

CONCEPT MAPS LEARNING STRATEGY IN HIGHER EDUCATIONAL PERSPECTIVES OF PAKISTANFouzia Ajmal¹, Ajaz Shaheen², Muhammad Hafeez*³ (Corresponding author)**Original Article**

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Abstract

In this era, the learning process has become more complex. Students from lower grade to higher education have to require powerful tools to understand difficult ideas. Concept maps can be successfully implemented in higher and professional education. The present research was designed to assess the usefulness of concept maps learning strategy for higher education in Pakistan. The Concept Maps are graphical or view devices for assembling and linking information. These are utilized for creating connections between concepts in the form of connected boxes. Quasi-experimental designed of study was used for the current research. The marks obtained in pre- and post- tests of students were analyzed by SPSS for three types of items (Knowledge, Comprehension and Application). The results of the research indicated a significant influence of concept maps learning strategy on the student's knowledge, comprehension and application.

Keywords: Effectiveness, Concept Maps, Experimental Study, Knowledge content, Pakistan

Introduction

Learning is a fundamental human need and a crucial element of a nation's progress. Learning is a decisive, cognizant as well as difficult procedure, (Lestari et al., 2019). The key characteristic of learning is that, learning contains a multi-layered collaborative coordination surrounding ecological, communal, Self-directed, emotive as well as mental aspects, (Huang et al., 2017). Numerous teaching methodology has been established to increase the scholar knowledge. Therefore, these learning approaches change from the learning philosophies describing the teacher performance, scholars as well as the subjects. At prevailing time in Pakistan, regularly social performs are in fashion in institutes, where scholars are inactive as well as teacher is dominated in classroom (Koufou, 2016; Hafeez et al., 2020). Therefore, in 2006, National Curriculum emphasized for the pattern change from the behaviorism theory to constructivism approach to develop mental learning in science as well as growth of insolvency to science education, (Govt. of Pakistan Report, 2006). Different learning methodologies are being used across the world, especially in industrialized nations, including computer-based idea mapping (Amemado, 2014). These nations are promoting critical thinking and problem-solving abilities in their students via the use of computer-based learning tools (Ali et al., 2017; Hafeez, 2021).

Media-based knowledge is a significant method of education. To create learning materials for the students, teachers employ learning media (Wanek & Nae, 2017). To help students readily comprehend the learning process, the instructional materials must be practical, engaging, and appropriate for their level of comprehension. An excellent learning tool encourages students and

produces greater results (Yamada & Yamada, 2018). When students use learning media during the learning process, their presenting, communication, and critical thinking abilities improve as well (Abdurrahman et al., 2018). As a result, teaching-learning methodologies call for a certain kind of curriculum that allows students to participate in the construction of their own knowledge while also keeping them at the center of the learning process and the instructor acting as a support.

Concept Mapping

The primary goal of twenty-first-century learning is to assist students in generating valuable and meaningful information that can be used to a variety of creating and addressing real-world issues (Hidding et al., 2018). The globe, with all of its difficulties including speedy development of facts and learning processes, as well as increased demands on the learning system creates an encounter for students to enhance their learning skills in order to compete with these complications. Thus, the primary goal of curriculum in schools, colleges and universities is to promote theoretical and conceptual learning that underlies students' development (Rimini & Spiezia, 2016).

D. Novak was the first to introduce concept maps (Novak & Gowin, 1984). He created this valuable tool based on Ausubel's learning ideas. A conceptual diagram called a concept map combines several concepts into a single figure. By using connecting words to create meaningful sentences, the concepts are meaningfully connected. Concepts are often depicted in these concept map diagrams as boxes, and the links between them are shown as arrows with joining different words (Ausubel & Barberán, 2002). Concept maps strategies show how students acquire knowledge and apply it to practical issues. The concept maps also help students in accepting the material supplied according on their mental level (Wang et al., 2017). Concept maps are diagrams in two dimensions that show information. Concept maps based on technology are employed in the teaching and learning process nowadays (Chiou et al., 2017).

Concept maps can serve as tools to promote links among designs inside and across contexts, which can help to streamline information integration and learning processes. A concept map comprises of nodes, two directional joining lines, and connecting tags that define the connection between nodes. A concept map is made up of two nodes that are linked by a characterized line (Hafeez, 2021).

