THE EFFECT OF POSTER ACTIVITIES ON LEARNERS' INTELLECTUAL STRUCTURE IN THE ENVIRONMENTAL EDUCATION*

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Abstract

The aim of this study is to determine the effect of poster activities on learners' intellectual structure in the environmental education. In this process, it has tried to reveal whether the porter activities have an effect on the teaching of identified environmental issues using a word association test, drawing concept network map and interpreting concepts and connections between concepts in their mind in order to concretely illustrate the changes in learners' intellectual structure at the beginning and at the end of the study. The method of the study is pretest-posttest control group design in the experimental method. The study sample consists of 62 third-grade students (experimental group 30, control group 32) studying in the department of Science Education, Faculty of Education, Gaziosmanpasa University in Tokat. In this process, the subjects were randomly assigned to two groups. In the research study, the word association test (WAT) and concept network map technique were used in order to reveal the difference of intellectual structure between the experimental group to which the poster activity was applied and the control group to which the poster activity was not applied. According to the research findings; it is found out that the poster activities has developed very important skills such as improving the intellectual structure related to the environment and contributing to meaningful learning.

Keywords: Poster Activities, Teacher Candidates, Environmental Education, Intellectual Structure, Word Association Test.

Introduction

That many important issues such as environmental awareness, environmental issues and the role of people in environmental protection have been predominantly included in the curriculum necessitate learning all of these issues by doing, living and thinking with student-centered approaches. Given the environmental education taking part within the scope of programs implemented in our country in the past years located the environmental education, it is known that the rote learning was at the forefront, the education was limited to verbal-linguistic domain and therefore, ensuring permanent learning was insufficient. The lack of implementation is one of the biggest problems here (Kavruk, 2002). In this context, performing the main theme applications in environmental education learning is to achieve learning from everyday life and real life. The studies related to performance of the poster activities that students take responsibility in the process, do research and investigation, bring creativity into the forefront and achieve learning from real life and everyday life have come to the fore.

Posters technique used in educational environments designed with powerful visuals. The images convey the message and develop students' creativity getting in touch with the curriculum (Hegarty, 1998; Seidman, 2007; Hubenthal et al., 2011). In this context, the posters provide the realization of meaningful and permenant learning in the class (Dunstan and Bassinger, 1997; Hubenthal, 2009; Hubenthal et al., 2011). Thanks to poster activities the students learn subjects more effectively, create meaningful and permanent knowledge and have the opportunity to exhibit their creativity taking responsibility in the process (Sisak, 1997; Dunstan and Bassinger,1997; Moule et al., 1998; Brown and Burroughs,2008; Kaya et all., 2009; Yalvaç and Doğan, 2011; Hastürk, 2013; Kuh and Rivard, 2014; Whitnell, 2014). These benefits provided by the poster activity eliminate the problem of failure to associate the information each other, to embody and to associate daily life. In this process the students become responsible for their own learning and helping the students with her/his guiding identity, the teacher encourages their development of creativity. In particular, such applications increase the chance of having the potential opportunities for leading to create environmental awareness to appear in the teaching process and improving the competence of teachers in environmental issues.

Considering the stated reasons, poster activities used in environmental education provide students' meaningful learning and are among the techniques which are quite important for developing creativity,

higher-order thinking and taking responsibility skills and whose efficiency must be investigated. In this context, the aim of this study is to determine the effect of poster activities on learners' intellectual structure in the environmental education. In this process, it has tried to reveal whether the porter activities have an effect on the teaching of identified environmental issues using a word association test, drawing concept network map and interpreting concepts and connections between concepts in their mind in order to concretely illustrate the changes in learners' intellectual structure at the beginning and at the end of the study.

Method

The method of the study is pretest-posttest control group design in the experimental method. in the study, the reason for selecting this method is to experimentally determine the effect of poster activities on the intellectual structure and meaningful learning. For this purpose, the subjects were randomly assigned to two groups. The groups consist of third-grade students of science teaching department taking 'Teaching Methodology I' lesson. The study group consists of students studying in the department of Educational Sciences, Faculty of Education, Gaziosmanpasa University in Tokat in the 2011-2012 academic year. In the experimental group the lessons were conducted based on the posters activity while in the control group the lessons are conducted in accordance with the curriculum. The researcher has attended the both groups' classes.

