

THE EFFECT OF SEMANTIC MAPPING ON STUDENTS' COMPREHENSION OF MEDICAL TEXTS

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ABSTRACT

Nursing students at King Saud University (KSU) are considered to be low achieving readers. They face difficulties with understanding and recalling medical texts. Thus, the researcher used computer-assisted semantic mapping (CASM) with level-three (114 NAJM) nursing students to map medical passages for the purpose of helping such students in comprehension. Participating subjects were of two groups: Group A (n = 32) and Group B (n = 26). The control group (n = 26) received traditional in-class instruction that depends on the textbook only and the experimental group (n = 32) received a combination of traditional in-class instruction and semantic mapping (SM) instruction using a software (FreeMind 0.8.1). A pre- and post-test were utilized to assess student reading skills before and after the intervention. The semantic-mapping treatment lasted 8 weeks. Results showed that SM was ineffective in improving student reading comprehension. This lack of progress in reading is attributed to the program's incapability of reinforcing reading comprehension skills such as inferencing and understanding causal relationships in a text. Further, students lack some necessary background knowledge that might aid them in making inferences and in comprehension. Also, SM needs more of teacher modelling and student training.

Keywords: Semantic Mapping, Reading Comprehension, ESP, Nursing Students, Free Mind

INTRODUCTION

The process of reading goes beyond simply decoding words on a page. It involves understanding the meaning of individual words and combining their meanings to reach an understanding of a reading text. As suggested by Davis (1942, 1944), reading, as a skill, is built on a number of sub-skills. He mentions that two of the components, word knowledge and reasoning in reading, account for 89% of students' achievement. Similarly, Sternberg and Powell (1983) suggest reasons for verbal comprehension which is defined as the person's ability to understand oral and written language. The suggested hypotheses are known as the bottom-up approach, the top-down approach, and the knowledge-based approach. Bottom-up processing in reading refers to readers' ability to decode letters and words to achieve some lexical information without recourse to higher-level knowledge. The top-down processing, however, is the reader's ability to combine their prior knowledge with the new information represented in the text to reach an overall understanding of the text. The knowledge-based approach, on the other hand, refers to the use of old knowledge in obtaining new one.

Nursing students at King Saud University (KSU) are considered to be struggling readers compared with medical students. Pre-medical and nursing students are required to take an

ESP (English for Specific Purposes) course known as 134 NAJM for pre-medical students and 114 NAJM for nursing students that aims at improving students' English and medical knowledge at the same time. The objectives of the course are mainly improving their reading comprehension level. Nursing and pre-medical students need to read a lot to be exposed to more medical terms. After teaching the course to both groups, the researcher noticed that nursing students are facing difficulties with understanding medical texts. Thus, the researcher will use computer-assisted semantic-mapping (CASM) to map medical passages for the purpose of helping nursing students in text comprehension.

One of the techniques that gained some popularity for its efficiency in improving students' reading comprehension level and their vocabulary is the technique of SM. As defined by Pearson and Johnson (1978), SM is an organizational strategy that shows graphically and visually the relationships between ideas.

Al-Jarf (2009) highlights that a considerable body of research indicates the effectiveness of SM in science, nursing, psychology, social studies, computer science, research methods, and teacher education. Due to the wide use of SM in different areas, the researcher will use CASM to investigate its effectiveness with nursing students who need to increase their readings to improve their vocabulary.

Selected Studies on Semantic Mapping and Reading Comprehension

A close examination of the studies conducted in the area of SM and reading comprehension revealed differences among instructional settings and research tools. For example, one of the earliest studies was by Sinatra, Stahl-Gemake, and Berg (1984) was conducted with special education students from a clinical setting. The purpose of the study was to determine whether SM or a traditional directed lesson was more effective in improving student comprehension level than a traditional textbook approach. The study was for four months and lessons were taught by clinical personnel. Each lesson began with a review followed by a general discussion of the lesson and, then, students were asked to read the passages silently. Comprehension questions were constructed to assess students' performance. The researchers found that SM was an effective strategy for reading comprehension, but no differences were found for main idea, inference, and details.