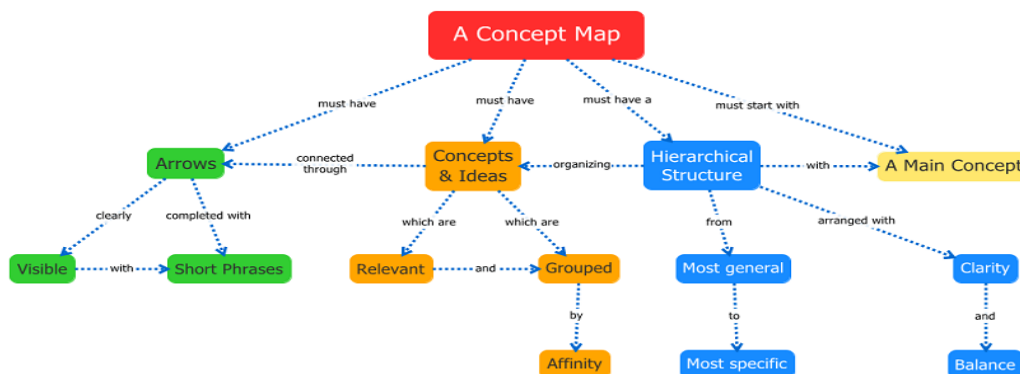


Figure.1: Basic concept of “Concept Maps”

Literature Review

Concept maps are a sort of media that may be used to illustrate how concepts relate to one another in a meaningful and practical way through intentions (Senthamarai, 2018). According to Chen et al., (2014), Novak was the first author to introduce the idea of a concept map in his book. According to him, concept maps help students grasp the lessons that are being taught. Students demonstrate conceptual diagrams in the form of maps by utilizing concept maps. This map is simple to comprehend and can be retained in memory for many years. Concept maps are often portrayed as two-dimensional images (Amado et al., 2015). Complex and challenging topics are portrayed in the concept maps. These maps may be utilized in a variety of academic disciplines, including physics, mathematics, home economics, and geography. On the map, a more thorough notion is sketched at the top and a less thorough concept at the bottom (Sari & Supahar, 2018).

In teaching-learning process concept mapping is its approaches in constructivism having, its direction in David Ausubel's Assimilation model (1968) of mental learning, the purposes of developing expressive learning through learners. So, it is learning process uses in highly communal circumstances, where students work together to support as well as judge everyone learning (Wang et al., 2016). It's a process of visually indicating the assembly of data, ideas, as well as their relationship. Scholarly investigation in science education reproduced that it can be implemented as a fruitful learning process from initial stage to higher level of education. For meaningful learning it is used is an instrument, evaluation, instructional development as well as discovery out the same ideas held by the students (Enger, 1998). Learning by concept mapping has lifelong result on reminiscence confirmed in the system of well consequences in hindered post-test as likened with other teaching leaning process. Concept mapping is valuable in blend with other scheming learning process, like trials (Bressington et al., 2018). Sex change in presentation in science has been lengthy discussed problem. Numerous investigations have originated that masculine learners acting, on average, improved if compare with female students.

Wan & Niu, (2016) explained the key aspects which promote sex change are gender part documentation, philosophy as well as socialization. Some investigations have stress on sex differences in use of concept mapping as well as particularly at of 13-14 years. Improved presentation of feminine scholars is exposed through short period studies on the application of concept maps as a research tool in Biochemistry (Obiagu et al., 2020) and Biology (Javonillo & Martin-Dunlop, 2019), in grade 10th viewing that boys' grades meaningfully lower than girls. Whereas in researches conducted by (Cañas et al., 2018; Ameyaw & Kyere, 2019) for long periods by applying concept maps stated that no gender difference in demonstration in science and technology topics.

According to Hwang et al., (2017) concept mapping calls for students to imagine playing a dynamic part in their learning process. The standard lecture methodologies of conditioned memory and passive learning are put to the test by idea mapping approaches (Baylen et al., 2017). By permitting them to generate, associate, and incorporate knowledge in different means, the students should be taught to reveal organizationally on maps, which supports comprehension of key issues in a profession of learning (Meheux, 2017). Concept mapping was suggested as a teaching tool for the children's educational system (Daley & Cervero, 2014). Numerous research has been conducted to address the difficulties in concept map implementation. According to Latif et al., (2016) more studies on concept maps is required, in order to successfully use this idea in education. Concept maps help students up through higher education to strengthen their creativity, critical thinking, and communication abilities.

The learners who created concept maps should have a richer facts base and, as a result, be more equipped to solve problems than those who learned to read by rote (Ariagai & Nwanekeziii 2018). They discovered that idea mapping is more effective in helping learners who have less prior

knowledge learn. Therefore, a scientific instructor may utilize concept maps to control the environment in which students hold predominate viewpoints, as well as to make clear the important concepts to be acquired and to propose linkages between the novel knowledge that has to be learnt and what the student already knows about it. Because everyone's knowledge is unique, cognitive structure and concept mapping are very distinctive. Concept maps are distinctive as a result. However, this does not imply that all concept maps are accurate. Which is conceivable to recognize mistakes, for example the lack of important views or unsuitable connection amongst thoughts.