Research sample

The study sample has been carried out with third-grade students studying in the department of Educational Sciences, Faculty of Education, Gaziosmanpasa University as a part of 'Teaching Methodology I' lesson in 14 weeks. In the study, 30 students have part in the experimental group, and 32 students have part in the control group.

In the study, there are 30 students in the experimental group and 32 in the control group. The following table 1, according to the sex of the students who participated in the survey frequency and percentage frequency are given.

Table 1. Frequency and Percentage Frequency of Students in the Study Group According to Gender

Groups	Girl		Boy		Total	
	f	**%**	**f**	**%**	**f**	**%**
The Experimental Group	20	66,6	10	33,4	30	100.0
The Control Group	20	62,5	12	37	32	100.0
Total	40	64,5	22	35,5	62	100.0

Research instrument and procedure

In the research study, word association test (WAT) and concept network map technique have been used as the data collection instruments. The data collection instruments are listed below used in the research study.

The Word Association Test

The studies about the association of the concepts learned in instructional environment by the students and the quality of their relationships are quite important. in recent years. The researchers turn to not only the information that students have but also, to techniques to measure students' relations between different concepts and knowledge, their cognitive structures, to what extent they understand the similarities between the functioning of real and natural world situations within the science and the information they create in their minds and whether they create meaningful learning associating new information with existing information. (Ercan et al., 2010). In this context, Word Association Test, which can reveal the cognitive structure of the students and the relationships between the concepts in this structure, that is, knowledge network; is one of the techniques used to identify whether the relationships between the concepts in the long term memory are sufficient or insufficient or significant or insignificant, has gained importance (Hammarling and Higham, 1996; Shavelson, 1974; Tao and Gunstone, 1999; Jonassen, Reeves Kong & Peters, 1997; Bahar et al., 1999; Atasoy, 2002; Bahar et al, 2006; Özatlı, 2006; Yalvac 2008 ; Kostova and Radoynovsk in 2010; Postman and Keppel, 2014). Thanks to WAT the concepts existing in the student's mind, misconceptions and relationships of the concept to each other can be concretely determined.

Performing word association test, the teacher defines the key concepts from any topic. It is regarded that the concepts to be selected are the most important concepts of the subject. Then, a page layout centering each word at the top of a page is created. In the word association test it is asked the students to write the

related key concepts about which they think within 30 seconds. The 30-s time period has been determined as the most suitable period of time in many academic researches (Shavelson, 1974; Hammer,1996; Jonassen, Reeves, Hong, &Peters 1997; Tao ve Gunstone, 1999; Bahar, 1999). The word association test used in our study consists of 10 key concepts which are the most important concepts of the subject, are on the subject of environmental education and can be related to daily life.

The word association test involves the keywords ; environmental issues, global warming, greenhouse effect, pollution, renewable energy sources, non- renewable energy sources, ozone layer, biodiversity, ecology and recycling . An expert in field of measurement and evaluation and an expert in field of biology helped the preparation process of word association test. Word association sample used in our study is located in Figure 1;
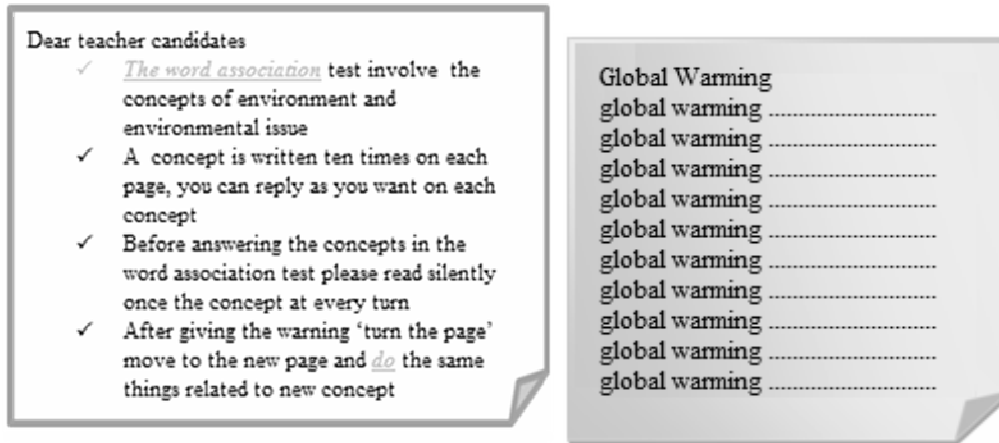

Figure 1. Word association test sample used in the study

The Concept Network Map

'The Concept Network Map' presenting visually concepts existing in students' mind using word association test is called. In the preparation of the concept map a frequency table has been created using students' answer words. Using the data in the frequency table the concept map can be drawn. The cut-off point technique which Bahar (1999) has developed was used for the preparation of the concept map in the study cut-off point.

