

# An Innovation in Student Learning and Assessment

## Exploring Concept Mapping During the Research Process and Beyond

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### *Abstract*

*The featured work examines concept maps as a tool in teaching and assessing student learning. The study utilises collaborative auto-ethnography in exploring students' learning experiences, while applying concept maps to individual research processes. Findings reveal that concept maps assisted students in planning research projects, offered faculty an innovative method to assess student understanding of course content, and served as study aids during students' doctoral qualifying examinations. Concept mapping as a learning and assessment tool (via examinations) was ultimately adopted across courses within the featured academic programme.*

**Keywords:** student learning, concept maps, research training, assessment

### Introduction

Concept maps have been used in classrooms across the globe as tools for idea creation, information recall, knowledge integration (Xie and Lin 2019), writing production, student engagement (Hsu 2019), and instructional assessment (Ruiz-Primo and Shavelson) at both undergraduate and graduate levels. Hsu creatively applied concept mapping as a preparatory teaching strategy in the classroom,

resulting in “improved students’ perceived attention, relevance, confidence, and satisfaction” (272). Concept maps can also be used throughout the qualitative research process, particularly through: (1) facilitating participant generated data (Wheeldon and Faubert, 2009), (2) framing research projects, (3) reducing data, (4) analyzing themes, and (5) presenting findings (Daley 2004). The first author holds a history of using concept mapping as an instructional tool to promote understanding and application in Finance and Education courses.

Yet, in what ways can concept mapping contribute to learning experiences and academic outcomes of new researchers enrolled in a graduate level research course? The work explores this research question, as the lead author and her graduate students explore concept maps and their utility in learning and conducting research during a Qualitative Research course. An autoethnographic approach was taken in answering the featured research question. Reflective journals served as data in this co-authored project and the constant comparative method of data analysis was employed to interpret this data.

Autoethnographic scholarship offers students the opportunity to reflect upon learning course content as it relates to their own lived experiences (Davis et al 2014). Using an autoethnographic approach, this work features the reflective writing of a faculty member and graduate students enrolled in the course “Qualitative Research.” The professor and graduate students used journaling to reflect upon a key teaching method within the course: Concept Mapping. The more difficult the concept, the more mapping items may be employed as a tool for learning to occur (Chang, Sung, and Chen 2002). This work explores concept mapping as an exercise to the early stages of the research process.

### **Significance of the study**

The results of this work promise to point towards the utility and effectiveness of concept mapping in the graduate classroom. Identifying this as a tool to be used during graduate level learning broadens available teaching strategies that faculty may use in classrooms and aids in the ability to reach students of all learning styles.

### **Major question**

This work focuses upon the following major question: In what ways can concept mapping influence the learning experiences and academic outcomes of new researchers?

## Methods

Our work takes a grounded autoethnographic approach to inquiry as a strategy to decolonise the research process and amplify the voices of participants. Researchers utilising the autoethnographic approach reflect on their lived experiences and social context via writing (Delmont 2009; Ellis and Bochner 2000). According to Schwandt (2000) autoethnography “commonly refers to a particular form of writing that seeks to unite ethnographic (looking outward at a world beyond one’s own) and autobiographical (gazing inward for a story of one’s self) intentions” (13). The autoethnographic nature of this scholarship requires collaboration between myself as a teacher-scholar, and participating students. Collaborative autoethnography uses autoethnographic data generated by individuals of the group or team to understand and explore social issues (Chang, Ngunjiri, and Hernandez 2016). Hence, the students who participated serve as the work’s second authors.

Using an autoethnographic, grounded approach, students employed journaling to share their experiences of learning about the research process by using concept mapping during a PhD level Qualitative Research course. Following review of the definition and function of concept maps using Novak and Cañas’ (2008) work as a guide ([https://www.researchgate.net/figure/Concept-map-about-concept-maps-from-Novak-Canas-2008\\_fig1\\_260592387](https://www.researchgate.net/figure/Concept-map-about-concept-maps-from-Novak-Canas-2008_fig1_260592387)), students were trained on the utility of the concept map process in planning and implementing a research project. The training included studying examples of research concept maps of other scholars and group discussion of the use of the tool for the students’ own individual research.

Following instruction on the concept map as a research tool, the group collectively worked to decide upon journaling prompts and questions to use for their focused journal entries to chronicle their learning experiences with the research-centred concept map. Some of the resulting journal questions included:

1. What did you learn about yourself as a new researcher by using this concept map?
2. How do you plan to use the concept map in your future research?
3. What were your priorities when creating the concept map?
4. Describe how concept maps can develop your research process.
5. What steps did you take in creating your concept map?
6. Describe your perception of your research question **before** creating your concept map.

7. Describe your perception of your research question **after** creating your concept map.
8. What were the outcomes of using concept mapping in your research?

Students submitted their journals electronically to the professor following completion. The group analyzed the data together during an instructor-led group coding session.

## Data analysis

Names were removed from journal entries and the constant comparative method – specifically open and axial coding – was used to analyze the data. With roots in grounded theory, the constant comparative method of data analysis is commonly used in varied forms of qualitative research and prompts the researcher to identify recurring patterns in the data (Merriam 2009). Multiple researchers were used during the data analysis process to strengthen triangulation. Analysis was conducted individually by each researcher and then discussed in the wider group.

## Participants

Participants consisted of a purposeful sample of mixed year PhD students enrolled in the graduate course, Qualitative Research. In terms of gender, five women and four men took part in the work. Participants self-identified in terms of race/ethnicity in the following ways: one of African descent, four of Middle Eastern descent, two White, and two Asian.

