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CONCEPT MAPPING USING NOVAK'S AND TROCHIM'S APPROACHES:CLASH OF THE TITANS OR A MARRIAGE MADE IN HEAVEN?

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Abstract: This paper presents the early results from an empirical study that has used a combination of two concept mapping methodologies, those of Novak (1990) and Trochim (1989), to explore students' understanding of Mental Health Nursing whilst on a three-year undergraduate training course. The paper will first explore each approach and then compare how the two concept mapping methodologies differ. The paper outlines how this study has integrated the two approaches into a single methodology. The findings of this study suggest that each of the approaches lead to different yet complimentary results. This indicates that each approach adds a different level of comprehension to the overall findings. The paper will discuss the strengths and limitations of this integrated concept mapping approach and make suggestions for further improvements.
Keywords: Concept mapping, methodology, professional education, mixed methods.

1. Introduction

The term 'concept mapping' is used to describe any methodology that is used to produce a pictorial representation of an idea (Trochim & Kane, 2005). Concept maps depict participants' understandings of the importance and the relationship between different concepts (Hammersley, 1996). Two clear approaches to concept mapping have emerged that are distinct and different. The aim of this paper is to explore the use of two approaches to concept mapping to explore a single topic: Mental Health Nursing.

The first concept mapping approach used was outlined by Joseph Novak (1990). This approach provides guidelines for the participants to develop their own individual map of a given topic. Novak's approach is based upon Ausubel's learning theory (1963), which postulates that learning occurs when new information is assimilated into existing knowledge structures. Hay (2007) used concept mapping to categorise deep learning, surface learning and non-learning in students based upon how individual's knowledge structure changes over time. This approach has been used in a wide range of disciplines to examine personal learning trajectories.

The second concept mapping approach was developed by William Trochim (1989). This approach asks participants to generate meaning statements about the given question or topic. These statements are collated for different participants into a single group of statements. These statements are then ranked according to their relative importance and clustered into themes defined by the participants. This approach then analyses this data using a statistical process called agglomerative cluster analysis, which leads to formation of the concept map (Trochim, 1989). This concept mapping approach too has been used to explore a range of topics.

Table 1, below, summarises the differences between Novak's and Trochim's concept mapping methodologies.

Table 1: Comparison of Novak's and Trochim's approaching to concept mapping methodologies

	Novak's Concept Mapping	Trochim's Concept Mapping
Focus	Individual	Group
Research paradigm	Qualitative	Quantitative
The concept map is….	The start of the process	The end of the process
Theoretical underpinnings	Learning theory (Ausubel, 1963)	Systems theory (Veney & Kaluzny, 1984)

This paper focuses on the analysis at a group level. A separate paper, *Becoming a Mental Health Nurse: A three year longitudinal study* (Wells & Bressington, submitted) provides a more detailed Novakian analysis of the individual maps.

2. Method

2.1 Participants

This study used a convenience sample of students (n=60) recruited from the two undergraduate pre-registration programmes in Mental Health Nursing. One university is located in London, UK and the other in the South East of the UK. All students on the first year of the programme were eligible to participate. The data was collected as part of their education programme to encourage critical reflection of what it means to be training as a mental health nurse. Permission to use the data for research purposes was formally requested from potential participants and ethical approval was granted by the Faculty research ethics committee.

2.2 Procedure

The procedure used in this study is outlined below in figure 1.

