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Comparison of Concept Maps and Traditional Lecture-Based Teaching Methods to Increase Diabetes Knowledge Level

Diyabet Bilgi Düzeyinin Artırılmasında Kavram Haritası ile Geleneksel Anlatıma Dayalı Öğretim Yönteminin Karşılaştırılması

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ÖZET

Amaç: Bu çalışma, hemşirelik öğrencilerinin diyabet bilgisinin arttırılmasında kavram haritası ve geleneksel anlatıma dayalı öğretim yöntemlerini karşılaştırmayı amaçlamaktadır.

Yöntem: Ön test-son test yarı deneysel çalışma, tabakalı örnekleme yöntemi kullanılarak iki gruba ayrılan (müdahale grubu: 24- kontrol grubu:28) 52 ikinci sınıf hemşirelik öğrencisi ile yürütülmüştür. Müdahale grubuna kavram haritası yöntemi, kontrol grubuna ise geleneksel anlatım yöntemiyle diyabet anlatılmıştır. Yaş, cinsiyet gibi demografik değişkenler bakımından kavram haritası ve geleneksel yöntem grubu arasında fark olup olmadığının değerlendirilmesinde ki-kare testi kullanılmıştır. Diyabet bilgisi yönünden iki grup arasında fark olup olmadığı Mann Whitney U testi ile karşılaştırılmıştır. Tekrarlı ölçümler arasındaki farkın belirlenmesinde Wilcoxon test ve Friedman testi kullanılmıştır.

Bulgular: Bu çalışmada her iki grubun da kendi içinde son test diyabet bilgi puanının ön test bilgi puanına göre istatistiksel olarak anlamlı yüksek olduğu bulunmuştur (p<0,05). Ancak gruplar arası karşılaştırmada kavram haritası grubunun son test bilgi puanının istatistiksel olarak anlamlı yüksek olduğu saptanmıştır (<0,001). Ayrıca son testten bir ay sonra yapılan tekrar testinde kavram haritası grubunun bilgi testi puanının istatistiksel olarak anlamlı yüksek olduğu saptanmıştır (<0,001).

Sonuç: Hemşirelik öğrencilerinin diyabet bilgisinin arttırılmasında kavram haritası yönteminin geleneksel anlatım yöntemine göre daha etkili olduğu görülmektedir. Aynı zamanda kavram haritası ile eğitim yönteminin, zamandan bağımsız olarak öğrenmenin sürekliliğini sağlamak için geleneksel yöntemlerden daha iyi olduğu söylenilebilir. Sonuç olarak, kavram haritası ile eğitim yönteminin hemşirelik öğrencilerinin diyabet bilgi düzeylerini artırmak ve uzun süreli öğrenmeyi sürdürmek için kullanılması önerilir.

Anahtar Kelimeler: Kavram haritası, Hemşirelik eğitimi, Öğretim yöntemleri, Geleneksel yöntem

ABSTRACT

Purpose: This study aims to compare the teaching methods based on concept maps and traditional method in increasing the diabetes knowledge of nursing students.

Methods: A quasi-experimental study with pretest-posttest design was conducted, involving 52 second-year nursing students who were divided into two groups (intervention group: 24, control group: 28) using stratified sampling method. The intervention group was explained through concept mapping method, while the control group was explained using traditional method. The chi-square test was used to evaluate whether there was a difference between the concept map and the traditional method group in terms of demographic variables such as age and gender. The difference between the two groups in terms of diabetes knowledge was compared with the Mann Whitney U test. Friedman test and Wilcoxon test was used to determine the difference between repeated measurements.

Results: In this study, it was found that the posttest diabetes knowledge score of both groups was statistically significantly higher than the pretest knowledge score (p=0.001). However, in the comparison between the groups, the posttest knowledge score of the concept map group was found to be statistically significantly higher (<0.001). In addition, in the retest performed one month after the posttest, the knowledge test score of the concept map group was found to be statistically significantly higher (<0.001).

