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Effect of concept mapping strategy in teaching and learning economics and academic performance in higher secondary school

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Abstract
Economics can be taught and learned better when different teaching strategies are used appropriately. Concept mapping is one of the teaching strategies used in teaching economics. This study investigates the effect of using concept mapping in teaching and learning economics and the academic performance of students. The study was carried out with 35 students of class eleven at one higher secondary school under Thimphu Thromde, Bhutan. The study adopts a mixed method. The quantitative data was collected through the Autumn class test (pre-test) and class test (post-test). The pretest and posttest data were analysed and interpreted using descriptive statistics via mean, standard deviation, and inferential statistics via t-test and level of confidence and statistical significance. The qualitative data collected through observation of group works and presentation, and group reflective journals were analysed by coding and thematic analysis was drawn to analyse the data. The findings showed students have a positive opinion towards concept mapping. Concept mapping helps students to understand and remember economic concepts and enhances descriptive ability. The study revealed that concept mapping enhanced the academic performance of students if used systematically. However, the finding also revealed that all economic lessons cannot be taught through concept mapping.

Keywords: Teaching and learning, concept mapping, economics, student

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Introduction

Various studies done on Bhutanese education have pointed out the need to address issues on the quality of education (GNHC, 2019). The diagnostic standardized test conducted by the Royal Education Council & Education Initiatives Private Limited (2008) in 18 schools for class V, VII, and IX in Science, Mathematics, and English revealed that student was unable to perform basic numeracy and literacy tasks and their learning outcomes were below the minimum expectations of their grade levels. The majority of students were unable to understand core concepts and apply knowledge in real-life situations. Students were found making simple mistakes in questions related to procedural learning and application. Most students fail to relate what they have learned to their environment. The Education Sector Review Commission (2008) revealed that there was high primary school grade repetition. Students were not able to master their curriculum within the prescribed time. The World Bank (2007) as cited in (Ministry of Education [MoE], 2014) found that the overall rate of learning was low in grade levels II and IV of primary schools of Bhutan.

Similarly, the Program for International Student Assessment for Development (PISA-D) 2018 in Bhutan revealed that students, in general, have higher success rates in items of acquiring lower cognitive skills. There is a significant gap in performance in more demanding tasks. Bhutanese students have performed at par with top PISA-D countries but significantly below the OECD average (BCSEA, 2019). The researcher strongly believed that the lower rate of learning in lower classes has a direct impact on the higher classes. The MoE (2014, p. 29) outlined that "the overall performance of Bhutanese children is challenged in meeting not only the international standards but also of the national standards". Several studies revealed shortcomings in learning outcomes, skills, and teaching-learning practice (GNHC, 2019). Therefore, teachers need to use student-centred teaching and learning, assessment approaches, classroom practices to promote understanding in all students (MoE, 2014; Dorji, 2018).

Over the years, there has been a change in the delivery of lectures from a mere talk or one-way teacher transmission to student-centred teaching and learning. Teaching, focused more on students, collaboration, reflection, and group discussion makes students think critically. Teaching becomes more interactive and rewarding (Dorji, 2020). The same issues have also been discussed and validated in the Bhutan Education Blueprint 2014-2024 (MoE, 2014). Providing quality education is critical for furthering the progress of human development in the country (Planning Commission of Bhutan, 2007). To make learning meaningful, there is a need to adopt an effective teaching strategy. Concept mapping is one strategy among others to improve the quality of classroom instructions. The concept mapping is found more valuable than traditional lecture teaching strategy (Alhomaidan, 2015). Concept mapping makes students visualize the relationship between concepts in a systematic way. According to Jibrin and Zayum (2012) students taught using concept mapping strategy achieved higher academic achievement than those students who were taught using the expository method. Similarly, in one study by Chiou (2008) on the effect of concept mapping on students learning achievements and interest revealed that students who were exposed to concept mapping performed better than those students who were not exposed to concept mapping.

