CONCEPT MAPPING: A TOOL FOR CREATING A LITERATURE REVIEW

Maizam Alias & Zurinah Suradi
Universiti Tun Hussein Onn Malaysia, Johor Darul Takzim, Malaysia

Abstract. Conducting a systematic literature review is an essential research activity in ensuring a good piece of research. However, students who are new to this research activity may find the activity highly challenging. This article presents the findings from a classroom research involving pre-service teachers on the use of concept mappings for conducting and creating a literature review. The findings indicate that students are overwhelmed by the vast amount of information that they encounter and often do not know how to identify and organize the information to be of use in their research. However, by using concept maps, the creation of a literature review becomes less daunting and more bearable throughout. Concept mappings are used for two purposes mainly that is, to summarize the information obtained from an individual source and to synthesise information obtained from the different sources.

1   Introduction

Having adequate knowledge of the relevant subject matter in the area of what one intends to study is a pre-requisite to producing a good piece of research. Adequate knowledge will ensure that the research is well justified in all aspects of its planning and implementations. One sure way of achieving such a knowledge state is by conducting a systematic review of what has been done in the area of interest that is, to conduct a literature review. So important is the literature review to the academic research endeavours that a section of a research article or a chapter of a thesis is allocated to the literature review documentation.

Creating a literature review is no easy task for students, as it demands multiple skills. A literature review is a multi-stage process that involves scanning the information, making notes of what have been read, synthesizing and structuring the information, writing a critical review of the literature and building a bibliography (Rowley, and Slack, 2004). Often, the literature review process becomes more demanding as the research gets more complex. The field of study can also have a bearing on the literature review as wisely noted by Boote and Beile (2005), "*... a thorough, sophisticated review of literature is even more important in education research, with its messy, complex problems, than in most other fields and disciplines*."

During the review process, the vast amount of information that is available to students is often the cause for high anxiety to many students especially to those who are new to the task. Rowley and Slack (2004) observe that "*Encountering the messy nature of knowledge*" while conducting the literature review can be "*One of the most intimidating aspects of a literature review…*" (p.1). Concept mappings have been suggested as one of the tools that can help in making sense of information while conducting a literature review (Carnot, 2006, Rowley and Slack, 2004). Rowley and Slack (2004) propose "*…concept mapping can be a useful way of identifying key concepts in a collection of documents or a research area*" (p.8). They suggest that concept maps can be used as a tool to "*…identify additional search terms during the literature search, clarify thinking about the structure of the literature review in preparation for writing the review and understand theory, concepts and the relationships between them*" (Rowley and Slack, 2004, p.8). What is more important, representing information in concept maps will provide a tool for potentially seeing the interconnections between areas that were not previously apparent (Novak, 1984). In this way thus, concept maps can be useful in creating coherence to the actual writing of the literature review. The objectives of this article are to identify the major challenges faced by students in creating a literature review, to determine what concept maps are being used for in the process and to determine their perceptions of the usefulness of concept mappings in the creation of a literature review.

2   Methods

The participants were a heterogeneous group of students ($n = 47$) from the Master in Technical and Vocational Education (MTVE) programme at Universiti Tun Hussein Onn Malaysia. The majority of students (~85%) were engineering graduates (civil, mechanical and electrical engineering) and the rest were information technology, business studies and hospitality graduates. The MTVE programme is a pre-service teacher-training programme and thus, the students have no prior teaching experience. The average age of the students was 24 years old and 40 out of the 47 students were females. The students were taking the research methods class taught by the first author which was offered in the first semester of this programme. The course required 200 hours of students' learning time.

As part of this course, each student was required to write a literature review on a topic of his or her choice, related to the technical and vocational education and training (TVET). A list of 11 topics pertaining to TVET and their sub-areas were given to students to assist them in determining a topic for their literature search. To help them focus on what information to gather, students were asked to write "research questions" related to the topic that they chose and to seek the answers to these questions from printed journals, online-journals and books. Suggestions were made on suitable questions such as, "what is the definition of…", "what are the advantages of …" and what are the benefits of…" Students were also taught how to use summary tables and concept maps for synthesizing and organizing the information that they had gathered. For the summary tables, they were asked to use summary titles such as objectives, sample, instruments and findings to focus their summarization efforts. All students were instructed to use the concept-mapping tool CmapTools downloaded from the website of the Institute of Human and Machine Cognition to construct their concept maps.

