

Concept Mapping Strategy and Learning Achievement: A Systematic Review

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Abstract:- Concept mapping is an essential tool for the development of the learning achievement of the student. It plays a very important role in the understanding of concepts, facts and information in a visual form. As per the current generation of teaching-learning process concept mapping is an essential tool to deliver the content and make students comfortable with teaching learning and their learning achievement. This paper deals with a systematic review of related literature on concept mapping. To find out the relation between concept mapping and the learning achievement of learners. For this purpose, studies related to concept mapping were collected from various sources like Research Gate, Google scholar, Shodhganga, Dissertation, Conference papers, and Online sources and analyzed for significant conclusions. Conclusions were made and thoroughly analyzed with the help of subject experts.

Keywords:- Concept Mapping, Learning Achievement Teaching Learning.

I. INTRODUCTION

Concept mapping is an instructional tool and strategy for the learner to integrate knowledge and create a new concept with the help of the association of facts or information (Torre, Durning, Dalay,2013). Concept mapping helps the students to integrate, organise new knowledge, and remodel the structure of knowledge. (Kalyuga,2009). Concept maps also help students to promote meaningful learning (Schroeder et al., 2018). Meaningful learning also has a positive emotional dividend in that the learner feels they are in control of what they have learned and able to use that knowledge to solve problems or facilitate further meaningful learning. It also helps the learner to organise and represent thoughts and ideas so which can help the latter represent a strong positive intrinsic motivation of the learner, in contrast to the extrinsic motivation that occurs with rote learning. Where the main dividend is a high test score. Moreover, knowledge gained in meaningful ways tends to last longer, serves to

facilitate future learning, and can be used to solve new problems and creative thinking. Present education has changed the scenario of student learning, they become more talented and curious about their teaching-learning process. Until they learn to express themselves student learning achievement is not able to increase. Concept mapping is a graphical presentation of concepts which helps students or learners to secure good marks in a semester or examination. The way they organized the fact and figures helped to interpret them in sequential order and show an understanding of the situation. Good presentation is needed for high achievement in the field of the teaching-learning process, it enhances the learning achievement of the student at different levels (Corre,2021; Schmid,2021.).

II. OBJECTIVE OF THE SYSTEMATIC REVIEW

This study focuses on the concept mapping strategy to find out whether the concept mapping affects the academic achievement of the students or not. whether the concept mapping has a greater effect on the thinking abilities of the students. This systematic review emphasizes concept mapping as a strategy for improving the teaching-learning process of the students at different levels to enhance the academic performance of the student to develop their careers and achieve their goals in life and also emphasizes the quality of the teaching process.

III. SOURCE OF RELATED LITERATURE

In the present review paper, the investigator used the study on concept mapping strategy on academic achievement of the students as the major observation. the investigator searches the primary database, google scholar, web science, Educational Resource Information Centre (ERIC) ProQuest digital platform, Shodhganga, Shodhgangaotri, Research Gate, etc. From there, the researcher collects the published article, published thesis and unpublished thesis taken in to review the related literature relating to the Concept Mapping Strategy and Learning Achievement.

IV. METHODOLOGY

A comprehensive literature review was done from Google Scholar, Web of Science, Educational Resource Information Centre (ERIC) ProQuest Digital Platform, Shodhganga, Shodhganga and Research Gate. Dissertations and articles were undertaken from 2009 to 2021. These electronic platforms were selected and obtained the

review paper on concept mapping strategy. The reference list of the retrieved articles and evaluated papers had been evaluated for any study. Few studies were undertaken that only emphasize concept mapping as a strategy for the teaching-learning process. which influence the learning achievement of student at different level of education. Therefore, a systematic review was collected by the researcher and evaluated thoroughly

V. REVIEW OF RELATED LITERATURE

SL NO	AUTHOR AND YEAR	TOPIC	METHOD AND SAMPLE	FINDINGS
1	Leake, David.B.Magu guhitman et al.(2004)	“GOOGLING” FROMA CONCEPT MAP: TOWARDS AUTOMATIC CONCEPT-MAP- BASED QUERY FORMATION	Descriptive method	Electronic concept mapping tools provide a flexiblevehicle for constructing concept maps. Linking conceptmaps to other concept maps and distributing them is helpful for users to consult additional resources to their memories.
2	Udofia,Dr.Nsikak Abasi.(2005)	A study of thestatistical interaction of gender, ability leveland methods in concept map	Experimentalstudy 70 samples	The significant interaction between gender and ability group so there was a need to apply caution when reporting results on these variables as one cannot say exactly where was responsible for the result obtained and at what level.
3	Navarro, leonel Iriarte.,and et al. (2014)	Concept Maps andLearning Objects	Content analysis	Compare the techniques of a concept map with the initiative for packing the content developmentdeveloped by themselves to produce more portable and powerful concept is stated.
4	Oppl, Stefan., Stry, Christian. (2014)	Tabletop ConceptMapping	Structural elaboration	The tablet concept mapping techniques and tool whichis supposed to meet this requirement provide an openspace to express individual thoughts and ideas it maximizes openness concerning parametric semantics take and syntax of modelling and minimizing intervention through features in relevant properties of the artefact
5	Lima,Glaucia Meceda and et al.(2017)	A Concept Map of Neonatal Hypoglycemia	observational, descriptive, mixed qualitative and quantitative study	A concept map is based on a testimonial from a physician the data were analyzed by the man Whitney test and fisher exact test and found that significant difference in the age of men and women.
6	Marquez,Luis Manuel Tobarja., and et al.(2017)	COLLABORATIVE LEARNING: USE OF THE JIGSAW TECHNIQUE IN MAPPING CONCEPTS OF PHYSICS	quasi-experimental, with 28 students	The result of a pre-test and post-test were compared for two groups where students who are collaboratively constructing concept maps using the JIGSAW perform better in learning and develop a positive attitude of the student toward how the topic is thought and also it found that the experimental group students were very encouraging despite the insecurity they felt with something that they have used the experimental group pre-test and post-test are highly correlated.
7	Araujo, Elinel. And Santos, Roberto .(2018)	CONCEPT MAPS TO PROMOTE LEARNING IN ZOOLOGY	Content analysis 59 first-year students	The concept map produced is discussed herein with a focus on their importance to improve understanding of animal taxonomy the strategy of building a concept map related to invertebrates was well perfected by the student and two concert maps built in the

