#### Use of Concept Mapping in the Management Curriculum to Foster Critical Thinking

#### Abstract

Critical thinking is an in-demand skills among job candidates, yet several barriers exist to the development of this skill in students. To promote the development of critical reasoning skills, students need to be provided with tools that allow them to engage in their learning processes and develop the ability to integrate a body of knowledge by understanding the connectedness of ideas. One such tool is "Concept Maps" that are knowledge representation tools to visually establish relationships that exist among concepts. In this paper we provide an overview of concept mapping and how it can be effectively employed in Management courses.

## Keywords: Concept maps, critical thinking, active learning

#### Introduction

Critical thinking is one of the most in-demand skills among job candidates (Plummer, 2019) as it allows the development of inquiring attitudes that challenge prevailing worldviews and assumptions and, thus, assists in making well thought-out and unbiased decisions (Smith, 2003). As such, critical thinking is viewed as an important component of management education. Yet, several barriers exist that impede the development of critical thinking skills among students. Preconceived notions about education, lack of training, and limited resources hinder the development of critical thinking skills (Snyder & Snyder, 2008). For instance, so many courses engage students in activities, assignments and tests that require them to come up with the same correct answer leading to students reading instrumentally to identify the things they believe the instructor wants them to know. This results in students lacking the ability to interpret readings, engage in reasoning, develop conceptual understandings, and assess the relatedness among ideas.

To address these challenges, students need to take responsibility for their learning and be provided with the tools to effectively do so. To promote the development of critical reasoning skills, students need to engage in their learning processes by developing the ability to integrate a body of knowledge by understanding the connectedness of ideas. One tool that has been employed in the sciences is "Concept Maps" that are knowledge representation tools to visually establish relationships that exist among concepts (Jacobs-Lawson & Hershey, 2002, Novak & Gowin, 1984). They consist of concepts located within a web, and connected by links representing the relationships among the concepts. Concept maps are organized hierarchically from the most general to more detailed and focused ideas.

While concept maps have been used extensively in sciences, there is limited literature on employing concept mapping in Management education. Our goal in this paper is to provide an overview of concept mapping and insights into how it can be effectively employed in Management courses. We present our experience of having students employ concept mapping in our introductory management course. Students consistently employed concept mapping as an individual and team-based tool to develop a deeper understanding of management concepts and the relationships among them. At the end of the course, students reported that concept mapping helped them improve their critical thinking skills, especially by allowing them to see connections among ideas that they had not seen prior.

Below, we introduce the theoretical underpinnings of concept mapping and provide an outline of how we employed it in our course, including the expected learning outcomes, an overview of the exercise, and a description of the structure of proposed conference session.

#### **Theoretical Foundation**

Concept mapping has found favor as an instructional and learning tool across a variety of disciplines. It is employed as an active learning strategy to foster meaningful learning (Novak, 1990), improve problem solving (González et al., 2008), and teach content. It has also been employed to assess learning (West et al., 2002), and promote curriculum and instructional strategy development (Edmondson, 1995; Stoddart, 2006).

The underlying principles of concept mapping are drawn from Ausubel's (1963) assimilation theory of meaningful learning that addresses how students learn new concepts meaningfully and construct knowledge from both familiar and novel concepts. Specifically, Ausubel argues that learning and assimilation of knowledge occurs in a three-step process:

 Subsumption – learners organize knowledge hierarchically so that new knowledge relates to prior knowledge

- Progressive differentiation –learners divide concepts into increasingly detailed and specific components through a process similar to analysis
- Integrative reconciliation learners relate concepts in unique ways through a process similar to synthesis (Ausubel, 2000).

Novak and Gowin (1984) employed Ausubel's theory to develop concept maps as a visual tool for organizing and representing knowledge and relationships among concepts.

Studies have consistently demonstrated the effectiveness of concept maps. For instance, Novak (1990) found that concept maps are not only useful to represent changes in the knowledge structure of students over time, but also help them "learn how to learn". Studies have also found that the use of concept maps helps students recognize new relationships among concepts and hence, develop new meanings (Novak & Gowin, 1984). The use of concept maps deepens one's understanding of the subject because it requires not only listing concepts but also identifying the relationships among them (Chiou, 2008; Hasemann & Mansfield, 1995; Novak, 1990). These connections and knowledge frameworks built through the use of concept mapping help in the long-term retention of knowledge (Novak, 1990). Roberts (1999) found that the examination of student-created concept maps brought forth misconceptions in students' understanding of basic concepts. Furthermore, Baroody and Bartels (2000) found that not only do concept maps reveal students' misconceptions, but allow them to discover these misconceptions and gaps in their knowledge for themselves. Novak and Gowin (1984) identified the facilitation of students' selfreflection and active learning as key benefits of concept mapping.