Nevertheless, there are other studies that reported no effect of SM on student reading comprehension. For example, Alvermann and Boothby (1986) worked with fourth graders to investigate the effect of graphic organizers on improving student comprehension and retention ability, but the study yielded no positive results in favor of the implemented treatment. Also, Clements-Davis & Ley (1991) study examined the effect of thematic preorganizers on secondary students' comprehension of prose fiction. Researchers found that thematic preorganizers did not improve student comprehension ability. In addition, Dunston and Ridgeway (1990) conducted their study with college students to explore the effect of teacher-constructed and student-created graphic organizers on student comprehension and retention ability. Students were assigned into either of two treatment groups (one used teacher-created graphic organizers and another used student-constructed graphic organizers) or one control group. Results revealed that graphic organizers made no improvement in students' reading comprehension and their ability to recall information. Further, De Fina

(1999) reported no effect of SM on college student comprehension of psychological texts. Students were randomly distributed into two treatment groups (one used SM and another used SM combined with subsequent discussion) and one control group. The retelling procedure was used as an assessment measure. Results showed no difference in performance between the two treatment groups and between the control group and the one using SM only. Analysis of data also revealed that the control group outperformed those using SM combined with follow-up discussion. However, students of the experimental group viewed the technique as a valuable one.

Most of the successful studies where done with elementary school students, whereas those reporting conflicting results were conducted with college students. This study, thus, explored the effect of SM on college students' reading comprehension level.

Methodology

Population of the study

The participants of this study were ESP Saudi university female students studying at the Nursing College, KSU, Riyadh, Saudi Arabia. This study took place during the first semester of the academic year 1430/31 A.H. (2009/10). Students were in their third semester taking an ESP course (114 NAJM) offered by COLT. The subjects were all native speakers of Arabic and they were the researcher's students. Their median age was 19, and they all had no less than seven years of EFL instruction in grades 6-12 prior to their admission to the Nursing College. Students enrolled at the College of Nursing are provided with the essential knowledge and skills that help them become qualified nurses. They are encouraged to act promptly and to think critically in order to face career challenges in any setting. Thus, students are not only offered specialized courses in nursing, but they are given other courses in chemistry, physics, nutrition, pharmacology, anatomy, physiology, biostatistics, the English language (112 NAJM and 113 NAJM), the Arabic language, the Islamic culture, etc.

Participants were of two intact groups (76 participants), but the total number of subjects became 58 because of students' irregular attendance and withdrawal, which affected the process of obtaining data. The control group ($n = 26$) received traditional in-class instruction that depends on the textbook only (*The Language of Medicine in English* by Ethel and Martin Tiersky) and the experimental group ($n = 32$) received a combination of traditional in-class instruction and SM instruction using a software (FreeMind 0.8.1).

Research Design

This study is of a *quasi-experimental design* known as the nonequivalent-control-group design (hereafter NEGD) represented as follows:

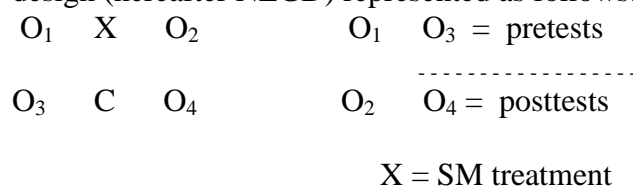


Figure 1. The pretest-posttest non-equivalent-groups design (Best & Kahn, 1986, p. 129).

Following the above illustrated design, Group A ($n = 32$) was the experimental group that received the intervention (SM instruction) whereas Group B ($n = 26$) was the one instructed traditionally using the textbook only. This study was of 11 weeks from the 14th of October to the 13th of January. SM treatment lasted 8 weeks. Both groups were pretested during Week 1 to ensure that they were comparable to each other and to attribute any resultant change in student behavior to the treatment itself and not to any other factor.