Conclusions: In achieving th elevel of nursing students' learning in Diabet, it seems that the concept mapping method was more effective than the traditional method. It can also be said that the education method with concept maps is better than traditional methods to ensure that learning continues regardless of time. As a result, the use of concept mapping combined with instructional methods is recommended for enhancing the diabetes knowledge levels of nursing students and promoting long-term retention of learning.

Keywords: Concept map, Nursing education, Teaching methods, Traditional method,

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INTRODUCTION

Nurses are responsible from managing the healthcare provided to patients with multidimensional health problems (1). Students of nursing are expected to develop skills to provide healthcare to more than one patient and to respond to the needs of the patients and their families, changing levels of healthcare, and the complex hospitalization and discharge criteria (2). Despite the increase in contemporary implementation needs, many new graduates of nursing departments do not have sufficient skills to provide healthcare services in line with the problems and needs of patients (1-3).

Although the traditional course-based curriculum is widely used in health education (4,5), it is not sufficient to educate self-confident and competent nurses (1). The need to reform the nursing education curriculum becomes evident when the developments in healthcare system and the demand for a competent nursing labor force are taken into consideration (1). It is necessary to use innovative nursing curriculum designs and methods to develop nursing students' skills to deal with complex clinical scenarios. This will help nursing students to be prepared to deal with the inherent challenges in postgraduate health settings and develop their critical thinking skills (1,2,6).

Concept mapping as an innovative method uses active learning and teaching strategies in nursing curriculum (1). Learning is completed when a logical link between the former and new information of the student is established (7). Concept mapping links the concepts and relationships about a disease to each other by using figures and links the information by demonstrating the relationship in graphics (1,2). The study of Chan (2017) found that concept mapping increased the motivations for creativity and active participation in learning process (8). Besides, concept mapping may act as a guide to develop a healthcare plan and be used as a tool to link and regulate the relationship between the processes of disease, body systems and physiological effects of the disease (9). The concept map used in nursing education can also be used in patient education.

The aim of concept mapping is to help the students to learn how they may learn (10). Students can see their mistakes in their attempts to relate concepts and may have higher motivation to correct these mistakes (11). Concept mapping is not only used to teach a subject to the student but also gives the lecturer the possibility to evaluate the student. Concept map visually represents what the students think. By this way, lecturers can evaluate wrong and right information and the opinions of students (2,6,9). The study of Jaafarpour, Azami and Mozafari

(2016) on the evaluation of learning outcomes by students found that the levels of knowledge and academic success were higher for the students that used concept-mapping method (6). Concept mapping in nursing is an education method that enables the students to understand and evaluate the relationship between clinical concepts, theoretical knowledge and nursing practices.

Existing studies found that the use of concept mapping in nursing education contributes to the internalization of nursing practices, proper management of patient care and safety processes, critical and multidimensional thinking skills on problem solving, synthesis and decision-making (3,12,13), and the development of creativity (2,3,10,14). Besides, it contributes to the academic success of nursing students (6,15). Despite its positive impacts on nursing students, concept mapping has not found its deserved place in the nursing curriculum of many departments. Existing studies evaluated the impact of concept mapping on the knowledge levels about the subjects of basic life support (4), respiratory failure (5), and electrocardiogram diagnosis (16). However, the analysis of the literature reveals that no studies on the impact of concept mapping on learning about the diabetes has been conducted yet. This study aims to compare the effects of the traditional and concept mapping methods on knowledge levels of the nursing students on diabetes.

The hypotheses of the study are as such:

H_0: Concept mapping method was more effective than the traditional method.

H_1: Traditional method was more effective than the concept mapping method.

