The Effects of Using Concept Maps on the Results of Nurse Students: An Experimental Study

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**Recommended Citation**
Ennaciri, Sami; Droui, Mohamed; and Chigr, Fatiha (2024) "The Effects of Using Concept Maps on the Results of Nurse Students: An Experimental Study," *Health Professions Education*: Vol. 10: Iss. 2, Article 6. Available at: [https://hpe.researchcommons.org/journal/vol10/iss2/6](https://hpe.researchcommons.org/journal/vol10/iss2/6)

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The Effects of Using Concept Maps on the Results of Nurse Students: An Experimental Study

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Abstract

Purpose: Concepts maps become fashionable in educational fields as pedagogical tool to improve learning among students. However, the effects of using concept maps are not completely explored. Therefore, this study aimed to explore the effects of using concept maps among nurse students at High Institute of Nursing Sciences and Health Technics in Rabat, Morocco.

Methods: An experimental quantitative explanatory research with pre-test and post-test was used. Seventy nursing students from Moroccan nursing school were enrolled in this study. Half of them received a course using classical methods (control group); the other half received the course using concept maps (experimental group). Before and after the courses the two groups passed the same pre-test and the post-test that assess, via scores, four levels of learning: knowledge, comprehension, analysis and synthesis.

Results: The means of student scores were like this: control group (7.54 ± 2.52) and the experimental group (12.37 ± 2.76); the means of both groups were significantly different. By using Hake Normalized Gain, control group obtained a score of 0.2 and experimental group had a score of 0.5. The use of concept maps in epidemiology course showed an improvement of nursing student’s results in terms of comprehension, analysis and synthesis.

Discussion: The use of concept maps in nurse education classroom allows students to have better results than those who don’t use concept maps. For this, concept maps should be generalized in nurse classroom. And future research should explore the effects of using concept maps on clinical reasoning in nursing student.

Keywords: Concept maps, Learning, Results, Nursing

1. Introduction

Concept maps have been found to help nursing students retain more information while also improving comprehension and critical thinking. Students who used concept maps as a study aid were able to retain knowledge more successfully than those who took notes using conventional techniques [3]. They can improve their memory recall by making mental links between topics due to the visual format of concept maps. In the context of nursing school, where students must remember a great amount of information for clinical practice.

Additionally, concept maps help students to develop their metacognitive abilities and self-regulated learning. The capacity to keep an eye on and control one’s own thought processes is known as
metacognition, and it is essential for learning to take place. Concept mapping helped students become more aware of their learning styles, recognize areas in their knowledge, and actively look for new materials to close those gaps [4]. This shows that concept maps can enable nursing students to become self-directed learners and take charge of their education. In the present study, we aimed to explore the effects of using concept maps on the academic results of nurse students. To do this, we tried to examine the difference between the results of a group that has followed its course with the classic method and those of a group that has followed its course using concept maps. In addition, this research attempted to determine which cognitive level was affected by the use of concept maps.

2. Methods

2.1. Overview

This study was an experimental quantitative explanatory research with pre-test and post-test comparisons. First, students passed a pre-test which is the same for both groups, then one group received an epidemiology course without using concept maps; and the other one received an epidemiology course via concept map. Finally, Student's passed a post-test which was the same as the pre-test. This study took place at Institut Supérieur des Sciences et Techniques de Santé in Rabat on the 17th of January, 2023 to the 28th of February, 2023.

2.2. Participants

The study included all nursing students in semester 2 at Institut Supérieur des Sciences et Techniques de Santé (Institute of nursing and Health Technics), Rabat, Morocco. The participants in this study were 70 students divided into 35 students for each class.

2.3. Materials

The test consisted of twenty multiple-choice questions (MCQs) related to epidemiology. There was five questions about knowledge, five questions about comprehension, five questions about analysis and five questions about synthesis. The questions were the same for the pre-test and the post-test. Variety of methods, including expositive, interrogative, and active methods were used in the course with control group. For experimental one, seven sub-groups of five students was made, they were asked to fill concept maps during explanation and to discuss it between each group members at the end of the course.

2.4. Procedures

Students were randomly assigned to one of the groups. Experimental group consisted of 35 students and control group consisted of 35 student. Before beginning the pedagogical activity, a pre-test was done by both groups to assess their prior scores. For this, each group had 2 h to complete the pre-test. Then, with control group, a traditional 3-h class for 10 days was provided. For the experimental group, 1 h of conceptual explanation of the concept maps was given, followed by a 3-h during 10 days. At the end, both groups passed the same post-test.

2.5. Analysis

SPSS V27 was used to analyse the student's score means of each group. For this, Independent T-Test was used to compare means, standard deviation and variances of two groups. The mean difference between groups in knowledge, comprehension, analysis and synthesis was done by using One-Way ANOVA. In addition, Hake's Normalized Gain test was held to avoid floor effect.