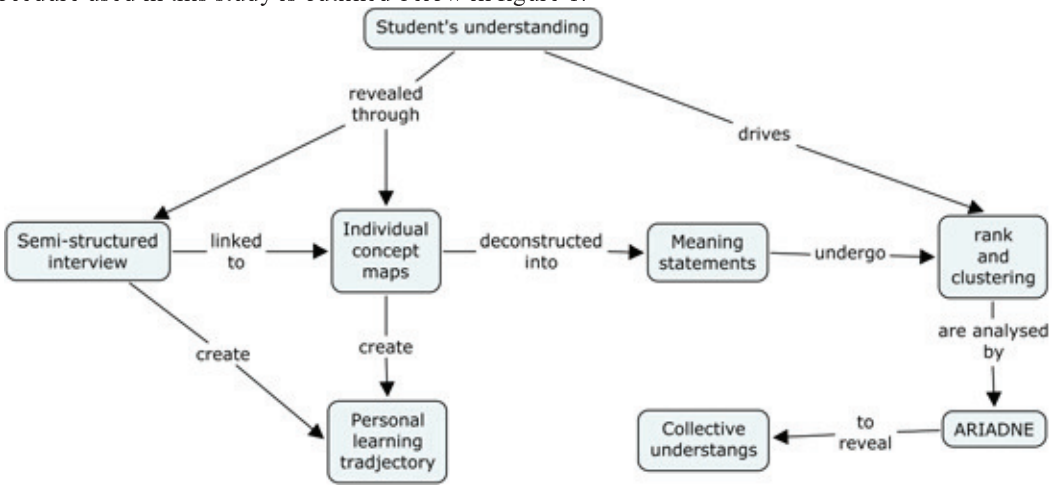

Figure 1: A concept map of the methodology used in this study

The individual concept maps were created using Novak's approach to elicit participants' understanding of 'Mental Health Nursing' (Novak, 1998). Maps were created at the beginning, middle and end of each year of the programme, totalling nine data points. Next, the concept maps underwent a cross-sectional analysis as outlined by Trochim (1989): Each map was deconstructed into meaning statements comprising of concept-label-concept. The statements from all the participants were collated together. Statements that were not clear or did not make sense were rejected. The remaining statements were grouped thematically and the researchers selected the 50 most commonly used statements. These statements were returned to the participants to be ranked on a Likert scale for relative importance and clustered into groups according to the participants' interpretation of the data. The data was then analysed using ARIADNE concept mapping software (Severens, 1995). The output of this analysis is a set of non-overlapping clusters representing themes that are collectively important to the cohort at that moment in the training.

3. Results

This study only considers the data from the first and final maps in order to evaluate the effectiveness of a concept mapping process integrates Novak's and Trochim's approaches. This next section will outline each of the results independently.

3.1 Novakian analysis

A Novakian analysis of the data constitutes an overview of the participants' choice of concepts on their first and final maps. It is appreciated that this is a crude interpretation of Novak's approach to analysis. A more detailed analysis of the participants' maps can be found in a separate paper, *Becoming a Mental Health Nurse: A three year longitudinal study* (Wells & Bressington, submitted).

411 meaning statements were generated by participants in the first maps. The final maps produced 162 statements. Despite the reduction in overall number of meaning statements, there was much greater convergence in the concepts used between the first and last maps. This can be seen on Table 2, below.

Table 2: Ranking the frequency of concepts for first and final maps

First maps			Final Maps	
Concept	**Freq.**	**Order**	**Concept**	**Freq.**
Patient, client, person	9	**1**	Person Centred	20
Medication	6	**2**	Recovery	18
Hospital	5	**3**	Talking therapy	15
Community	5	**4**	Medication	15
Communication skills	4	**5**	Risks	11
Reflection	2	**6**	Collaboration	9

The frequency of particular concepts changed from the first to final map. In the first map, 'patient, client or person' appeared most frequently, followed by 'medication', 'hospital' and 'community'. In the final maps, 'person centred' appeared most frequently, followed by 'recovery', 'talking therapy' and 'medication'.

3.2 Trochimian analysis

The Trochimian concept maps can be seen below.