According to Dorji (2020) in the Bhutanese classroom setting teachers used individual activity, group activity, lecturer cum demonstration, and PowerPoint presentations. Problem-solving, cooperative learning, experiential learning, student research, role play, concept mapping, differentiated learning, simulation games, project-based learning, team teaching, and co-teaching, learning through feedback, live consultancy assignments were not used by teachers in the classroom teaching. There is a long history of teacher resistance to pedagogical changes in Bhutan (iDiscoveri Education & REC, 2009; Sherab, 2013; Gyamtsho, Sherab & Maxwell, 2017).

This study was carried out in one higher secondary school under Thimphu, Thromde. There were 74 teachers, 9 non-teaching staff, and 6 supporting staff. The school is a co-educational day school with an enrolment of 1813 students (850 boys and 863 girls) ranging from classes PP to XII. The school offers science, commerce, and arts streams. The school and students are striving for academic excellence although the outcome of class XII board examinations was not encouraging and satisfactory despite collective commitment, hard work, and efforts initiated by the school. Currently, the researcher teaches economics in classes XI and XII. Economics requires a lot of effort to understand and remember concepts, facts, and ideas (Dorji, 2018). The researcher has seen many students scoring low marks in economics in Bhutan Higher Secondary Education Certificate Examination.

The researcher believed that an effective teaching strategy is the bedrock of effective learning. The quality of teaching strategy has a direct relation to the quality of student performance.

To make students learn effectively, the teacher should adopt the right teaching strategy (Yadav, 2006). The poor academic performance in higher classes could be due to inappropriate teaching strategy or shallow knowledge of the subject used in the classroom. Therefore, the teacher needs to identify teaching strategy for students to relate, interact and share their ideas and interact academically (Jibrin & Zayum, 2012). After going through a literature review the researcher felt necessary to carry out a study on teaching and learning economics through concept mapping. According to Tenzin (2005) concept mapping enables both students and teachers to use visual perception in learning and remembering economic concepts, facts, ideas, theory, etc., (Tenzin, 2005). The teaching and learning become meaningful if there is a formation of variable relationship better concepts, ideas, and facts (Cliburn, 1990).

This study intended to try out the concept mapping as an intervention program in teaching and learning economic and assess how such practices helped students improve their learning and academic achievements. The literature shows concept mapping is used to teach and learn concepts, facts, and ideas in the context of cross-cultural teaching and learning.

Objective of the Study

So far, no study was carried out on the effect of using concept mapping as a teaching strategy in the Bhutanese classrooms. The aim objective of the study was to examine the effect of using concept mapping in teaching and learning economics and student academic performance.

Research Question

Based on the objective of the study, the following questions were asked:

1. What are the effect of using concept mapping in teaching and learning economics and student academic performance?
2. What are the views and opinions of students towards the teaching and learning economics through concept mapping?

Significance of the Study

This study can be a powerful strategy that can be used by teachers to study their pedagogical practices and implement interventions to improve their pedagogical practices (Choeda, Drukpa, Yuden, Dukpa & Chuki, 2018). Evidence from this study has the potential to encourage other teachers to adopt concept mapping as one of the popular teaching strategies in teaching and learning. According to MoE (2020) the implementation of Bhutan Professional Standard for Teachers requires all teachers in Bhutan to adopt student-centred teaching practice.

Literature Review

What is concept mapping?

The concept mapping was first explored by Joseph Novok and his research team at Cornell University in 1970. Joseph Novok and his research team describe concept mapping as graphic means of expressing scientific concepts to students. A concept map is a graphical representation of the relationship among terms (Vides, Yin, Tomita & Primo, 2005). Concept mapping is a schematic device for representing a set of concepts embedded in a hierarchical diagram (Novak & Godwin, 1984). Concept mapping helps students connect terms and visualize relationships between concepts in systematic ways. According to NCERT (n.d. p.181)

> concept mapping is a technique of linking different concepts to visualize the relationship between them. Here different concepts are shown by means of suitable figures and then they

are joined with arrows or lines. The lines can also be associated with suitable phrases like 'goes to', 'comes out', 'added to', etc. However, it is not compulsory to associate the lines with such phrases. The main idea is to make the reader understand what a particular line means.