Before the mid semester break, students submitted three items for their literature review assignment namely, a five-page literature review on a topic of their choice, a journal describing their learning experience and a description of the process and activities that they had undertaken to create their literature reviews. They were encouraged to include flowcharts, tables and concept maps in the description of their literature review process. Students were also encouraged to share their thoughts in the journal on the difficulties that they faced as well as their perception of the usefulness of the three tools that they used. To verify whether concept mappings had any influence on the content and organization of their literature reviews, the drawn concept maps were compared to the written literature reviews. The three items were analysed to achieve the objectives of the study mentioned earlier.

3   Findings and discussions

Out of 47 students, only 45 students (96%) use concept mappings in the creation of their literature reviews. Of those who use concept mappings, 12 students (27%) make use of concept mappings to summarise information from an individual source as well as to synthesise the information that they have gathered while the rest use summary tables to summarise and concept mappings to synthesise information.

3.1   Challenges faced by students in creating a literature review

Analysis of students' journals indicates that many students find conducting a literature review is highly challenging. The first challenge for them is deciding on a topic for the literature search, "...*finding the topic is quite difficult because I am not sure of which topic that could catch my interest*" (GB186) and "…*cannot decide on the area to create the literature review …*" (GB018). Their lack of experience in teaching and thus of the educational issues makes it extremely difficult for them to come up with a topic that could catch their interests. Students tend to spend a lot of time and an effort before a final topic is decided. One student (GB007) who begins his search on women in TVET focussing on sexual harassment at the workplace changes his search topics several times before he finally decides that he likes to work on virtual laboratories and technology in TVET. Students typically read on three topics with five to ten articles on each before they can decide on the one that they feel comfortable with. This exercise can take them up to week six sometimes leaving them little time to complete their assignment. Once a student has decided on a topic, the next major hurdle that they face is their inability to identify the main ideas from the article that they read, as clearly exemplified by (GB215), "… *do not know how to extract the gist of the articles that I read*". For students who manage to extract the information that they feel they need, the next hurdle for them is how to organise and synthesise the information in a useful form that is, as lamented by (GB252), "...*I worry about how I'm going to add up all the information to make one essay that make sense…*". Therefore, making sense of the information that they have gathered is certainly not an easy task for students.

3.2   Uses of concept mappings in creating a literature review

Upon analyzing the concept maps and the description of the literature review process it is found that students make use of concept maps in three inter-related ways namely, to extract and summarise the important points from an article, to synthesize and organize information obtained from multiple sources.

3.2.1   Using concept maps to extract and summarize main points from an article

An example of a concept used for summarization purposes is shown in Figure 1. The author of this concept map writes in her journal of the difficulties that she experiences in extracting the required information from the materials that she has read, "… *do not know how to extract the gist of the articles that I read*" (GB215). This

particular student feels that concept mappings help her to overcome the extraction problem, "…*from the concept map of the individual article, I have identified the important points related to learning styles…*" (GB215). Another student who concurs with her states "…*concept mapping is a way to get an idea …*" (GB128).

The concept maps produced by both students are typically of the spoke type with a maximum of three levels of hierarchies. The structure of their concept maps indicate that they may not have a good understanding of the article that they have read. Nonetheless, by using concept mappings, they manage to extract some relevant key concepts and to reduce their anxiety relating to the issue of extracting information from a source.
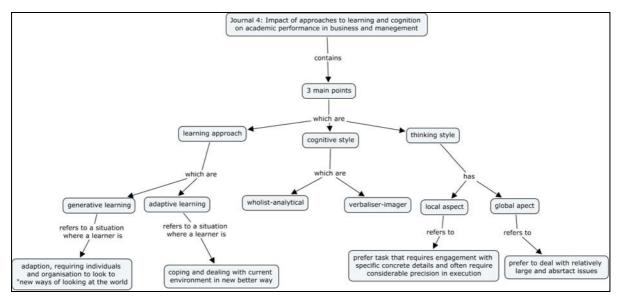