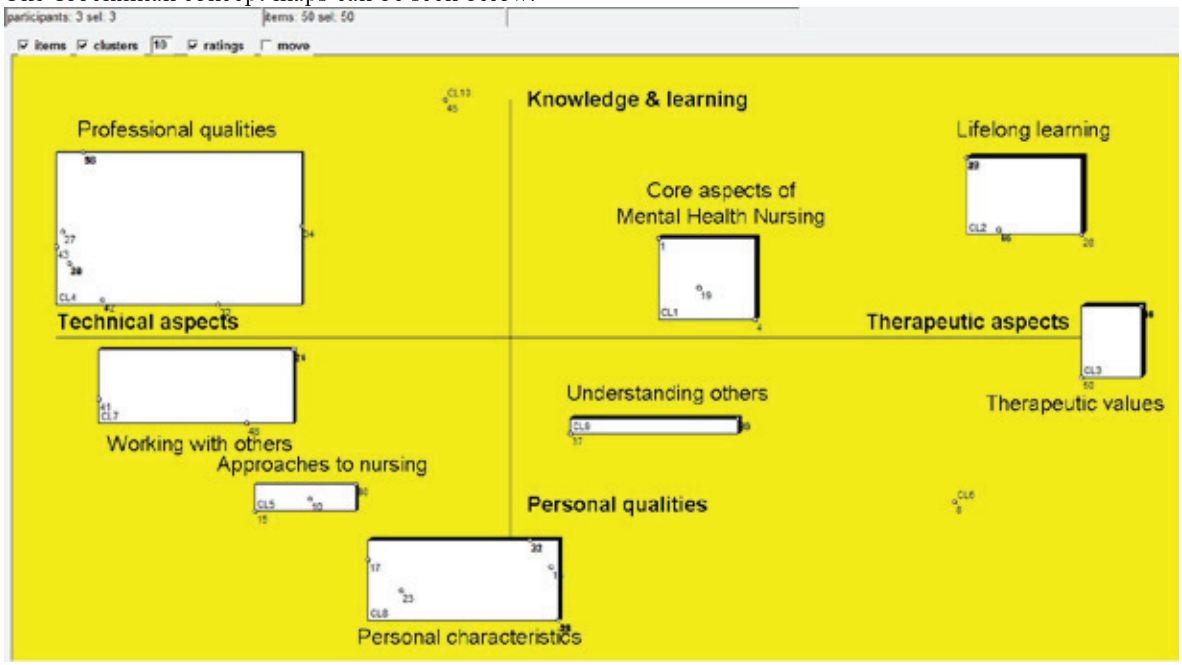

Figure 2: Ariadne cluster analysis of first maps.

The cluster analysis of the first maps shows 8 themes: 'Core aspects on MHN', 'lifelong learning', 'therapeutic values', 'professional qualities', 'approaches to nursing', 'working with others', 'personal characteristics' and 'understanding others'. These are organised on two axes: 'knowledge & learning' to 'personal qualities', and 'technical aspects' to 'therapeutic aspects'.

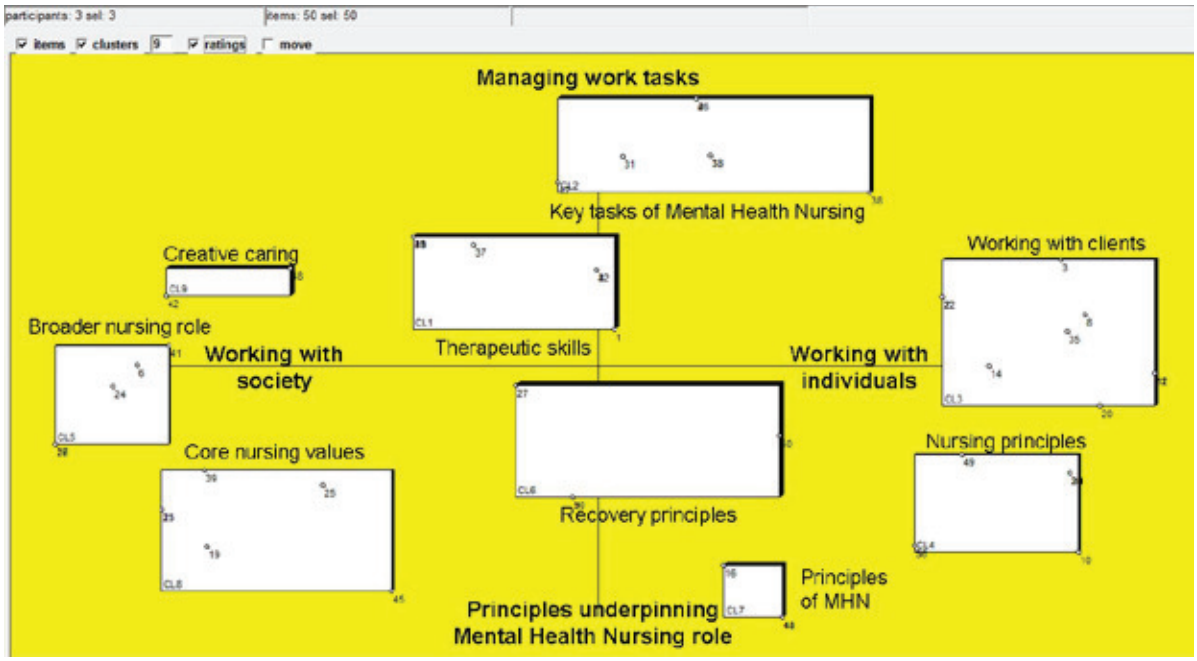

Figure 3: Ariadne cluster analysis of final maps.