The concepts linked by their connection through means of arrows are called propositions. Alhomaidan (2015) describes a concept map as a visual way of representing knowledge in which concepts, relationships, and propositions exist. Concept mapping is a kind of visual road map connecting the meaning of concepts. "Concept mapping is a means of organizing ideas" (Bybee, Powell and Trowbridge, 2008. P. 135). Concept mapping is based on the approach of constructivism. The constructivists strongly believe that students actively construct knowledge. It is a good way of learning by doing (Esler & Esler, 1989) and learning with understanding. Bybee, Powell and Trowbridge (2008) outlined that concept mapping can be used in assessment and lesson planning, note-taking, assessing student misconception, as a means of self-reflection on student learning and self-study as well. After the completion of a lesson, a schematic summary of what was learned and understood can be outlined through concept mapping.

Psychological foundations of concept mapping

The concept mapping is strongly supported by Piagetian theory. According to psychologists, real learning is not filling up the storehouse of the brain by rote learning. Real learning takes place by the interaction of information inputs with existing knowledge through different parts of the brain. The construction of a concept map activates the function of the brain. The construction of different concepts is related to each other (NCERT, n.d). Psychologists hold a strong belief that concept mapping facilitates learning in two ways by acquiring related images faster and retaining images for a longer period. The retention of visual images becomes longer.

Use of concept mapping in teaching Economics

In economics, students need to understand the relationship between abstract concepts. Since many students were studying the subject for the first time in class XI in researcher school, the student felt difficult to learn abstract concepts and to understand the relationship between them. Concept mapping is one of the effective tools in learning abstract concepts and also to understand the relationship between abstract concepts (NCERT, n.d; Tenzin, 2005).

How to develop a concept map?

(i) The first step to develop a good concept map is to decide about the domain. One has to decide about what should be the subject matter of the concept map which is going to be created.

(ii) The next step is to set a good focus question. Here it should be decided what one is going to establish or show using the concept map.

(iii) After this it is better to have a rough sketch showing how the different key concepts are to be placed and related.

iv) Different key concepts are to be labelled at different places with different symbols or figures.

v) Concepts are then linked with arrows and/or linking words or phrases.

vi) For a good understanding of the relationships between the sub-domains of the map, it may be necessary to crosslink different concepts.

vii) Finally, the concept map should be revised to give better look and to make better meaning (NCERT, n.d. p.183).

According to Bybee, Powell and Trowbridge (2008) concept map can be developed as: (i) Students should identify major and minor concepts of a topic under the study, (ii) Student will organize concepts in hierarchical relationships. (iii) During the analysis of the concept map produced by students, the teacher needs to look at the concepts that are related to the topic, (iv) Concept map should show a hierarchical relationship from simple to complex. (v) Assessment should be subjective in nature. A bigger picture of student understanding of the topic should be ascertained. Similarly, Dorttepe and Arikan (2019, p.161) highlight the process of concept mapping as consisting of "preparation, generation of statements, structuring of the statement, representation of statements, interpretation of maps and utilization".

Types of concept map

According to NCERT (n.d); Dorttepe and Arikan (2019) there are different types of concept map: (i) Hierarchical, (ii) Cyclical, (iii) Chain and (iv) Spider map or network. There are differences of opinion tool on what type of concept map is more beneficial for teaching and learning (NCERT, n.d). In the initial stage, Hibberd, Jones and Morris (2002) as cited in NCERT, (n.d.) strongly supported the hierarchical concept map for teaching concept abstracts. On the other hand, Safayeni, Derbentseba and Canas (2003) as cited in NCERT (n.d) supported favour of a cyclical type of concept map. However, the type of concept map doesn't matter as the choice of concept map solely depends on the comforts of teachers and students in teaching and learning.

Difference between concept map and follow chart

Unlike flow charts, in concept mapping, concepts are expressed in the proposition by using linking words or arrows. The linking words or arrows describe the concepts, relationship with other concepts through hierarchical and cross-linking arrows or lines (Cliburn, 1990; Tenzin, 2005). The arrowhead brings the senses or direction of relationships.