In this technique, in the frequency table, the lower value of the concepts of 3 – 5 mostly given as answers for any key concept in the word association test is used as the cut-off point and the answers whose frequencies exceed this level are written in the first part of the map. Thereafter, the cut-off point is reduced by certain intervals and the procedure goes on until all the key concepts appear on the map (Bahar ve diğ. 2006; Ercan,vd, 2010; Yalvaç ve Doğan,2011) . Prepared concept map is a technique which determine students' interpretation levels of relationships between concepts and using levels of concepts related to the subject and which facilitate meaningful learning also due to address visual memory. Prepared concept map is a technique which determine students' interpretation levels of relationships between concepts and using levels of concepts related to the subject and which facilitate meaningful learning also due to address visual memory.

Data Collection Process

The data collection process consists of three basic steps.

I. In the study at the beginning of the process pre -word association test consisting of 10 key concepts has been applied and consequently pre-concept maps of students were drawn in order to concretely reveal students' intellectual structure s related to the environment, concepts, relationships between concepts.

II. In the experimental group, related to identified key concepts, 14-week courses based on poster activities were planned, in this process the students in the experimental group were divided into groups of 4–5 and every week the poster activities were performed on identified topics. In the process of poster activities in the experimental group, computer-aided poster preparation rules were explained to the teacher candidate. Preparing the posters, the formats identified by the researchers in the literature (Hammarling & Higham, 1996; Huddle, 2000; Hollander, 2002 were used and showing the posters examples (NASA, 2010) the embodiment of the activity was provided. After taking expert opinions the topics related to some identified environmental issues were distributed to

students, it was guided them in the poster-making process. In the control group related to identified key concepts it was taught by traditional methods.

III. The posters prepared in the experimental group was presented in the classroom environmeny after pressing in a proper format. In the study, in order to reveal the difference between the intellectual structures of the experimental group performed the poster activity and the control group conducted the lessons in accordance with the curriculum the word assoiciation test and concept map technics were used.

Data analysis

In this study that the effect of the poster activities on the intellectual structure of some environmental issues is investigated, pre and post word association test was applied. In data analysis process initially WAT answered by the teachers is scored. Then, data were analyzed using a content analysis method. The main objective of the content analysis is to reach the relations and the concepts to explain data (Yıldırım and Şimşek, 2005). After performed the word association test each student's response to a identified key concepts were determined one by one. Determining the key concepts of the answers given for each group pretest and posttest frequency tables indicating how many times these concepts were repeated were prepared. By determining the number of answer words for each key concept emerged in the frequency table, they were compared. the assessment was conducted with three experts in the field of biology to perform the analysis of the words in a significant and scientific answers and to ensure the reliability of the data analysis process. The reliability of data analysis was calculated using the following formula: [Consensus/Consensus. + Disagreement x 100] (Miles and Huberman, 1994). The results show that the average value of the reliability coefficients between coders was 92%. Then, using data from frequency table the concept maps revealing teacher candidates' intellectual structure on the issue were drawn.

Results and Discussion

Findings on the Word Association Test

The number of answer words obtained in the word association test is one of the methods used to evaluate the data in these techniques. The table 2 below involves the number of answer words of pre - post word association test of experimental group. When these findings were examined it was found that students achieved 1586 answer words in pre-Wat and 2812 in post-Wat. Before and after, when each key concept was examined one by one, it is seen that pre-Wat is superior than post-Wat in terms of the number of the answer words. The reason is the students' participating in the process one to one, performing learning from everyday life and real life and learning by doing and living.

Table 2. The number of answer words of pre - post word association test of the experimental group

Key concepts	Pre-test	Post-test
Environmental Issue	153	357
Global Warming	167	340
Greenhouse Effect	183	271
Pollution	171	302
Renewable Energy Sources	144	212
Non-renewable Energy Sources	132	239
Ozone Layer	140	302
Biodiversity	158	329
Ecology	175	248
Recycle	163	212
Total Number of Answer Words	1586	2812

In order to evaluate the data in the word association test, a*nother used method* is to analyze the answer words obtained. When pre - post word association test of the experimental group is analyzed in terms of the kind of word answer it is seen that pre-Wat is superior than post-Wat in terms of each key concepts. When prepared frequency tables have been examined according to Wat it is seen that the answer words given are more significant and better quality in post-test.