Figure 1: Important points and concepts identified from an article using concept mapping

3.2.2 Using concept map to summarise information

Quite a number of students use concept maps to summarise information obtain from multiple sources. The content of the summary depends on the question that underlies the concept map. One of the most asked questions is of the type "*What is the definition for …*" As stated earlier; these students have no prior experience in teacher education and therefore, are unfamiliar to most education concepts. Concept mappings help these students to construct the meaning of the concepts that they are interested in based on the information retrieved. Figure 2 is an example of a concept map constructed by one student who is interested in defining the concept of problem based learning (PBL). In this case, concept mapping produced is a network type showing the student's emerging understanding of the concept of PBL.
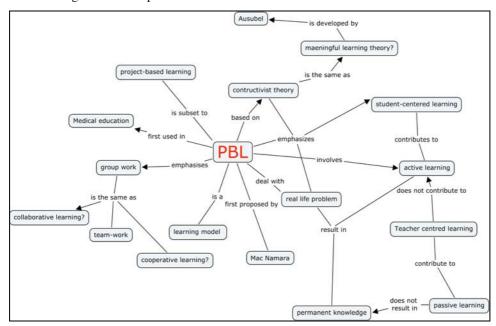

Figure 2: An example of a concept map used to elaborate on the concept of problem based learning (PBL)

3.2.3 Using concept mappings for organizing and structuring the literature review paper

When a concept map is used for organising and structuring a literature review paper, the structure of the concept map often takes the form given in Figure 1 where the hierarchy of topics and sub-topics are clearly illustrated. The top most concepts often become the title, followed by the next lower concepts as sub-headings and so on. The content, structure and organisation of the concept map is thus used as the framework for the literature review paper. The comprehensiveness and the quality of the concept maps content is however, determined not only by the guiding questions but also by the students' comprehension of the materials that they read. Therefore, a concept map that looks structurally good may not produce a good literature review paper.

3.3 *Perception of students towards the usefulness of concept maps*

Out of the 45 students who used concept mapping, 12 students draw concept maps first to summarize the individual journal articles before summarising the information using tables of summaries. The rest of the students use summary tables first to summarize information from the individual source, which is later represented in the form of concept maps. The decision to draw the concept maps or tables first could have been influenced by prior experience on concept maps, "…*I used concept map to summarize my journal articles because I believe that it is the best method … I have used it since my secondary school days*" (GB169). This particular student produced sixteen concept maps, one for each of the article that she reads. Another student felt that using concept maps help her in writing her literature review; "*I have found that concept maps used in this assignment has helped me a lot in writing a good literature review. I can plan what I'm going to include in the literature review by constructing the concept map. Concept map has saved my time and it's easy to understand*" (GB186). Some students with engineering background however, find that constructing concept maps is loaded with anxiety. One student states that "*do not know what words to use to make the connections as there were so many choices of words available*" (GB070). It appears that the open-ended nature of the concept mapping process may have caused high anxiety among some students. Not surprisingly, their past trainings as engineers could have pre-disposed them towards analytical-mathematical inclinations rather than verbal-analytical inclinations. Nonetheless, based on the concept maps constructed, the journals and the literature review paper that they submitted, concept mapping is perceived by students in general to be a useful tool in the creation of literature review.

4 Conclusion

Overall, most students find that creating a literature review is highly challenging with deciding on a topic, extracting ideas from a document and synthesizing and organizing information being the three major areas of concern. Nonetheless, evidence from the documents that students submitted indicate that concept mappings do help them to a certain extent in the three major areas of concern. It also observed that the content and quality of the concept maps are determined by the questions students ask as well their comprehension of the materials that they read and thus, the quality of the literature paper, which varies accordingly.

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