METHODS

Design and Participants

This study had a pretest-posttest quasi-experimental design. Institution permit and approval of students were optained for the study carried out on students. The population of the study consisted of a total of 66 students in the second year of nursing at a university (N=66). Ten students who received diabetes education in their previous education and four students who repeated the course were not included in the study. We used stratified sampling method by taking the university entrance exam scores of the participants into consideration and placed 24 students to the concept mapping method (intervention) group whereas the remaining 28 students were included to the traditional learning method (control) group. We used permutation method to achieve balance between the strata. At the end of the study, the diabetes achievement test

post-test mean score of both groups was taken as the primary variable and a post-hoc power analysis was performed. With a statistical significance level (alpha) of 5% and a confidence interval of 95%, the study demonstrated a power of (1-β) % 100, and an effect size of d=3.5.

Sophomore nursing students, who had not received any diabetes theoretical course or did not have any clinical experience with diabetes, were included to the study. Participants that received course on diabetes before were excluded from the study.

Data Collection Tool

"Personal Information Form" and "Diabetes achievement test" are used for the collection of research data. Personal information form had three questions on age, gender and the cumulative average grade point of the students for the first year. Diabetes achievement test had 20 multiple-choice questions on physiopathology, etiology, symptoms, therapy and complications of diabetes etc. Right answers for the second part of the questionnaire were scored 5 whereas wrong answers were scored 0. Total score was obtained by summing the scores for right answers and higher scores indicated higher levels of knowledge on diabetes.

Ethical Consideration

Before the research was conducted, the approval and the permission of the Social and Human Sciences Research Ethics Committee of Tokat Gaziosmanpaşa University (Decision date: 19.11.2021; Decision number: 01-23) had been obtained. The nursing students, who accepted to participate in the research, were informed about the purpose and process of the research, and their written and verbal informed consent was obtained. At the end of the study, the control group students were provided with diabetes education using the concept mapping method. The research was conducted according to the principles of the Declaration of Helsinki.

Education Materials

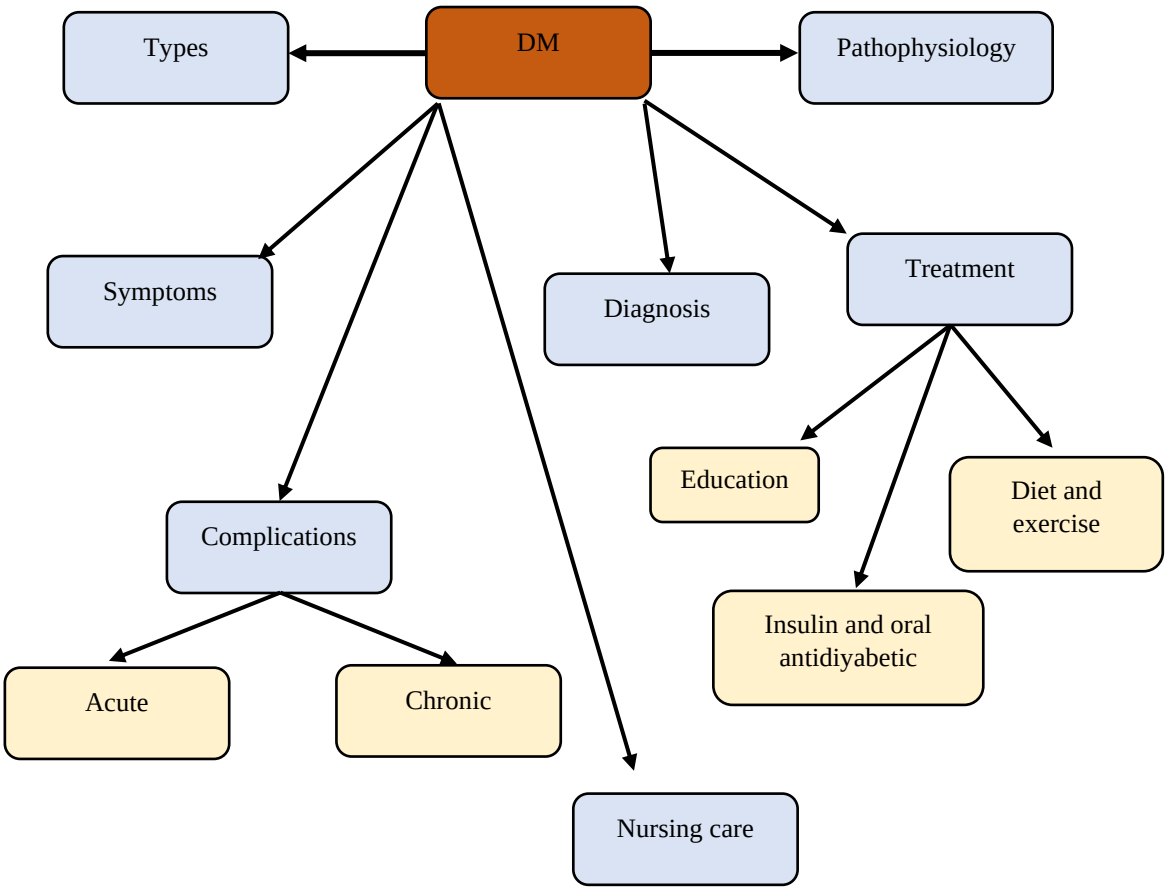
We prepared the content of the course by using the course books on diabetes and academic papers (17,18). We drew a concept map for the intervention group, which included all aspects of diabetes (physiopathology, etiology, symptoms, therapy and complications of diabetes etc). The control group, which received traditional educational method, received the same content of education as the experimental group through a power point presentation. Conformity of the educational materials to academic standards was analyzed by five academicians and the content of the materials was revised in line with their suggestions.