For example,

In pre-wat for the key concept of biodiversity; the students produced the concepts such as animal (f: 17), plants (f12), human (f12), alive (f: 10) . When the concepts except the specified ones were examined, it was observed that each was produced with quite low frequency (f≤8) and they were neither directly related to the topic nor scientific.

When the post-Wat has been examined, it is observed that they produced directly related with the topics and significant words such as plant (f: 19), animals (F17), species (F17), endemic species (f: 15), 3000 (f: 15), flora (f: 12), fauna (f: 12), ecosystem (f: 10), ecology (f: 11), the WWF (World Wide Fund for Nature) (f: 10), alive (F: 9), environment (f: 9), communities (f: 9), population (f:9), ecological potenza (f: 9), snowdrop of Abant (f: 9), Mediterranean monk seal (f: 9), bellflower (f:9). Students produced the answer words such as species diversity, endemic species, 3000 endemic species unique to Turkey, flora, fauna for the key concept of biodiversity furthermore, they have also proved that meaningful learning occurs as giving the examples of the endemic species in our country.

As a result, when pro-Wat and post-Wat frequency tables are examined, it is seen that post-Wat is superior than pre-Wat in terms of quality and nature of the answer words. The students can't associate the current concept with the key concepts, it is considered to be a major shortcoming in the pretest but it is observed that it has been resolved in post-test. The findings show that the poster activities allow the students to produce directly related to topics, significant and scientific answer words, to learn the subjects and to progress positively their intellectual structures.

The findings in Table 3 are analyzed in terms of word answer of pre - post word association test of control group, it is founda that the students produced 1701 answer words in pre-wat and 2085 in post-wat.

Table 3.the number of word answer of pre - post word association test of control group

Key concepts	Pre-test	Post-test
Environmental Issue	161	268
Global Warming	196	255
Greenhouse Effect	168	191
Pollution	201	240
Renewable Energy Sources	110	138
Non-renewable Energy Sources	160	172
Ozone Layer	179	206
Biodiversity	165	228
Ecology	177	198
Recycle	184	189
Total Number of Answer Words	1701	2085

Before and after, when each key concept has been examined one by one, it is seen that post-Wat is superior than pre-Wat in terms of the number of the answer words. However, having a greater number of produced answer words were not provided feedback about the quality of information. What is the important in the word association test is the nature and quality of the word (Shavelson, 1974; Bahar, Johnstone ve Sutcliffe, 1999, Yalvaç, 2008; Ercan, 2010).. the nature and quality of the word of the answer word relates to be directly related to the topic, scientific, siginificant and true.

When pre - post word association test of the experimental group was analyzed in terms of the type of word answer it was found that significant and scientific word was not produced.
For example,

 In pre-wat for the key concept of biodiversity; the students produced the words such as plant (f:16), animals (f:12), inheritance (f:7), the world (f: 7), the environment (f: 7), ecosystem (for 7) . The concepts outside of identified concepts have been examined each one is very low frequencies (f≤8) and it seems not to be directly related to the topic and scientific.

They produced the answer words such as animal (f: 16), plants (f: 15), human (f: 12), species (f: 12), gender (f: 10), Mendel (f: 9), the world (f: 7). When the produced answer words have been examined, for the key concept of biodiversity it is seen that there is no difference in point of the type of the answer words produced between pre-post-tests. Only, the frequencies of the response word are different from each other. But in both pre and post test it seems that directly related to the topic and scientific concepts have not been produced.

In order to support the findings of our study with quantitative data, the answers given in the word association test were scored. In the comparison of the results from pre and post word association test of the experimental and control group, given 1 point per a significant word written for each key concepts, it was entered into SPSS and t-test was applied Similar to study of Bahar and Özatlı (2010) the concepts in the literature were examined together with an expert in the field and the concepts in the word association test were evaluated. in the evaluation process, directly related to the topic , correct and scientific concepts were given 1 point with regard to the key concepts and it was entered into SPSS and to reveal differences between groups t-test was used.

To examine whether there is a significant difference between pre and post test results of word association test of the experimental group t-test was used to be compared the results of pre-post wat of the experimental group.