During the second week, students of the intervention group only received a training session on the procedure of SM. A week later, the experimental group started using SM to map medical passages in their textbook. The control group, on the other hand, was taught in a traditional way, as is usually the case in traditional teacher-fronted classrooms. The post-test was administered to students of both groups during Week 11 to measure the extent to which the treatment benefited students of the experimental group.

Reading Test

The reading test is of five passages (adopted from *Health Topics* offered by the University of Iowa) and of 30 items (True-False and multiple-choice questions). It examines students' ability in identifying causal relationship between ideas, inferencing, and understanding the texts. Such reading skills are emphasized in student textbook. Text readability statistics of the five passages (Hernia Problems, Food Poisoning, Appendicitis, Migraine, Glaucoma) chosen for the test have been calculated using Flesch–Kincaid readability. The five selected passages scored between 40.0 and 57.7 and thus they are suitable to students at grade 9 through 12. The researcher's students have spent at least 7 years of EFL instruction and studied specialized nursing courses for one year which made the selected passages suitable to student level.

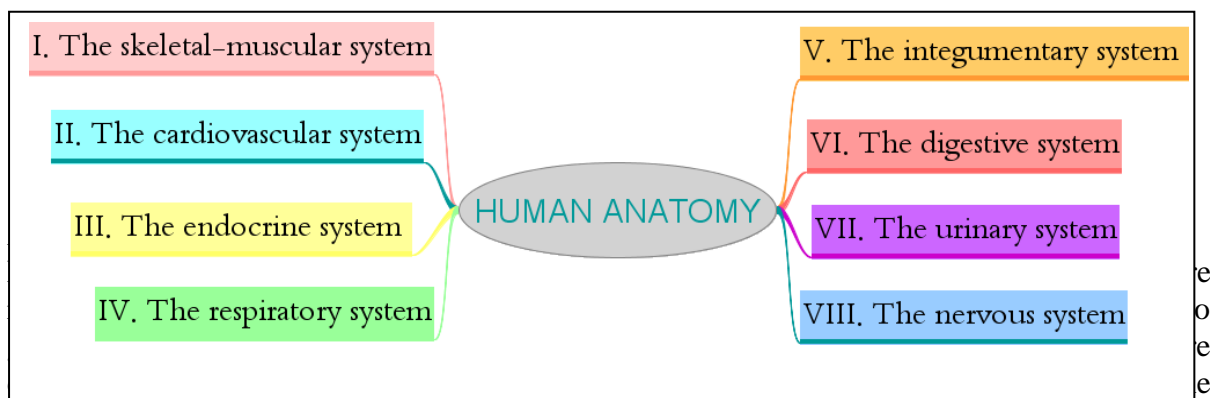
Three types of validity have been obtained for the pre- and post-test content validity, face validity, and concurrent validity. For concurrent validity, the researcher compared results of the post-test with those of the final exam which has been previously validated. Both tests were administered during Week 11 and were intended to measure student performance in the skills of reading comprehension. Scores obtained from both tests were correlated using the Pearson product-moment correlation coefficient. Results showed that there is a moderate degree of correlation between both test scores ($r = 0.403$) and in this way concurrent validity of the test used in this study has been obtained. To achieve test-re-test reliability, the pre- and post-test was piloted with a sample ($n = 24$) of 114 NAJM students who were not part of the present study. Results showed that the reading test ($r = 0.711$) is considered to be reliable.