Implementation

The research was carried out at Tokat Gaziosmanpaşa University, Turkey between December 2021-January 2022. We started with explaining the aim and scope of the research to the participant students. The participants were administered a pre-test before the lesson. The pre-test was conducted simultaneously for both groups but in different classrooms. Once one group completed their education, an immediate post-test was administered, and the instructor moved to the classroom of the other group. This was done to prevent the students from influencing each other. Both groups received a 2-hour (120-minute) lesson from the same instructor. After one month of the education, a retest was conducted on the participants. All tests were administered by an independent researcher.

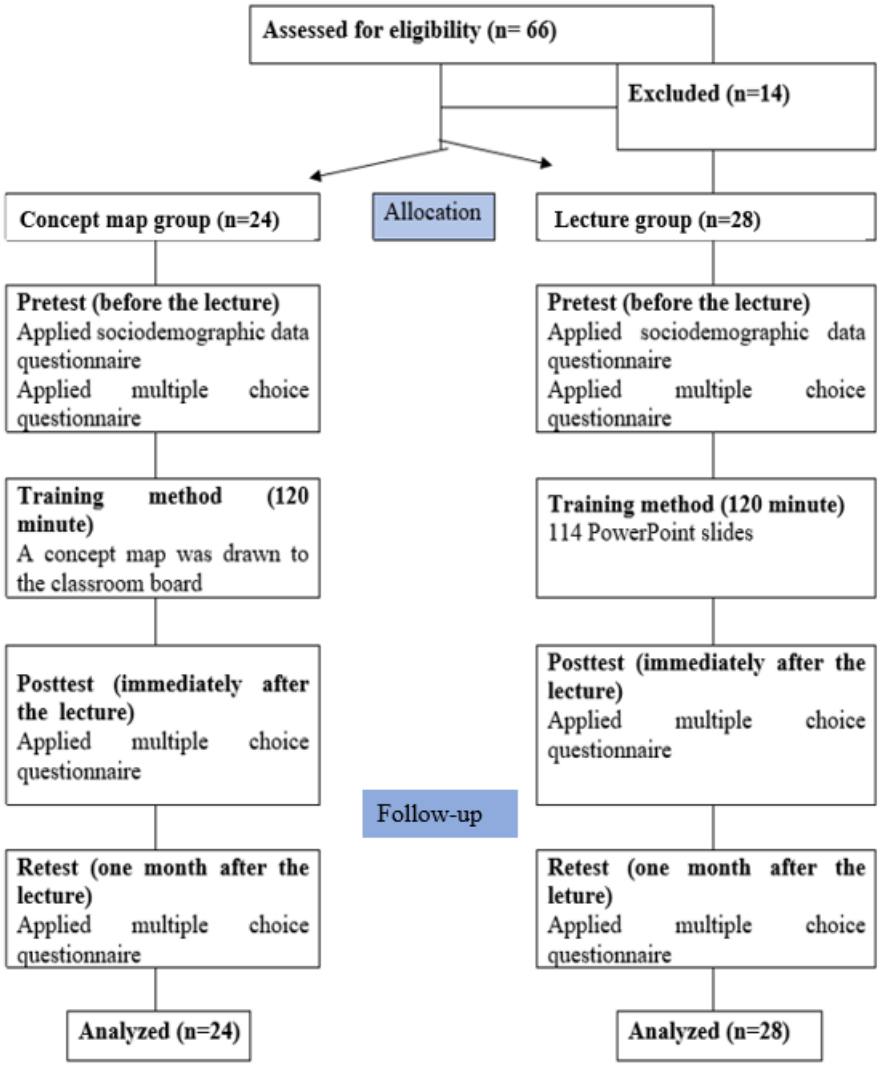
We prepared a general concept map for the intervention group, which included all aspects of diabetes (Figure 1). The concept map on diabetes was drawn on the board for the education of the intervention group.