Table 4. t-test results concerning the experimental group students' pre-wat and post-wat scores

Test	N	$\overline{X}$	SS	Sd	t	p
Pre-wat	30	30,96	6,07			
Post-wat	30	59,63	8,86	29	-13,83	.000

p<0.05

It is seen that when the data has been examined in Table 4, post-wat average of the experimental group is $\overline{X}$ =30,96 and post-wat average is $\overline{X}$ =59,63. . It has determined that there is a significant difference (t = -13.83, P <0.05) between types of answer words of pre-wat and post-wat of experimental group which has been performed poster activities. These results supported with the concept maps has concretely proved the effect that the poster activities has positively developed intellectual structures and has provided the meaningful learning .

For comparison of pre-post wat results to examine whether there is significant difference between pre-post association test results of control group, t-test has been used. The fallowing table 5 involves t-test results for the pre-post test scores of students in control group.

Table 5. t-test results for the pre-post test scores of students in control group

Test	N	$\overline{X}$	SS	Sd	t	p
Pre-wat	32	30,96	6.07			
Post-wat	32	31,1	6.55	29	-.092	.928

p<0.05

When the data has been examined in table 5, there is no significant (t=-0,92, p>0.05) between the scores taken from the pre and post word association test of the control group taking the courses according to the curriculum. As a result, when the experimental group to which the poster activity has been applied has been compared with the control group taking the courses according to the curriculum the development in the intellectual structure seems to be in favor of the experimental group.

