We assess the group of the students using formative assessment, and compared with previous presentation.

In this paper we analyze the student's performance in different ways. First we examine in formative assessment with individual board presentation and after that those students have to appear the test. Before Mind-Mapping we examine the student with one class test. After that we conducted one test known as the summative assessment, here we analyze the student's final status where he is? Secondly we examine the students using formative assessment, this assessment is applied after the Mind-Mapping activity which is conducted in CLP sessions.

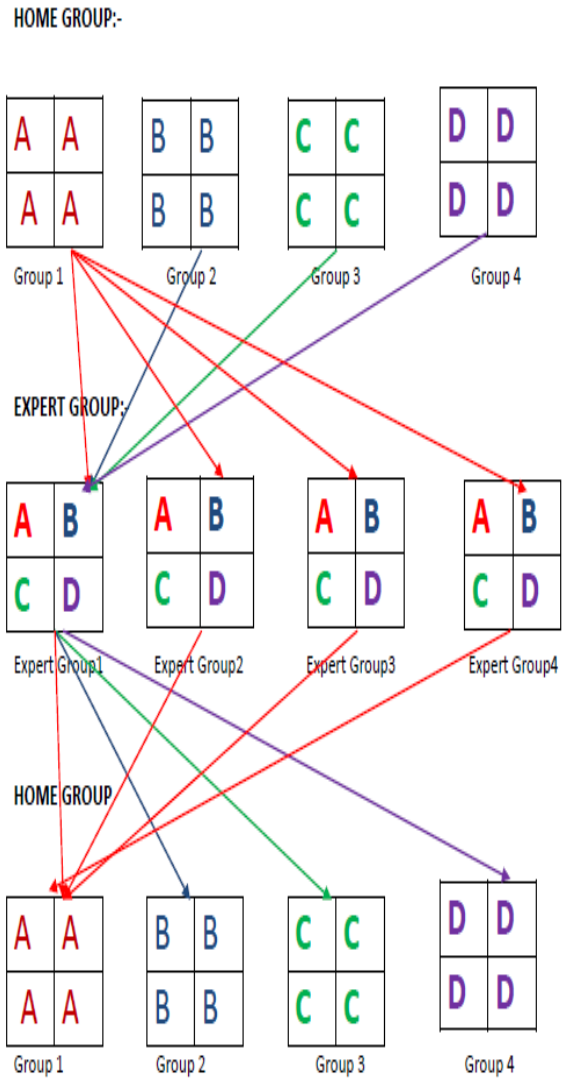

Figure 1: Jigsaw Activity with Group wise

In this formative assessment we examine with individual board presentation and after that conducted a test to know the student's improvement after the Mind-Mapping In this paper we present the student's improvements with graphical representations. We are not presents this graphs only on topics, also focused on entire subject with all the neighbors of the topic also the subject [14]. We found that students can enhance not only in topic wise, improved with respect of the subject.

Table 1: assessment for Formative and Summative with presentation individually.

	Before Mind-Mapping Formative Assessment		Summative Mind-Map Assessment	After Mind-Mapping Formative Assessment		Summative Mind-Map Assessment
Sample	Presentation1	Test 1	Test 2	Presentation 2	Test3	Test 4
Student 1	B	20	22	A	23	25
Student 2	C	15	20	A	20	23
Student 3	A	20	23	A+	22	24
Student4	A	21	25	A+	23	25
Student5	B	13	17	A	20	22
Student6	B	19	23	A	21	24
Student7	B	17	23	A+	21	25
Student8	C	16	20	A	22	24
Student9	A	19	23	A+	23	25
Student10	B	17	20	A	20	24
Student11	C	14	19	B+	19	23
Student12	C	12	19	B+	19	23
Student13	B	14	20	A	20	23
Student114	A	19	22	A+	21	25
Student15	B+	18	21	A	21	24

A=23, B=20, C=18 **A+= 25, A= 24 B=23**

We also examined the students in summative assessment and we find that not only regular students, below average students also improved a lot. From this activity

In each group we assess the students for final judgment, by using the summative assessment. In this assessment we are implementing it before Mind-Mapping what is the status of the student in the respective portion of the subject, and also assess the status of the student after mind-Mapping. Here we found a lot f differences between these two assessments on the same batch we found the memory power of the students. we are examined the student's that, what is the final improvement of the students, by comparing the status report of the formative assessment before Mind-Mapping, and status report after Mind-Mappings.

Here we analyze the students in THREE ways of formatives. First assess the students using formative assessment, in this formative assessment, we analysis the before Mind-Mapping and after Mind-mapping, the students are improved maximum 20% to 25% of better performance on average students. In this context some of the students those who are the good and Ok (satisfied) students are improved [4],[11]. But we focus on not only topics, the students who are the good they can be able to explain the collaborated all neighbor topics. . We follow for this activity, collaborative learning practices with group wise, because as group they can collaborate the portion of the topic.