Figure 1. A Sample of the conceptual map



The control group, on the other hand, received traditional education through the method of power point presentation. Implementation of the research is illustrated in Figure 2.

Figure 2: Research chart



We obtained institutional permission for the conduct of the study. Participants were informed about the aim and scope of the study and their verbal consent was obtained.

Data Analysis

Collected data was analyzed by using IBMM SPSS 24.0 statistical software. The chi-square test was used to evaluate whether there was a difference between the concept map and the traditional method group in terms of demographic variables such as age and gender. The conformity to normal distribution was examined with the Shapiro-Wilk. Median values were used instead of the mean when the data were not normally distributed. The difference between the two groups

in terms of diabetes knowledge was compared with the Mann Whitney U test. Wilcoxon test and Friedman test was used to determine the difference between repeated measurements. For statistical significance, $p < .05$ was used.

RESULTS

There was no statistically significant difference among participants in terms of age, gender, and overall grade scores between the concept mapping and traditional learning method groups ($p > .05$) (Table 1).

Table 1. Frequency distribution of the personal characteristics of students

Variables		**Concept mapping n (%)**	**Traditional education n (%)**	**Test Statistics**	
Age[a]		19.82±1.42	20.33±1.97	t=1.127	p=0.260
Mean cumulative average grade point	2.01-2.50	5 (20.8)	1 (3.6)		
	2.51-3.00	7 (29.2)	22 (78.6)	χ^2=1.275	p=0.202
	3.01-3.50	12 (50.0)	5 (17.9)		
Gender	Female	15 (62.5)	19 (67.9)		
	Male	9 (37.5)	9 (32.1)	χ^2=0.401	p=0.688

[a:] Age is presented as M (SD) and evaluated using a *t*-test rather than χ^2.

It was found that there was a significant difference between the pretest and posttest knowledge scores of both groups ($p<.05$). There was no statistically significant difference between the pretest scores of the intervention and the control groups on diabetes knowledge ($p>0.05$). However, the posttest median values of the intervention group were statistically significantly higher than the control group ($p<.05$) (Table 2).

Table 2. The Comparison of Pretest and Posttest Diabetes Knowledge Scores in Each Group.