Description of the Treatment

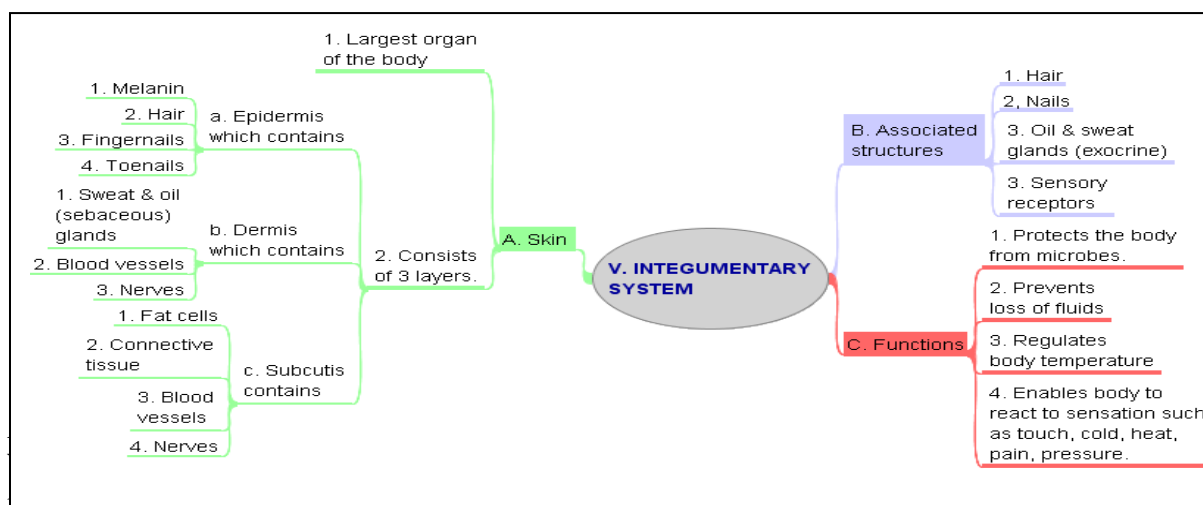
Free Mind 0.8.1 is a software used for creating mind maps. A mind map, as mentioned above, is a diagram of nodes representing ideas or words and arranged around a central concept (Tanaka, 2007, ¶ 4). The program is notable for its ability in helping users in generating, classifying, and organizing ideas. It can also aid in problem solving and decision making (Tanaka, 2007, ¶ 5).

Week 3 was marked as the first week of the experiment, which lasted eight weeks. The control group (Group B) was taught in a traditional way, whereas the intervention group

(Group A) was exposed to the technique of SM and was required to map medical passages using FreeMind 0.8.1. To map medical passages, the teacher first wrote the chapter title and encouraged students through questioning to think of other concepts related to the one in question. Some of the generated concepts are considered to be subheadings related to the one suggested earlier by the teacher. Hence, the first constructed map was of the chapter title and its subheadings (see Figure 1).



paragraphs of each subheading to find more ideas and supporting details that were later added to each subheading map (see Figure 2).



created one major semantic map that is representative of the chapter title and its subheadings and others that elaborated on the chapter subheadings. After the completion of the map, the teacher read aloud the content of the map as a summary of the whole text. The students were then asked to do the textbook exercises. The teacher assigned some paragraphs as homework, so that students would use the software at home and their computer-generated maps would be discussed later on.

Data Analysis

Inferential statistics such as the independent samples t tests, the paired samples t tests, and the Pearson product-moment correlation coefficient were used to compare the mean scores of

both groups, to measure student progress in each group, and to compare student performance on one post-test with that of another.

The research question asks: Is CASM an effective technique for improving nursing students' reading comprehension level? To answer this question, one needs to compare student performance in both groups before and after the treatment. The pre-test was used to ensure that both groups were equivalent before carrying out the experiment. To ensure the equality of both groups, the researcher used the independent samples t test. Results of the reading pre-test (see Table 1) showed that there was no significant difference between the two groups. The mean score of the experimental group ($n = 32$) was (13.25) with a standard deviation (SD) of (3.182), whereas the control group ($n = 26$) scored (14.88) with a SD of (4.245). As shown in Table 2, the Sig. (2-tailed) was (0.099) and it is greater than (0.05) and hence one can conclude that there was no significant difference in the mean scores for each of the two groups before carrying out the experiment.

Reading Pre-test Results Using the Independent Samples t Test

Group	N	Mean	SD	t -Value	Sig. (2-tailed)
Case group	32	13.25	3.182	-1.675	.099
Control group	26	14.88	4.245		

Note. The probability of error (P -value) is significant if it is equal or less than .05.