#### **Learning Objectives**

One of the key goals of our introductory management course is to help students develop crucial organizing and managerial skills that will be required for them to succeed in their careers.

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As such, an emphasis of the course is on helping students understand and interpret complex information, reflect on how that information and knowledge applies to their own personal experiences, and develop ways of applying their understanding while engaging in a semester-long self-managed teaming initiative. The objective of employing concept mapping in our course is to facilitate students' understanding of how various management concepts and theories are related to one another and how these understandings relate to their experience and can help them work through the opportunities and challenges they encounter during their participation in the self-managed teaming initiatives.

Thus, rather than asking "What does the instructor want me to know?" or "How do I show the instructor that I've read the material?" concept mapping is based on the following questions: "What concepts or ideas interest me in this reading?", "How do those concepts relate to each other from my perspective?", "What does this concept map allow me to understand in the big picture?", and "Based on my response to the first three questions, what questions are provoked about the reading?", "What else do I want to know about these issues?"

Concept mapping facilitates students' deeper understanding of the course readings, theories and concepts and ability to articulate this understanding. In the process, students take responsibility for their learning and relate to course content in a way relevant to their unique experience. Indeed, with Concept Mapping there is no right answer. What's important is to generate different ways of seeing and comparing them to get a far richer understanding of the concepts, and how they connect to others covered in the course. We have found that this not only alleviates student anxiety associated with "getting it right," it privileges each student's way of seeing. In this way they authentically add value to the overall understanding that emerges. We sought to achieve the following learning objectives through the use of concept mapping:

- Help students see the big picture and the relationships between ideas, concepts, or authors
- Assist in the development of higher-level thinking skills (analytical, critical and creative)
- Encourage students to think creatively about the subject and appreciate different perspectives

#### **Exercise Overview**

#### Summary of use of concept mapping

We piloted concept mapping as a learning tool across five sections (124 students with 24-26 students in each section) in our introductory management course in Fall 2020. We introduced concept mapping to students in the 2<sup>nd</sup> week of the semester and continued to consistently incorporate it as a learning strategy. Students engaged in concept mapping seven times - three of those activities were done individually while the remaining were done in groups. As most of the students were first year students, not only did we hope that concept mapping would support their learning in our course but that it would help them develop a valuable tool to support their learning over the course of their undergraduate education.

Prior to the use of concept maps, students were given a pre-reading explaining why concept mapping is a useful tool for learning and how concept mapping can be used to show relationships among concepts and assist in higher-level thinking. They were then asked to draw concept maps in class to demonstrate their own understanding of the assigned readings and the connections that they saw among concepts and ideas. Students typically spent 30 minutes constructing their concept maps. This was followed by a discussion and debrief for 30-45 minutes in which students explained their concept maps to class.

The students were, specifically, guided to think about the following three stages of concept mapping:

- **Spatial / locational** What are the most important concepts from your reading?
- **Relational** How do those concepts relate to one another?
- Analytical Given the connections among concepts, what questions do they raise?

Appendix A shows the specific instructions students were provided to construct their concept maps. While students created concept maps on paper when working individually, due to restrictions as a result of COVID-19, when working in groups, we adapted by having students use collaborative online software tools such as "Miro" (<u>www.miro.com</u>) to develop concept maps.

#### Example

In Appendix B, we present a specific example of the concept maps created by students. In this session, we were exploring the idea of a responsible economy. In prior class meetings, students had learned about the importance of organizing effectively and taking responsibility around a shared purpose. We had also discussed the role of responsible companies in society. For the concept mapping activity, students were asked to: a.) reflect on the material they read on a responsible economy and think through what intrigued them about the reading (spatial element), b.) construct a map that showed the connections between not only the readings and videos on responsible economy but also the connections with their prior understanding of individual purpose and responsibility and responsible companies (relational element), and c.) create one thought provoking question to generate class discussion (analytical element).

As can be seen from the two examples, students were able to use concept maps effectively to organize their key takeaways from the readings and demonstrate the hierarchical structure of their understanding. The use of concept maps showcased their ability to see interrelationships between societal, economic, and environmental factors and their effects on overall human well-being. Their ability to view these connections led to the development of thought-provoking questions that challenge normative assumptions and ways of thinking. Additionally, students were able to include their personal experience in their maps through questions such as "how can we as college students make an impact looking towards to the future?" Listening to their classmates share their concept maps during the class discussion helped students develop a deeper understanding of the readings and identify symmetry among all three responsibilities: personal, organizational, and global.