	Pretest		**Posttest**		**p***
	Median (min-max)	**Mean±SD**	**Median (min-max)**	**Mean±SD**	
Concept mapping (n= 24)	57.50 (30-85)	56.88±13.65	80 (60-90)	79.79±8.00	0.001
Traditional learning (n= 28)	55 (40-80)	56.78±12.11	70 (65-80)	71.25±5.20	0.001
p**	0.941		0.001		

*Wilcoxon Test, **Mann Whitney U Test.

Comparison of the scores obtained by the concept mapping and traditional learning groups from the pretest, posttest and retest showed a statistically significant difference ($p< .05$). Analysis to conduct the source of difference showed that the median values obtained from the posttest for both groups were statistically significantly higher than the median values of the pretest and the retest ($p< .05$) (Table 3).

Table 3. Paired Comparison of Diabetes Knowledge Scores in Each Group

	Pretest	**Posttest**	**Retest**	**p***
Concept mapping (n= 24)	57.50 (30-85)	80 (60-90)	75 (55-90)	0.001
Traditional learning (n= 28)	55 (40-80)	70 (65-80)	57.50 (45-70)	0.001

*Friedman test,

DISCUSSION

In this study, although knowledge levels before the lecture on diabetes were low for both of the groups that received concept mapping and traditional education, they increased after the lecture for both groups. The group that received the concept mapping method obtained higher scores for its knowledge of diabetes compared to the group that received the traditional learning method. This finding shows not only the contributions of the lecture on diabetes to the knowledge levels and learning of students in both groups but also that the concept mapping method is more effective than the traditional learning method. Because concept mapping is a learning and teaching strategy that forms a bridge between the learning style and meaningful learning subjects (19). Other studies that compared the effects of concept mapping and traditional learning methods on nursing education found similar results. Aein and Aliakbari (2017), in their study comparing the traditional linear nursing care plan and the concept mapping method, found that the increase in the critical thinking skills of the participants using the concept mapping method was significantly higher (20). Similarly, the studies of Aghakhani et al. (2015) on the nursing care of patients with glandular diseases, Jaafarpour et al. (2016) on academic success, Tiap et al. (2018) on patient care and safety, and Zadeh et al. (2015) on hygiene, injection, and sterilization found that the mean scores of the participants that received concept mapping education were better (6,7,10,11). Different from our findings, Aliyari et al. (2019) found no difference between the knowledge levels of groups that received concept mapping and traditional education on basic life support but found that the participants that received concept-mapping education obtained higher score from practical skills (4). In our study, the reason for the high knowledge score of the concept map group is thought to be due

to the fact that the concept map establishes relationships between concepts and creates both visual and causal connections.

Knowledge in short-term memory is forgotten in a few seconds. New information on short-term memory becomes meaningful by establishing connection with the former information by means of visual images, schemes or cognitive restructuring. This new information is then transferred to the long-term memory and stored there. In order to maintain a meaningful learning, executive cognitive learning strategies that empower the capacity of long-term memory are highly important (21). Concept maps illustrate information in long-term memory in a hierarchical form from the general to the specific information. As such, learned concepts may be stored for a long time, which, in turn, may help learning significantly (11). Although our study found a decrease in the scores of retest, the decrease was more significant for the traditional education group. Similarly, Sarıca and Çetin (2012) reported that there was a decrease in the post-test scores one month later and this decrease was more in the traditional group (15). This finding implies that concept mapping method is better than the traditional methods to maintain durability of learning regardless of time. Consequently, we may conclude that modern education methods are better than the traditional methods in order to maintain long-lasting learning.

Although the interactions were controlled during the post-test administration, they could not be controlled during the retest administration conducted one month later. This situation can be shown as the limitation of the study.

CONCLUSION

This study found that concept mapping was a better method than the traditional learning methods. The findings of the study implies that concept-mapping method will be a better option for the lectures, such as the nursing of internal diseases, which have both theoretical and practical implementations and which deal with various systemic diseases.

Conflict of interest statement: The authors declare no conflict of interest.

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