The cluster analysis of the final maps shows 9 themes: 'Therapeutic skills', 'key tasks of MHN', 'working with clients', 'nursing principles', 'broader nursing role', 'recovery principles', 'principles of MHN', 'core nursing values' and 'creative caring'. These themes are organised on two axes: 'Managing the tasks of MHN' to the 'principles underpinning MHN', and 'working with society' to 'working with individuals'.

The cluster analysis (Table 3) shows that the highest ranked themes were, for the first map: 'therapeutic values', 'lifelong learning', and 'core aspects', and for the final map to 'recovery principles', 'creative caring' and 'therapeutic skills'.

Table 3: Comparison of participants' ranking of themes for first and final maps

First maps			Final Maps	
Theme	**Pref.**	**Order**	**Theme**	**Pref.**
Therapeutic values	3.83	**1**	Recovery principles	3.83
Lifelong learning	3.61	**2**	Creative approaches	3.5
Core aspects of MHN	3.44	**3**	Therapeutic skills	3.33
Personal qualities	3.27	**4**	Principles of MHN	3.11
Understanding others	3.22	**5**	Key tasks of MHN	3.09
Working with others	2.75	**6**	Working with clients	3.0
Ways of working	2.5	**7**	Core values of nursing	2.66
Professional qualities	2.31	**8**	Broader nursing role	2.6
-	-	**9**	Nursing principles	2.47

The focus of understanding shifts from 'therapeutic values'/'lifelong learning'/'core aspects' in the first map to 'recovery principles'/'creative caring' and 'therapeutic skills' in the final map.

4. Discussion

The students engaged well with the cyclical nature of the study. They used the development of their own map to reflect on their understanding of Mental Health Nursing. This was an activity that was largely personal and independent from the rest of the group. Conversely, the ranking and clustering tasks were completed in groups. These sessions would frequently be a lively discussion on the relative importance of each of the meaning statements. Each group would typically discuss one statement in some depth before reaching agreement. These sessions encouraged the students to engage with some of the tensions inherent to Mental Health Nursing and to draw their own conclusions about these.

The overall reduction in the number of meaning statements can be partially accounted for by attrition from the programme and therefore withdrawal from the study. However, this does not account for the overall

reduction in meaning statements. Some of this may have been due to the cyclical data collection and clustering-ranking tasks - participants shared their ideas with each other and then ranked and clustered these - which may have led to a shared understanding. However, it is more likely that this convergence is a product of the socialisation into the profession as a product of their education and clinical experiences.

Participants' use of concepts moved away from describing the focus and context of Mental Health Nursing in the first maps to citing the underlying principles of nursing and the key interventions. This suggests that participants' understanding of Mental Health Nursing developed and matured over the course of their training. This conclusion is also supported by the Trochimian analysis, but through different means.

The cluster analysis illustrates that the first maps were aspirational in nature, perhaps identifying the kind of Mental Health Nurse they wanted to become at the end of the training. This had progressed to reveal a much greater awareness of the actual role of the Mental Health Nurse. Equally, the early emphasis on education and their personal qualities decreased from the first map to a greater emphasis on the skills and principles required to support recovery. It may be that the participants felt more equipped to deliver interventions at the end of the programme as they are readied to formally enter the profession.

5. Limitations

This is the first time (to our knowledge) that these two approaches have been used in the same study. This has presented a number of challenges in the process of completing this research. Integrating the two approaches may have sacrificed the purity of doing each separately. The analysis of the results from each approach has been complicated by the combined approach and cyclical nature of data collection, may have influenced the interpretations. The researchers are also tutors on the nursing programmes and this may have influenced both the students' responses and the interpretation of the findings. An attempt to manage this was achieved by each researcher leading the study in the other's university.

6. Conclusion

Each of the two concept mapping approaches used in this study reveals something different. Novak's approach, by proving a framework for the externalising the participant's knowledge structure, allow this structure to be interrogated and discussed. Over time these maps can form milestones along a personal learning trajectory, which can be analysed according to the gross typology. Trochim's approach allows for the analysis of the group's perspective on the important aspects and the relationships between these. This approach allows for a meta-level understanding of how different groups understand a given topic, but is distanced from each individual's understanding. When integrated, these two approaches provide different but complimentary insights into the phenomenon being investigated.

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