To figure out if CASM has improved the reading ability of the experimental group, the independent samples t test was used to analyze reading post-test results. Table 2 showed that the mean score of the experimental group was (16.18) with a SD of (2.693) and that the control group scored (16.11) with a SD of (3.141). Table 4-2 revealed that the Sig. (2-tailed) was (0.925) and it is greater than (0.05) indicating no significant difference between both groups after the intervention.

Table 2

Reading Post-test Results Using the Independent Samples t Test

Group	N	Mean	SD	t -Value	Sig. (2-tailed)
Case group	32	16.18	2.693	.094	.925
Control group	26	16.11	3.141		

From the results cited above, it is clear that the control group's performance in reading comprehension did not progress during the period of the experiment as opposed to that of the experimental group whose reading comprehension level has improved but that improvement did not result in any significant difference between both groups. Thus, one can hardly attribute this improvement to the treatment. To answer the first question in this study, it could be concluded that CASM did not improve nursing students' comprehension of medical texts. Hence, the researcher would accept the null hypothesis that states that the difference between both groups after the treatment is equal to zero.

Discussion of Results

The present study yielded no positive effects in favour of the SM treatment on students' reading comprehension. One reason behind such finding is the clash between what the program used to reinforce (identifying the topic, the main idea, and its supporting details) and what the book and the tests focused on (inferencing and identifying causal relationships in a text). Free Mind 0.8.1, as a mind-mapping program, could not exhibit causal relationships in a text because making connections between nodes of the same level or of different levels was not possible. Also, inferencing is a higher-order thinking skill in which students need to work on the information explicitly mentioned in a text to arrive at other pieces of information that are implicit. Students, however, were trained to work on what is explicit to locate the main idea and its supporting details. They spent much of their time organizing information rather than comprehending it. Further, students' failure in making inferences and comprehending the test passages is attributed to their poor background knowledge. As noted by Ehren (2005), students sometimes lack the background knowledge necessary for comprehension and making inferences. The researcher had difficulties activating students' prior knowledge because students either lack good background knowledge related to what is explained in classes or cannot express what they know in English. In recalling the findings of previous studies, Sinatra, Stahl-Gemake, and Berg (1984) mentioned that SM was ineffective in improving students' inferencing ability.

There are other reasons that may account for such findings. One reason has to do with the strategy itself. SM, as a metacognitive strategy, needs more of teacher modeling and student training. Students did not receive longer periods of training focusing on creating maps of reading passages. Previous research (Ruddell & Boyle, 1989; Caverly, Mandeville, & Nicholason, 1995; Boyle, 1996; Lipson, 1995) suggested that intensive training in the use of SM can result in significant gains in reading comprehension. One more reason has to do with students who failed sometimes to decide which details are important (should be mapped) and which are minor (should be discarded). When examining students' maps, one may notice that students sometimes tend to include all the information mentioned in the paragraph in the map because they feel secure doing so.

The teacher used to see her students once a week and hence offering intensive training on what to include in maps was not possible. Thus, it is highly recommended that students should spend more time comparing their maps to those of the teacher to verify their understanding of medical texts. According to Antonacci (1990), "post-analysis" (p.194) of students' maps should be conducted after map construction to ensure that students "connect ideas and integrate information" accurately (p. 175).

Conclusion

The present study aims at investigating the Effect of SM on students' comprehension of medical texts. Results showed that there was no statistically significant difference between both groups after the intervention. One reason behind such finding is the emphasis paid to identifying main ideas and supporting details in a text and not to inferencing and understanding causal relationships in the same text. Further, students lack some necessary background knowledge that might aid them in making inferences and in comprehension. Also, SM, as metacognitive strategy, needs more of teacher modeling and student training. Students had difficulties with mapping reading passages because they did not know what to include in a map and what to ignore. Nevertheless, students believed that SM was effective in promoting their reading ability.

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