Advantages of concept mapping

Concept mapping is a valuable tool in teaching and learning. A concept map is used to communicate complex ideas, summarize information, and facilities learning process (Alhomaidan, 2015). A study of 23 EFL students (as cited in Alhomaidan, 2015,) found students who were taught economics concepts using concept mapping learn better and perform better than the students who were taught concepts without using concept mapping. Cliburn (1990) outlined retention of concepts is higher when learning is done with understanding. Students understand and remember concepts for a longer period. Similarly, Fahim and Hiedar (2006) found a positive relationship between concept mapping and listening comprehension of students. As students construct a concept map, students relate new knowledge with existing or prior knowledge. Marriott and Torress (2008) as (cited in Alhomaidan, 2015) suggest that concept mapping is useful for the development of oral, reading, and writing skills. Students tend to learn more, better, and retain longer when students see or write a concept rather than the concept is taught through rote learning (NCERT, n.d). Concept mapping abstractly promotes reflective thinking with deeper understanding through the picture (Tenzin, 2005). The chalk and talk method cannot promote reflective thinking and contribute less to the knowledge structure (Dorji, 2020).

Using concept mapping in a teaching and learning process breaks the monotony of lectures and lessons become lively, interesting, and insightful. Some of the advantages of concept mapping according to NCERT (n.d., p.184-185) are (i) a well-constructed concept map helps students understand the relationship depicted in it. (ii) Concept mapping organizes the knowledge systematically and helps students define and explain different concepts and the relationship amongst them. (iii) As the students get to create, learning becomes interesting and fun. (iv) Concept maps also help a teacher to identify where the student's learning gaps. A wrong arrow or a wrong phrase easily reflects the problem area of the students. (v) Concept mapping can also be used to evaluate the student's level of learning. According to Bello and Abimbola (1997) concept mapping is one strategy which makes teaching and learning meaningful and students become independent in the learning process.

Methods

The study adopts a mixed method with a quantitative approach at beginning and followed by qualitative and quantitative approach (Cresswell, 2014). The quantitative data was collected through the Autumn class test (pretest) and class test (posttest) to evaluate the effect of the concept mapping. The qualitative data was collected through the observation of group work and group presentation and students' group reflective journals. The qualitative data were analysed using the process of emerging themes.

Population and Sample

The study was carried out with 35 students (11 boys and 24 girls) in class XI. Out of 35 students, 11 boys and 19 girls had not taken economics in class IX and X. They were studying economics for the first time in class XI. The chapter 'Demand' was chosen to examine the effect of concept mapping strategy. 20 periods of 45 minutes were allocated for the study.

The researcher briefed the purpose of the study to the students. Study approval was obtained from the school management. Consent was also obtained from all students and confidentiality was assured. All students participated in the study.

Quantitative Data Collection Instrument

1. Autumn class test (pre-test)

The baseline data was collected through Autumn class test conducted on September 25, 2019**.** The objective of Autumn class test was to determine the level of knowledge that students owned before the implementation of concept mapping as an intervention program. The twenty marks of short essay type questions covered after the midterm examination were prepared. The 20 marks were later converted into 100 marks for easier tabulation. The writing time of the Autumn test was 40 minutes.

2. Class test (posttest)

After the Autumn class test, the first chapter 'Demand' in class XI was taught by incorporating concept mapping strategy because the class XI economic syllabus was completed. After the completion of the chapter class test was conducted on November 15, 2019, to assess the student's level of academic performance in economics after using concept mapping as an intervention program. The class test consists of similar questions carrying the same marks with the same writing time as the Autumn class test. The class test was also used to examine and compare the students' level of academic performance between the Autumn class test and class test.

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3. Group Work and Group Presentation

During the lesson, group work and group presentations were assigned to seven groups consisting of five members each. The objective for administrating group work and group presentations was to investigate and examine students' interest and participation in group activities and their level of understanding during the three-week intervention program.

4. Student Group Reflective Journal

The seven groups were asked to write a reflective journal about how they felt, experienced, and learned the chapter 'demand' through concept mapping. The purpose of writing the reflective journal was to find out the views and opinions towards learning economics and academic performance through concept mapping. The group reflective journal also provided information to the researcher on how students have progressed with concept mapping. Journal promote reflective thinking and generate further questions among students (Bybee, Powell & Trowbridge 2008).