3. Results

An Independent T-test was conducted to compare means of pre-test between control and experimental groups (Table 1). The difference of means was 0.86 with \( p = 0.463 \), non-significant. The difference of means in the experimental group was 4.83 with \( p = 0.001 \), significant. These findings show that there

<table>
<thead>
<tr>
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<th>Mean (SD)</th>
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<tbody>
<tr>
<td></td>
<td>Control group</td>
<td></td>
<td>Experimental group</td>
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<td></td>
<td>N = 35</td>
<td></td>
<td>N = 35</td>
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<tr>
<td>Score pre-test</td>
<td>3.86 (1.83)</td>
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<td>4.14 (1.37)</td>
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<td>0.86 (−0.49, 1.60) 0.463</td>
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<tr>
<td>Score post-test</td>
<td>12.37 (2.76)</td>
<td></td>
<td>7.54 (2.52)</td>
<td></td>
<td>4.83 (3.56, 6.09) 0.001</td>
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</table>
is a significant difference of means in post-test scores between both groups.

To point the concerned cognitive levels by this difference, a One-Way-ANOVA test was run. Knowledge score of control group versus knowledge score of experimental group: $F (1,68) = 2.57$, $p = 0.094$; comprehension score of control group versus comprehension score of experimental group: $F (1, 68) = 16.00$, $p < 0.001$; analysis score of control group versus analysis score of experimental group: $F (1, 68) = 19.18$, $p < 0.001$ and synthesis score of control group versus synthesis score of experimental group: $F (1, 68) = 104.60$, $p < 0.001$.

These results implied that using concept maps in an epidemiology course improved nurse student's results. This improvement was discernible on levels of comprehension, analysis and synthesis. To avoid the floor effect, we proposed calculating Hake's normalized gain [5]: the control group obtained a score of 0.23 which means that the gain was small; and the experimental group obtained a score of 0.51 which means that the gain was medium. So, students who received the course using concept maps improved their scores more than those who received the traditional course.

4. Discussion

The goal of the study was to investigate the effects of concept maps on academic results among first-year nursing students. To that end, we conducted a classroom intervention. After that intervention we found that the use of concept maps, for nursing student in epidemiology course, enhanced their level of comprehension, analysis and synthesis.

Concept maps allow students to be engaged in meaningful learning that has an impact on their grades [6]. Significant learning is one factor that could explain this shift in student performance. In fact, the group who had the concept maps course was able to use a graphic tool that was close to how our brain work. Also, peer discussions can foster understanding more than teacher explanation or self-explanation [7].

According to our findings, the group that used concept maps outperformed the group that used conventional learning techniques in terms of comprehension. This result is consistent with earlier studies that have demonstrated how useful concept maps are for improving comprehension [8]. A better comprehension, of the subject matter, appears as a result of structuring and integration of knowledge: made easier by the visual portrayal of concepts and their links in concept maps.

The experimental group performed at a higher level of analysis than the control one. In fact, concept maps give students a visual framework to help them find connections and patterns in the body of knowledge. Learners participate in a more methodical and structured examination of the material by visualizing the connections between concepts, which improves their analytical thinking abilities [9].

Synthesis, the highest level of cognitive processing, entails combining and rearranging knowledge to produce fresh insights or solutions. Based on the findings, the experimental group did better in terms of synthesis than the control group because concept maps can help foster higher-order cognitive abilities. Concept maps' visual structure helps students to spot knowledge gaps and to be able to do transformation of knowledge [10], which makes it easier for them to synthesize information from several sources and come up with new ideas. In fact, concept maps allow students to be placed in concentration circumstances, allowing for the formation of new synaptic connections and thus an increase in brain capacity. The concept maps also functions as a tool for representing and organizing knowledge [11], which explains why students' comprehension, analysis and synthesis have improved.

4.1. Limitations

In this study there was some limitations. We noticed that due to scheduling constraints we were: unable to enroll second year and third year nursing students; and to reverse the two groups in order to repeat the experiment.

5. Conclusion

Compared to conventional learning tools, our study concludes that the usage of concept maps improves levels of comprehension, analysis, and synthesis. Concept maps assist the synthesis of information, foster analytical thinking abilities, and allow a greater grasp of the subject matter through the visual representation and organizing knowledge. These results demonstrate the potential of concept maps as teaching aid that fosters meaningful learning experiences and helps students build higher order thinking skills.

Ethical approval

This study was approved by Institut Supérieur des Sciences Infirmières et Techniques de Santé de Rabat (High Institute of Nursing Sciences and Health Technics Rabat) (01/01/2023). Informed consent was obtained from all the participants in the study.
Conflicts of interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

We want to thank all the participants in this study.

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