Using an autoethnographic approach, students used journaling to share their experiences in applying concept mapping as a tool. The group decided on using journaling prompts for their focused journal entries. This incorporation of journaling was a component of course participation.

## Findings

As a result of using the constant comparative method of analysis, themes that emerged include differing student perceptions of the research questions before creating concept maps, how those perceptions changed following concept map creation, and varied student priorities while creating the map. These are further described in the following paragraphs.

## Perception of the research question before creating the concept map

Using a concept map for research purposes was a first-time experience for most participants. Students noted that initially their research questions were vague, yet became clearer following the use of this tool. This finding mirrors that of Daley's (2004) work on how concept maps help frame research projects. Overall, many found the mapping process interesting and engaging.

## Perception of the research question after creating the concept map

The process of using the concept map allowed participants to identify missing elements of the research process, thereby identifying areas for improvement to help render the research stronger. Using concept maps resulted in students having a clear plan to organise their research and develop research questions. Students believed the concept map was helpful and useful, as it offered a visual guide illustrating their research goals and clarifying their ideas. Some students noted that the process resulted in new research related discoveries.

One student explained the shift in her perception of her research question as follows:

After creating my concept map, I have a much clearer understanding of the research questions I want to explore. I was better able to articulate the issue in words, specifically (in) a short phrase or statement. The map also greatly increased my understanding of the steps I needed to take and the various "stepping stones" along the path . . . While I knew that I would have to identify a target population, collect data, and complete various components of the research process, I now have a better idea of when those steps will occur, what steps lead to others, and the connections between each. As I created the map, I discovered significantly more steps than I would have previously mentioned . . . I found myself going back and rearranging things to make room for other steps that occurred to me as I kept mapping. I also have a clearer articulation of the steps that lead to my research problem . . . Overall, I feel more assured in what I need to do and how to do it. (Female Doctoral Student)

The multifaceted benefits of applying concept mapping to the research process may be beneficial to undergraduate student researchers as well. Whether applied at the undergraduate or graduate level, the use of concept maps facilitates the learning process and strengthens research outcomes.

## Priorities while doing the concept map

Priorities while developing the concept map included capturing details and main points of the research process. Some students considered delving deeper in the research as a priority, while others were concerned about getting sidetracked and staying on topic. Some individuals went in depth with smaller elements of their topics, while others focused on the broad overview of their research when applying the concept map strategy. One student described her priorities during the research map process as follows:

My first priority was space, though it probably shouldn't have been. I'm a very organised person, and I found it difficult to get started with the map because I didn't have a good sense of how many "bubbles"/ concepts I would need and therefore couldn't start because I didn't know *where* to start (literally) on the page. For instance, putting the research problem in the middle felt logical, but I knew I would need significantly more steps/concepts "after" than "before," so I stopped and started my map several times and with several different tools: Word Smart Art tool, (a) pen and paper list, (and the) Canva (website) tool. All of these tools had very rigid space restrictions or would require a lot of formatting effort, and I stalled out each time. I finally found a website (<https://bubbl.us>) that had a really flexible system. I could add, remove, (and) move bubbles extremely easily. Once the space priority was met, I was able to focus on getting down as many concept bubbles as I could (which probably should have been my first priority in the first place, but I couldn't get past the space/formatting hurdle). I plotted the main path of the problem and the steps the research would take first, using the phases of the (text) book as a basic starting point. Then I used keywords, major concepts from the book, and my personal research to add further steps or branching paths. Once the research process side was (essentially) fully fleshed, I went back and tracked the path the problem took: how it developed, who facilitated the problem's creation, and what actions led to the problem. (Female Doctoral Student)

While the student clearly used a strong strategy to complete her map and utilised the textbook as a resource (as required), her focus upon the research question itself in the creation of the map did not occur. While research mapping clearly served her in terms of applying the course material to her own work and prompting her to think deeply about it, her reflection suggests the importance of emphasising to students that the research question should serve as the starting point of the research concept mapping exercise. This emphasis of the research

question being at the centre might be made in the future by the first author developing her own concept map in front of students, following a formal lecture of the research map concept, with my research question at the centre of the map. Such a strategy would shift the concept map from a research tool to that of an instructional aid (Xie and Lin 2019).

## Lessons Learned as a New Researcher by Creating the Concept Map

Students learned that the concept map assisted them in organising their thoughts as researchers and as a study aid for research-related concepts learned during the course. The map also contributed to their increased confidence and knowledge of research, as well as how to apply it to their specific topics. They further believed that the map assisted in planning their research and preparing for their future writing processes. These findings parallel those of Hsu (2019) who found concept maps beneficial for both student writing production and confidence.

## Conclusion

Concept maps have long served as tools for teaching, learning, and assessment. This work points to the tool's utility in the early stages of the research process. Application of concept mapping holds a clear creative game element that students enjoy. Considering gamification's positive influence upon student learning (Buckley and Doyle 2014) and achievement (Yildirim and Sen 2019), continued use of concept mapping with focus upon creative game aspects of the exercise promises to promote understanding and application of course content.

Concept mapping has also been useful to students for retention of information during doctoral examinations and has been applied to assess learning in other courses within the featured programme, such as the class Higher Education Finance. Future work in this area could continue to explore the role of the concept map throughout the varied phases of the research process and study the utility of this tool in assessing outcomes at varied educational levels, including undergraduate and postgraduate training. Further, research might explore how the concept map as a tool may meet the needs of neurodiverse learners and those needing learning accommodations.

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