				teaching and learning process are being used in another classroom.
8	Correia, Paulo. Et al (2018)	The Multiple Uses Of Concept Maps For Planning And Developing A Mooc On Concept Mapping	Conference paper	Concept mapping technique critical to ensuring a high-quality concept mapping regarding the geographical structure and content accuracy.
9	Levine, Eli. and Butler, J.S. (2018)	Causal Graphs and Concept-Mapping Assumptions	causal graph as the researcher perceives	A causal relationship between two or more concept maps found that two ideas can be deconstructed from taking holistic to education and educational success.
10	Dorttepe, ZimraUlker., Arikan, Bilgen.(2019)	Use of Concept Maps in Nursing Education	Thematic paper	Investigator in nursing education concept map can be used as a method for combining practice and theory case management academic writing and study skill of nursing students
11	Fitrianingdh, S. et al.(2019)	Concept map and problem-based learning	classroom action research 34 X-grade students.	Percentage of concept mapping pre-cycle, cycle and post-cycle, repeatedly have a range of value of 4.62 to 20.80% 11.56 to 24.25% and 12.142 3aan n 0.86an % with an average increase in the first cycle thus the application of problem-based learning to increase the percentage of concept mapping score based on the linear increase in the average component of HP B and E
12	Kinchan, Ian m., and et al. (2019)	Uncovering Types of Knowledge in Concept Maps	descriptive e determination of map quality.	The positive impact on the quality of student learning in a variety of disciplinary contexts and educational levels from primary school to university level by helping the student to connect ideas and develop product knowledge.
13	Kodam, Kapil., and et al. (2019)	Quantitative Evaluation of Concept Maps: An Evidence-Based Approach	robust evaluation method from the analysis of evidence first-year engineering undergraduate CS students	This study analysed concept maps that have been used as a tool for the assessment of student learning where the teacher is required to evaluate concept maps manually. The model shows several learning actions such as adding links and connections. Seem to be a predictor of a good concept map
14	Nji, Cecilia. (2019)	Concept Mapping Strategy	Experimental method	The student thought selected chemistry concept with the use of concept mapping strategy performed significantly better than the student or chemistry concept without concept mapping
15	Wang, shun- Ho. (2019)	Instruction Design and Strategy of Concept Mapping	the instruction design philosophy of concept mapping	The investigator found that contributing to the construction of memory knowledge the communication and negotiation of meaning the evolution and improvement of learning results also contribute to the organisation of information and the innovation of ideas. It is still regarded as a powerful teaching tool.
16	Balik,Ozlem. and et al.(2020)	Effects of web-based concept mapping education on students' concept mapping and critical thinking skills: A double blind, randomized, controlled study☆	Experimental method Second-year nursing students	There was a significant difference in consent mapping scores between the Student of the based concept mapping education
17	Eachempati, Prashanti., et al. (2020)	Concept Maps for Teaching, Training, Testing and Thinking	Case study	This study that the usage of concept maps for teaching testing training and thinking implies students construct a concept map chain with link functioning through relationships.