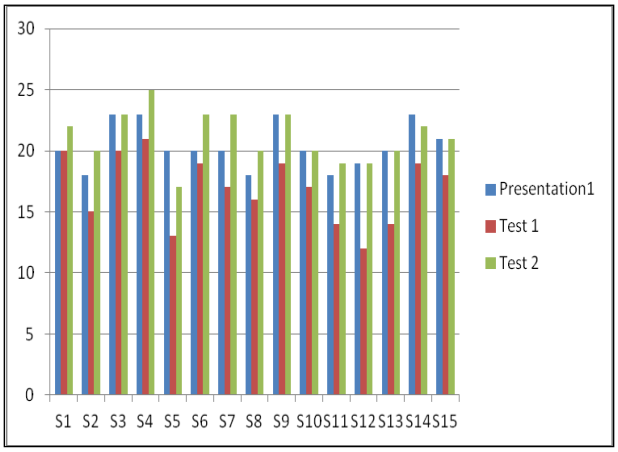

Figure 2:- Formative assessment of students before Mind-Mapping Activity.

The evaluation the student's status using formative assessment, in which here one is board presentation and another one is clip test (Test-1)[14], finally summative assessment to find the improvement of the student's before Mind-Mapping activity[1,14].

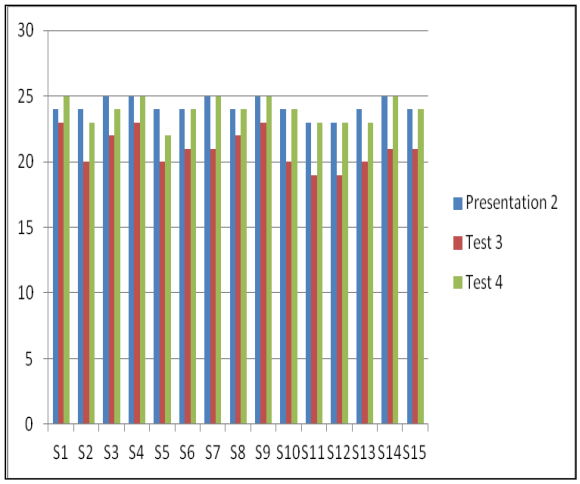

Figure 3:- Summative assessment of students before Mind-Mapping Activity

The evaluation the student's status using formative assessment, in which here one is board presentation and another one is clip test (Test-3), after the Mind-Mapping activity. Finally summarize the student's status using the summative assessment to find the improvement of the student's after design the all topics with subject-wise using Mind-Mapping activity[1],[7],[14]. We found that most of the students learning all the contents of the portions, and also the associated topics of the subject.

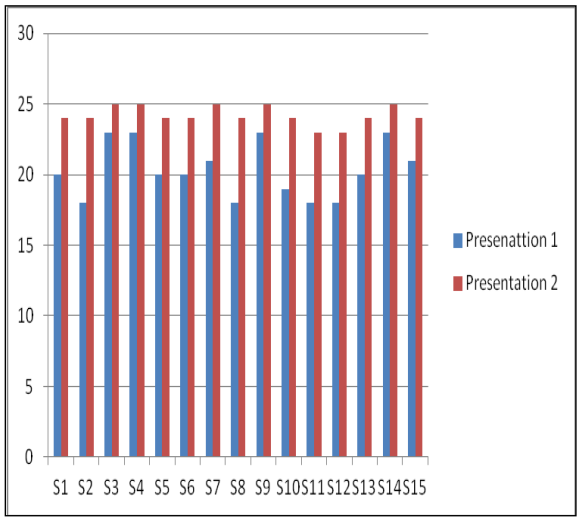

Figure 4:- Students performance on board Presentation

The evaluation of Student's performance in presentation 1 which is conducted before Mind-Mapping and presentation 2 which is conducted after the Mind-Mapping [14]. We found the students presentation that they can talk about any of the topic in the academic curriculum in the in easiest way.