According to Eggert et al., (2017) concept maps may be used for evaluation. Additionally, they suggested that there are three different forms of idea maps that are employed in evaluation: (i) concept maps with locked proposal (ii) concept maps with a semi-open proposal (iii) Concept maps with open intentions. Daley et al., (2016) directed a review of previous researches on using concept maps in nursing by using the data that were published between 2001 and 2014. The findings of the research indicated that they had a favourable influence on the learners' critical thinking and creative skills. Stevenson et al., (2017) explored the influence of idea mapping on low-achieving learners in scientific education. The study's findings revealed that by adopting concept map learning strategy, low achievers' scores might be enhanced. Palmer et al., (2014) shown in a research that concept mapping improved learning efficacy in disabled students. Ciullo & Reutebuch, (2013) conducted an evaluation of twelve idea mapping experiments undertaken between 2002 and 2010. The review's findings demonstrated that concept maps helped students' understanding abilities.

Concept Mapping for Instructors

If instructors learn that how to build concept maps as well as practise them for preparation as well as evaluating lessons, which were capable them to explain learners well how to make concept maps to form their opinions as well as concepts (Campbell, 2016). It is necessary for the learners to learn conceptually for clear concept about the science subjects. Different teaching-learning techniques and methods like project based, concept maps, problem based and module-based approaches are used for conceptual learning. Within this conceptual framework, the relationship between concepts in concept maps created by preservice teachers are evaluated according to not only the representations regarding the connection of a concept to a previous one, but also the interrelationship of concepts possessing common properties (Mumcu, 2018).

According to Ebenezer & Connor, (1998) the procedure for construction concepts map is (1) Select a path from a science book. (2) Highlight the key ideas from the passage of the science book. (3) Write each and every view on page. (4) Inscribe the ideas on minor cards as well as labels, so the ideas can be stirred everywhere. If you wish to practice a computer-centered meaningful web, practise SemNet, Knowledge Instrument, Manuscript Idea, CMap, as well as Stimulus software. (5) Write the key concepts on the top of the page. (6) Assemble the ideas after upper to end, thus a grading is specified. In building this grading, dwelling ideas succeeding to one another straight if they are measured to have identical position before assessment. (7) Narrate views through putting connecting verbs as well as linking dictions on reversing arrows. Maintains the views with instances. (8) Have supporters of a supportive set disparagingly investigate the concept maps to develop on more spread your concepts.

Objectives of the study

The present experimental research was designed to assess concept maps learning strategy in Higher Educational level in Pakistan.

Methodology

The quasi-experimental design was used for this research. The educational research course was taught to 30 BS students at Department of Education, International Islamic University Islamabad, for every concept the students were allotted the task to create their concept maps.

Instrumentation

After managing the pre-test, the students were educated the courses for 8 weeks by using concept Maps and posttest was taking as a mid-term exam. The pre-test was based on 30 MCQs items related to the course content of educational research at BS level. The post test was a midterm exam of 30 marks based on the contents taught in 8 weeks. The items were related to knowledge, comprehension and application.

Data Analysis

The data were analyzed by utilizing paired sample t-Test for pre and post-test analysis.

Results

The useful teaching-learning process occurs by linking new knowledge to prior knowledge. It is necessary to understand the previous knowledge of learners before integrating the new knowledge and new concept. In this way the learners understand the concepts in a better and scientifically (Bergan-Roller et al., 2020). The research conducted by Im, (2018) concluded that integration of concept mapping in higher education increased the creativity and higher order thinking skills in learners. Knowing the importance of concept maps in higher education, a research has been conducted to highlight the effectiveness of the concept maps. The data were analyzed statistically by T-test tool. The results are shown in the tables 1, 2 and 3. The t-test analysis has been performed for pre and post-test scores of pupils in knowledge, comprehension and application.

The results of descriptive statistics and t-test analysis for pre and post-test for knowledge items are shown in table 1. The results of descriptive statistics show that the mean score values for pre and post-test were 44.27 and 48.03 and the values for standard deviation (SD) for pre and post-test were 8.994 and 4.870, respectively. The value of mean difference (df) for pre and post-test was 58. The p value for pre and post-test was 0.0486 at a significance level of 0.05. As the p value was less than 0.05 ($p < 0.05$), so the results of pre and post-test showed a significance relation at a significance level of 0.05.