#### **Outcomes**

At the end of the semester we surveyed our students about their experiences with concept mapping and the impact on their learning. We include the questionnaire in Appendix C. The responses to the survey supported the achievement of identified learning outcomes. Appendix D provides a sample of comments related to each of the expected learning outcomes.

#### **Session Outline**

This workshop will be valuable to:

- faculty wanting to facilitate students' critical, creative and self-reflective learning
- faculty wanting to facilitate their students taking responsibility for their learning
- faculty wanting their students to gain confidence from adding value to the collective understanding of course knowledge
- faculty looking to incorporate an active learning component into their courses

• departments to systematically incorporate the above into their curriculum

We plan to use a combination of a PowerPoint presentation and group breakout discussion

for our session. Our 60-minute presentation will include:

- An explanation of our motivation to employ concept mapping (5 minutes)
- An overview of concept mapping (5 minutes)
- Identification of learning goals (5 minutes)
- Discussion of the student feedback (15 minutes)
- Small group discussions of how participants might employ concept mapping in their course(s) (20 minutes)
- Debrief, audience discussion and questions (10 minutes)

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## Appendix A

NOTE: The following represent the basic guidelines we'll use to learn how to create a concept map. Once you understand what the maps are, we encourage you to use your creativity in drawing the maps.

### How to draw a concept map

- 1. Read the material thoroughly, don't take notes as you read.
- 2. When finished reading, open your journal so that both pages are blank.
- 3. Draw a frame around the whole sheet (both pages in your open journal). This is a reminder that we have the entire space with which to work.
- 4. Spend some time thinking back through your reading. What you remember (without going back to the reading) is what's important for mapping.

### Spatial / Locational (Choose a color)

- 1. Come up with five (5) concepts from the material, the ones that in your reading have jumped out at you as most important. Limit your concepts to one or two words.
- 2. Write those on the sheet, no specific order.

**Relational** (Choose a second color)

- 1. Now, start thinking about how the five are related.
- 2. Draw lines between the concepts where you see connections
  - a. single lines
  - b. fat lines (for example, could denote a stronger connection)
  - c. dotted lines (where you are not quite sure about the connection)
  - d. an X in the line -----X----- (denotes a negative or inverse relationship)
  - e. **arrowheads** (that imply direction. . .this leads to that or this has a direct impact on that)
  - f. **labels** you can use a few words, but play with pictures / doodles. Your maps don't need to be completely understandable to the rest of us. You can provide a Map Legend or we can just ask you.

Analytical (Choose a third color)

1. Based on what you have in the first two stages, what questions arise? What hypotheses might you posit?



## Appendix B





## Appendix C

## **Concept Mapping Reflection Questions**

- 1. Did you find creating concepts maps of the readings effective in facilitating and supporting your learning?
- 2. Describe *two-three* ways in which the use of concept maps added to your learning in this course.
- 3. What was most challenging about creating and using concept maps? Why?
- 4. How did the concept maps help you see and understand things that you did not prior to drawing the concept maps?
- 5. How could we have used concept maps more effectively in this course to enhance our learning?

# Appendix D

## Sample Student Survey Responses

Learning Objective	Student Comment
Help students see the big picture and the relationships between ideas, concepts, or authors	<ul> <li>"When I would read, I often would not think about how topics related. The concept map forced you to think about how things related, and I found that super useful in understanding the text as a whole."</li> <li>"The concept maps not only helped me to see and understand the bigger picture of things but, to see how the individual components make up this</li> </ul>
	"big picture".
Assist in the development of higher-level thinking skills (analytical, critical and creative)	<ul> <li>Through the concept maps I was able to see connections that I would have otherwise overlooked."</li> </ul>
	• "The concept maps added a different type of learning in this course because it allowed me to explore a new way of retaining information and expressing what I want to say, while incorporating my other group members ideas into it. Concept mapping helped to lay out the key points that you took away from the reading in an organized way and it help to create a visual for everyone to look at instead of just talking about what we learned. When someone is given a visual that they need to follow, it tends to make it easier to follow and understand what your classmates are saying."
Encourage students to think creatively about the subject and understand and appreciate different perspectives	• "By seeing others concept map, it always brought new ideas to me and made me think of things in a different way. I also enjoyed working on concept maps with my group because

I found that I learned more about the readings that way."
• "By working in groups on concept maps and seeing others concept maps it helped me learn other people's perspectives. It was interesting to see that although we all read the same thing, we each had different ideas about the overall meaning."