Data Analysis

The quantitative data collected through pretest (Autumn class test) and posttest (class test) were analysed using SPSS version 24. The descriptive statistics via mean and standard deviation and inferential statistics via t-test, statistical significance, and level of confidence were determined.

Qualitative data collected through group work and group presentation and student group reflective journals were analysed by using the coding system. After coding, themes were generated (Choeda, Drukpa, Yuden, Dukpa & Chuki, 2018). Quantitative and qualitative data were triangulated to confirm results and discussion.

Results and Discussion

1. Comparison of Autumn class test and class test

The analysis of the Autumn class test and the class test revealed a significant difference between the two means. The mean of the class test was higher than the Autumn class test as shown in Table 1. The mean difference between the class test and the Autumn class test was 17.18. Table 1 supports that concept mapping has a positive impact and using it systematically could improve teaching and learning economics. The Autumn class test scores revealed that most students had a weak understanding of economics. However, the improvement of the class test score proves that concept mapping has positively affected learning economics. There is a statistically significant difference between the Autumn class test and class test.

Table 1

Comparison of pretest and posttest score

Test	N	Mean	Std. Deviation	Test Value=0				
				T	Df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
							Lower	Upper
Autumn Test	35	45.79	16.536	16.381	34	.000	40.11	51.47
Class Test	35	62.97	14.460	25.763	34	.000	58.00	67.94

The analysis of the group work revealed that initially, students were not aware of concept mapping. Students were confused between the flow diagram and concept mapping. After three sessions/lessons, students understand what is concept mapping. The researcher observed that all students in the group participated in the group work and showed keen interest in group presentations. Students also clarified their doubts. Overall, the researcher found students enjoying economics taught through concept mapping.

The analysis of student group reflective journal (using the content or thematic analysis) revealed the effect of concept mapping on students' learning in the following five major themes:

1. Descriptive ability

The student participants found that the concept mapping strategy useful in improving descriptive ability. Four groups mentioned that "concept mapping is mainly done by mentioning all the important points about a particular concept or topic and later students can supplement with additional information. Students were able to describe more about the topic or lesson taught in the classroom through visual means.

2. Retention power

Concept maps are important to promote learning with understanding. Student participants mentioned that concept maps helped students remember concepts for a longer period. Memory retention becomes higher when learning is done by doing and understanding. Five groups mentioned that concept mapping help students in improving sentence structures and grammar skills by describing the key points. Through concept mapping, students were able to understand the concepts in more detail. As students construct concept maps, students might attempt to relate new knowledge to their existing knowledge.

3. Confidence

Through group work and group presentations, students gained confidence as they presented their group findings to the whole class. It was observed by all that concept mapping is a platform for brainstorming. Student participants found that learning economics through concept mapping enhances students to communicate new ideas. Five groups mentioned that concept mapping was a great way to build knowledge upon previous knowledge by connecting new information. The students were passionate about learning new lessons and it broadened their knowledge.

4. Participation

All students agreed that there was active participation among the group members. The group discussed and asked questions related to lessons taught in the class. All students actively participated throughout the lessons. Five groups mentioned, "we enjoyed learning concepts, facts, and ideas through concept mapping. It makes us active and learning somewhat became fun and interesting".

5. Test score

All group members mentioned that concept mapping saves time for students to revise lessons and prepare for the examination. During revision, students can read text linking concepts or study links between concepts. Six group members mentioned that a concept map makes it easier to recall the lesson or topic and review the information presented in the class. All groups also mentioned that concept mapping helps them to score more marks in tests.

The results and discussion were found consistent with the study done by Chiou (2008);

Jibrin & Zayum, (2012); Alhomaidan, (2015). The results and discussion conclude that concept mapping enhanced teaching and learning and student academic achievement as concept mapping allowed students to involve directly and actively in the teaching-learning process (NCERT, n.d.).

Reflection of the Study

Through group work and group presentation, the researcher has learned that there were a variety of ways of representing lessons through concept mapping. Unfortunately, the research found few students were memorizing concept map or copying concept map from the group members. The researcher felt that it was important for teachers to note and discourage students from memorizing concept maps or copying concept maps from groups or friends. The main purpose of using concept mapping strategy was to promote learning through understanding and deemphasize rote learning. Students can revise the lesson or prepare examinations by linking text with important concepts or study links between concepts.