18	Habul, Robert., and et al. (2020)	Testing of a Program to Automatically Analyze Students' Concept Maps	Second-year students in a core curriculum pharmacist therapy course Correlation al method	There was a significant correlation between the two systems for the study also shows that adding game elements in concept assessment can improve student concept maps and certain test time students' tools.
19	Khotimah, Rita pramujiyanti., Sari, Christina., Kritika, M.(20 20)	The Effect of the Concept Map Learning Model on Student's Reasoning	Experiment al study, 35 students of IVB semester	The p-value of 0.012 is greater than 0.5% hence null hypothesis was rejected which implied that the scores of the post-test of the two classes were different at the 5% level of significance. It indicates a significant difference in the reasoning skills of students and the increase in the reasoning of students in the experimental classes is higher than in the control group.
20	Murugan, John D., and etal. (2020)	Activating student engagement with concept mapping: A Web GIS case study	Case study	Illustrate a design and implementation of having students create concept mapping as a part of the learning process around building customers with GIS and illustration how students build concept maps and encourage student interaction specific to course content
21	Sanchez, M., and et al.(2015)	Concept Mapping as an Instructional Strategy for High School Biology	Experiment al research	The export provides a map of significantly increased influence-based learning outcomes. Building a concept map and decreasing the coherence of the navigation path elaborated and did not improve learning outcomes. Another finding that collaborative the cognitive load hypothesis shows that building a concept map is a challenging task
22	Sivaraman, Shreekanth k.(2020)	CONCEPT MAPPING, AN INNOVATIVE EDUCATIONAL TOOL FOR LEARNING BIOCHEMISTRY	Experiment al method 150 students of the 1st MBBS	The mean value of the score control group and test should be the statistical significance of the individual score of the test group. Also found that to be better than the knowledge of the subject
23	Srivastav, Anveshna., and et al.(2020)	The quality of concept maps is affected by map-building strategies	Explorative research two separate groups of university students (N = 38 (18 + 20))	The investigator asked individuals to build concept maps related to two separate concepts in biology and chemistry respectively and found that students constantly followed the same order of element placement that the begin significant difference in the quality of the eventual map resulting from the student's map building strategy.
24	Wang, zhe., and et al.(2020)	Effects of different concept map activities on chemistry learning	Experimental study	The map translation group significantly outperformed the fill-in-the-concept and fill-in-level groups in conceptual understanding indicate by open and at questions while there was no significant difference among the three groups in conceptual understanding.
25	Arumugam,sashikumar(2021)	"Concept mapping – an innovative approach to learning	Experimental study first-year MBBS students	The significant improvement between pre-test and post-test scores and participants' workshop and felt concert mapping was an innovative way of learning it could assimilate complicated subject matter.
26	Cora, Milagros I.revara., and et al.(2021)	The Power of a Doodling Brain: Concept Maps as Pathways to Learning	Thematic paper	The investigator emphasized the ability to visualize and understand the relationship of the critically important medical concept remain an invaluable skill which can be reflected through diagramming concept mapping and doodling.

27	Daniel, Oliveira. and et al. (2021)	CONCEPT MAPS COLLABORATIVE CREATION IN PRODUCT LIFECYCLE MANAGEMENT	Explorative research	The author explores the creation of a concept map focused on the product life cycle helped the participant navigate data information from other teams using their mental model creating a connection between their information environmental and one of the other teams.
28	Dmoshinskaia, Natasha., and et al. (2021)	Giving feedback on peers' concept maps as a learning experience: does the quality of reviewed concept maps matter?	Experimental study 77 students	Investigate the effect of the level of quality of the reviewed product on the knowledge acquisition of feedback provider as well as the role of prior knowledge the investigator include 77 participants and found that there was no interaction with the level of prior knowledge possible implication for practice.
	Enebechi, Dr. Reginal., Nzewi, prof. uchenna M.(2021)	EFFECT OF CONCEPT MAPPING AS INSTRUCTIONAL SCAFFOLDING ON STUDENTS' ACHIEVEMENT IN BIOLOGY	Experimental study, 140 senior secondary two biology students	The concept mapping used as a scaffold was more effective than the one without a scaffold in enhancing achievement in biology the finding equally indicated that there was no significant interaction effect of gender and strategy on students' mean achievements score in biology

Table 1:- Review of Related Literature

VI. CONCLUSION OF SYSTEMATIC REVIEW

Concept mapping helps the student to relate the resources and distribute them to additional resources to their memory (lake, et al, 2009) this technique initiate content development by the students to produce more portable and powerful concept (Navarro et al, 2014.) sometimes the strategy provides the open space to the student to express individual thought and it who is can be maximizing openness and modelling the various concept in teaching-learning (Oppl and stare,2014.) The concept of focusing on the importance to improve the understanding the human and animal behaviour are using a concept map to correlate concert with one another (Araujo and Santos,2018) student correlate the concept in various situation and the concept leads to the development of the critical thinking and also there able develop with the quality concept in various concept (Corria, and et al,2018.) Students utilizing the concert made for both the theory and practices (Dorttepe,2019.) So the quality of student learning in various disciplinary contacts and educational levels from primary to University it's helping the student to connect Ideas and developed productive knowledge (Kodam et al, 019.) Further concept mapping emphasizes the ability to visualize and understand the relationship of critical concepts invaluable skill which can be reflected through diagramming concept mapping (Cora and al,2021)

VII. LEARNING ACHIEVEMENT

Most of the studies found there are significant differences between the experimental group and the control group in terms of academic performance gender pre-test and post-test scores and they found that also the experimental group is higher than the control group. Students increase their reasoning and develop critical thinking for those who belong to the experiment group or experimental classes higher than the control group (Khotimah et al,2020.) An article found

that there is no interaction with the level before knowledge and its practices (Dmoshinskaia and al,2021.) Another researcher found the opposite opinion like there is no significant interaction effect of gender and strategy on student achievement scores (enabechi and Nziwe,2021).

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