Table 1: Statistical analysis of scores of Pre and Post Test (Knowledge Items)

Level	N	M	SD	p	df	Sig.(2tailed)
Pre-test	30	44.27	8.994	0.0486	58	0.05
Post-test	30	48.03	4.870			

N=30 Statistically significant at the significance level of 0.05.

The outcomes of descriptive statistics and t-test analysis for pre and post-test for comprehension items are shown in table 2. The results of descriptive statistics show that the mean score values for pre and post-test were 33.67 and 35.97 and the values for standard deviation (SD) for pre and post-test were 7.144 and 4.012, respectively. The value of mean difference (df) for pre and post-test was 58. The p value for pre and post-test was 0.0486 at a significance level of 0.05. As the p value was less than 0.05 ($p < 0.05$), so the results of pre and post-test showed a significance relation at a significance level of 0.05.

Table 2: T-test analysis of Pre and Post Test (Comprehension Items)

Level	N	M	SD	p	Df	Sig.(2tailed)
Pre-test	30	33.67	7.144			
Post-test	30	35.97	4.012	0.0486	58	0.05

N=30 Statistically significant at the significance level of 0.05.

The outcomes of descriptive statistics and t-test analysis for pre and post-test for application items are shown in table 3. The results of descriptive statistics show that the mean score values for pre and post-test were 26.45 and 30.00 and the values for standard deviation (SD) for pre and post-test were 5.050 and 3.691, respectively. The value of mean difference (df) for pre and post-test was 58. The p value for pre and post-test was 0.0486 at a significance level of 0.05. As the p value was less than 0.05 ($p < 0.05$), so the results of pre and post-test showed a significance relation at a significance level of 0.05.

Table 3: T-test analysis of Pre and Post Test (Application Items)

Level	N	M	SD	p	Df	Sig.(2tailed)
Pre-test	30	26.45	5.050			
Post-test	30	30.00	3.691	0.0486	58	0.05

N=30 Statistically significant at the significance level of 0.05.

Discussion

The concept maps strategy is an effective learning technique proved by many studies (Yue et al., 2017; Bosakova et al., 2019). This strategy can be implemented in higher education to achieve higher order achievements and thinking skills (Guilcher et al., 2020).

In this modern era, many latest techniques are available in the teaching-learning systems to improve the learning standards of students. Setyowati et al., (2019) concluded in a study that learning strategy can be made effective by transferring traditional learning strategy to blended learning strategy to achieve better academic achievements in higher education. By applying the blended learning approach like concept mapping, the learners fully engaged in the learning process and enjoying the learning. The involvement of learners makes the learning process more interesting and higher academic and thinking skills can be achieved. Moreover, researches (Harris & Zha, 2017; Morfidi et al., 2018) also indicated the effectiveness of the concept maps in higher education.

The current research was conducted to evaluate the effectiveness of concept maps in higher educational institutions for three items (Knowledge, Comprehension and Application) of the learners. The consequences of the research study directed that by integrating concept maps in learning process, the pupils achieved better and conceptual results.

Challenges in Using Concept Maps

Concept maps are frequently measured a new mode of learning by both pupils and faculty members, and it takes time to understand and integrate as a learning approach. The learner's confrontation is occasionally realized during the early stages for incorporating the concept of concept mapping in secondary, college and higher level of education (Pandey & Tyagi, 2020). This

confrontation is generally associated to the time it takes to generate maps. It may also be associated to learner's incapability to recognize how creating maps and learning eloquently will support them in achieving higher scores in standardized tests. Another challenge to use the concept maps includes helping faculty members recognize that concept maps are planned to implement the concept of useful teaching-learning. It means that the faculty staff concentration changes from teaching course content to assist the learners in creating and understanding the sense of concept maps within the course context of his or her learning practice. As the learners develop and understand the meaning of useful learning, their abilities in using concept maps will increase in course contents (Aleixo et al., 2018). This suggested that as students' learning progresses, their concept maps will change over time. Teaching staff may interpret this as 'unreliability' in the maps, although the distinctive form of the maps illustrates how students' learning has expanded and altered over time (Hasimu et al., 2017).

Conclusion

The Concepts maps are widely used in many fields of study. The current research showed the effectiveness of concept mapping in students learning process in higher educational institutions. The pre and post-test scores of pupils in knowledge, comprehension and application were examined by descriptive statistics and paired samples t-test analysis. It is concluded from the research that the application of concept maps showed to be an operative tool for developing knowledge of students, for developing comprehension of students and for emerging application of knowledge. As the integration of concept maps showed to be an effective tool for active learning of students in distance mode of education, so it may be utilized extensively in programs at higher education level.

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