The researcher felt that teachers need to plan group activities and supervise group activities properly. Teachers as facilitators should facilitate students' learning. Students should be encouraged to reflect upon concept mapping and promote meaningful learning or learning with understanding. Although students found concept mapping very useful, the researcher observed that the concept maps are not easy to constructs and teachers should encourage students to persevere before students master the concept mapping techniques. On a few occasions, the researcher found some students knew more about a lesson and students illustrated concepts with many links for the lesson. In such a situation, a teacher should interfere and remind what students need to do to meet the learning objective of the lesson. With the start of concept mapping, the research saw positive behaviour towards teaching and learning. Concept mapping strategy enhanced interpersonal relationships, confidence, and shared responsibilities between students.

A teacher should give hands-on or minds-on or hearts on activity to students on the many aspects of a topic or chapter to prepare charts with clear concepts, ideas, and theories. Such activities present the potential to trigger and arouse more interest in the subject. During group presentations, the researcher observed that concept maps could be prepared in PowerPoint presentations for an easy demonstration to the class. It could even be better if students can prepare concept maps on a computer using concept mapping tools to make their concept clear, colourful and presentable. Due to the shortage of computers and projectors in the current school, the students had to work with charts and chalkboard. The researcher believes that the use of concept mapping will not only help teachers to teach but also the young students to learn difficult topics and concepts better and with fun. However, not all concepts, facts, ideas, and theories can be taught through concept mapping.

Conclusion and Recommendation

The current study was the first study on the effect of concept mapping strategy in teaching and learning economics and academic performance in higher secondary school. Evidence from the study showed that concept mapping has positive effects on teaching and learning economics. It promotes student-centred teaching and learning. The study showed that concept mapping enhanced descriptive ability, understand and remember concepts longer, build confidence, promote participation, and improve test scores. The researcher recommends other economics teachers to use concept mapping in their teaching and learning process. From this study, the researcher concluded that concept mapping strategy is effective in teaching and learning economics in higher secondary school. It enhanced the academic performance of students.

Although teaching economics is a challenging job, teachers can modify teaching strategies by incorporating concept mapping strategy to suit the diverse learning needs and interests of students. The Bhutan Professional Standards for Teachers (MoE, 2020) requires all teachers in Bhutan to practice such strategies that take into account the backgrounds of learners, use of information technology and adopt student-centred teaching strategies.

However, the study found that teachers should discourage students from copying concept mapping or memorize concept maps for examination. Concept mapping is a strategy to 'de-emphasize rote learning' or to promote 'learning through understanding. There is also a note of caution for all teachers while using concept mapping in the teaching and learning process. Teachers need to remind the objectives of the lesson so that the right objectives are achieved within a specified time. The teacher needs to share the expectation with students. While constructing the concept map sometimes a student can easily forget the objective of a lesson. As a result, a student might lose the path by getting involved in useless drawings and lose their path. Therefore, the teacher should develop an idea beforehand about what the teacher expects from students. The teacher needs to remain vigilant in the class to guide students to achieve the right objective within the stipulated time. The teacher should give hands-on or minds on or hearts on activities to students to prepare concept maps on charts or a computer with clear concepts and arrows.

Limitation of the Study

The construction of a concept map never ends. The use of computer software, like Excel, PowerPoint, plays an important role in constructing a concept map. Therefore, future research in the same field can try to use Microsoft Excel and PowerPoint to construct concept maps.

The researcher also recommends other researchers to replicate the same study in their schools with a longer intervention period and make a comparison. It is also recommended that the Colleges of Education can find out the effects of concept mapping in teaching and learning for pre-and in-service teachers.

It is also important for the teacher to know that there is no best teaching strategy for an effective teaching and learning process (Yadav, 2006; Cohen, Manion, Morrison & Wyse, 2010). Each student comes with some uniqueness in background, interest, and needs, therefore, different teaching strategies are a must and necessary in the classroom (NCERT, n.d). Students may vary in several ways according to their learning preferences.

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