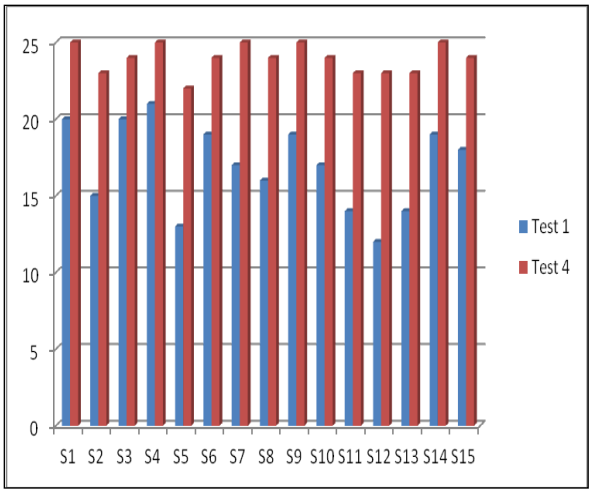

Figure 5:- Students assessment in before and after the Mind-Mapping Activity

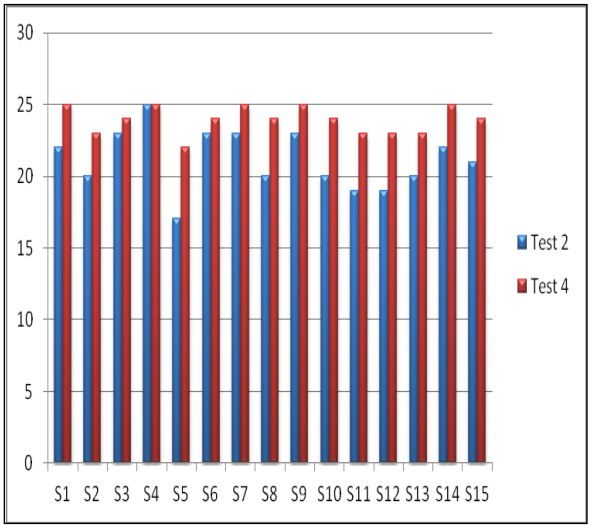

Figure 6:- Students assessment in Summative assessment

Finally we will analyze our student's status using the summative assessment [4]. The evaluation of a Students performance and compared exact improvement of the a students in test 1, which is the conducted before Mind-Mapping[1], and evaluation of a Students performance in test 4, which is conducted after the Mind-Mapping. We found that maximum of the students are reached up to the top level in an internal presentation and clip tests of the CLP sessions[3],[4],[5].

5. CONCLUSION

In India, Mind-Mapping is known to each and every villager, literate and illiterate and works with the mind-mapping techniques. They always applied this activity in their daily work locations also. We present in this paper how to learn the concepts in a particular course, topic and the related subtopics in engineering effectively. In this study we focused on the effective use of mind mapping technique, which helps the students to understand and learn the content/ concept very easily because of the path connectivity among the topics and the diagrammatic representation of it and hence can be stored in his memory permanently. Additionally, study has been carried out in which students are divided into two batches and assigned the same topic to both. Found the result that the batch which is applying Mind–Mapping Techniques has performed much better than the other batch.

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7. REFERENCES

[1] Daniel Long, Dr. David Carlson (fall 2011). Mind the Map: How Thinking Maps Affect Student Achievement. Vol. 13, Issue 2, Networks-An Online journal for Teachers Research.

[2] Black, P., Harrison, C., Lee, C., Marshall, B., & William,D. (2003) Assessment for Learning: Putting it into practice. Berkshire, England: Open University Press.

[3] Sadler, D.R. (1998) Formative assessment: revisiting the territory. Assessment in Education,5(1),77-84.

[4] Assessment and Collaborative Learning practices in Class Room: http://bit.ly/d3dEy5.

[5] Fun, C., Maskat, N.: Teacher-centered mind mapping vs student-centered mind mapping in the teaching of accounting at pre-U level - an action research. Procedia Soc. Behav. Sci. 7,240–246 (2010).

[6] Tee, T., Yunos, J.M., Mohammad, B., Othman, W., Yee,M.H., Mohamad, M.: The development and implementation of Buzan mind mapping module. Procedia Soc. Behav.Sci. 69, 705–708., (2012).

[7].Somers, M., Passerini, K., Parhankangas, A., Casal, J.:Using mind maps to study howbusiness school students and faculty organize and apply general business knowledge. J. Manage. Educ. 12(1), 1–13 (2014), Digital Educational Mind Maps 29

[8]. Kokotovich, V.: Problem analysis and thinking tools: an empirical analysis of nonhierarchical mind mapping. Des. Stud. 29(1), 49–69 (2004).

[9]. Naps, T., Fleisher, R., McNally, M., Roßling, G.,Hundhausen, C., Roger, S., Almstrum, V.,Korhonen, A., Velazquez-Iturbide, J., Dann, W., Malmi, L.: Exploring the role of visualization and engagement in computer science education. In: Report of the Working Group on “Improving the Educational Impact of Algorithm Visualization” (2002),

[10]. Buzan, T., Buzan, B.: The Mind Map Book. Plume, New York (2000).

[11]. Collaborative Learning Structures Strategies and Techniques:http://www.gdrc.org/kmgmt/c-learn/methods.html

[12]. Aydin, G., Balim, A.: Technologically-supported mind and concep maps prepared by students on the subject of the unit “systems of our body”. Procedia Soc. Behav. Sci. 1(1),2838–2842 (2009).

[13]. Jbeili, I.: The impact of digital maps on science achievement among sixth grade students in Saudi Arabia. Procedia Soc. Behav. Sci. 103, 1078–1087 (2013)

[14]. Journal of Engineering Education Transformation, Special issue on ICTIEE-2017, Issue No.119.,Valume 30,No.3ISSN 2349-2473, eISSN 2394-1707., January-2017.

[15] Noonan, M.: Mind maps: enchancing mindwifery education. Nurse Educ. Today 33,842–847 (2013)