Findings About The Concept Map

Using frequency tables derived from the word association test, pre and post-test concept maps has been drawn for control group and experimental group. The purpose of using concept maps in the study is to reveal whether the concepts generated in students' mind as a result of posters activities are scientific, qualified and significant. Through the concept maps it can be determined whether meaningful learning performs. This situation is also specified by many researchers (Bahar and Özatlı 2003; Yalvaç, 2008, Ercan et al., 2010; Yalvaç and Dogan, 2011). The figures 2 and 3 below involve pre- wat and post-wat concept map and comments
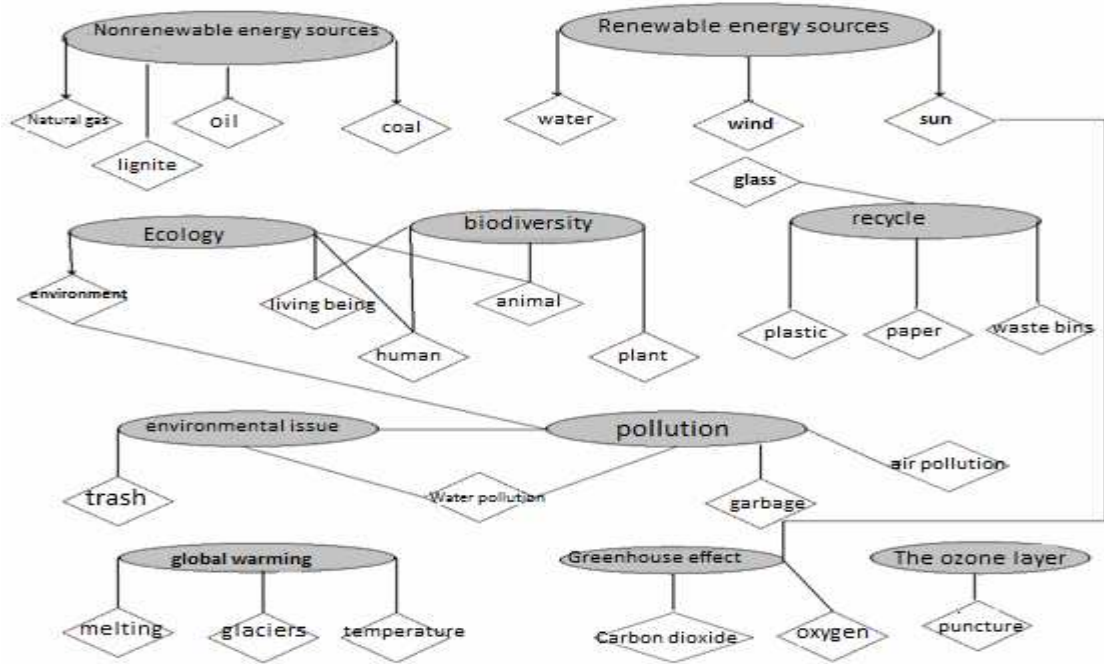
Figure 2: The concept network map of pre-Wat of the experimental group (the cut-off point 10-14)
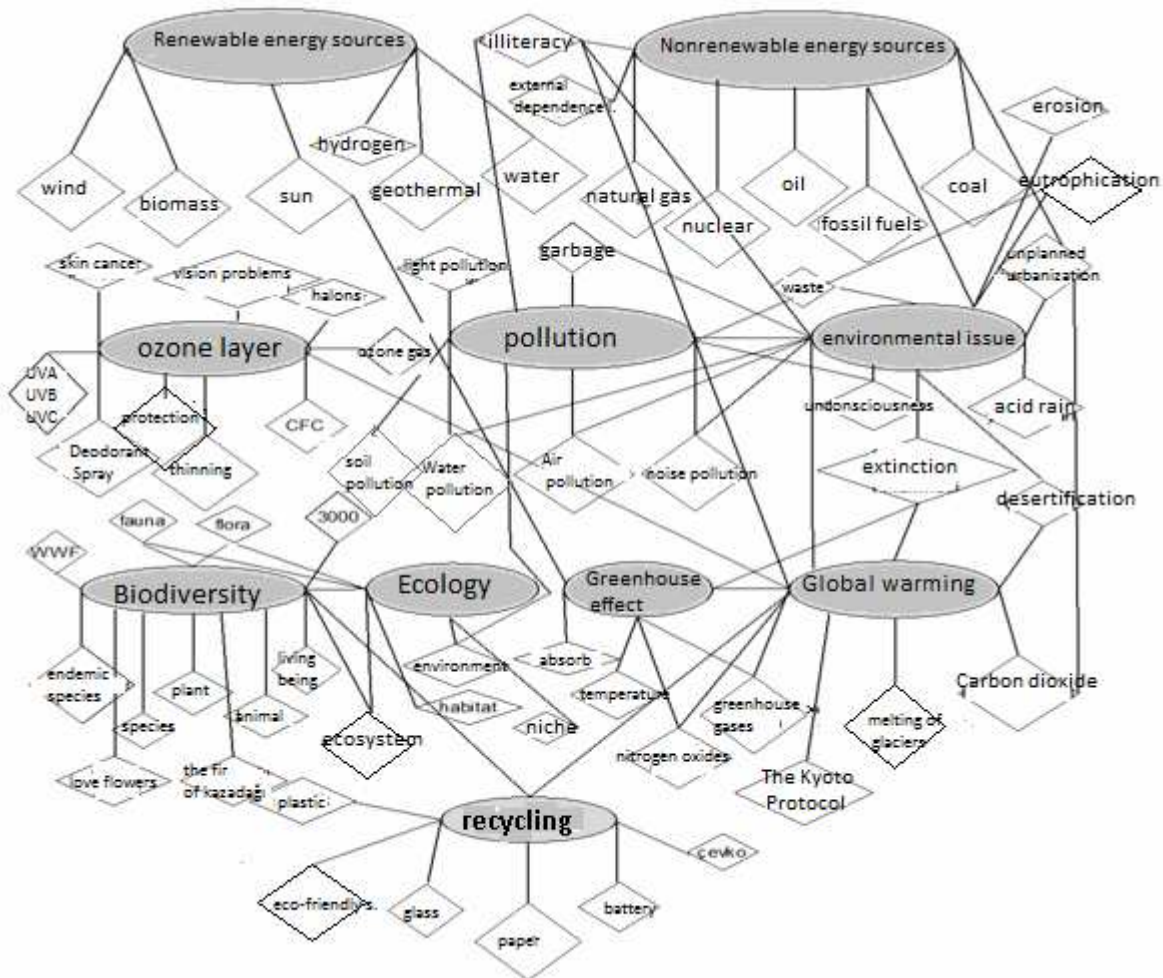

Figure 3: The concept network map of post-Wat of the experimental group (the cut-off point 10-14)

When pre-wat and post-wat concept map has been examined from every level, as a result of activities, found to increase the quality of the key concepts generating in the students' mind. Enhancing the quality of the produced answer word, associating of the answer words with each other and producing the answers which are directly related to the topic and scientific. It is found that the concepts regarding the environment which must be in the students at the pre-application but do not exist have been occurred as a result of activities. Thus the efficiency of the posters activities revealed concretely.

The pre and post test concept maps and reviews of the control group taking the courses according to curriculum and to which the poster activities was not applied are included in figures 4 and 5 below.
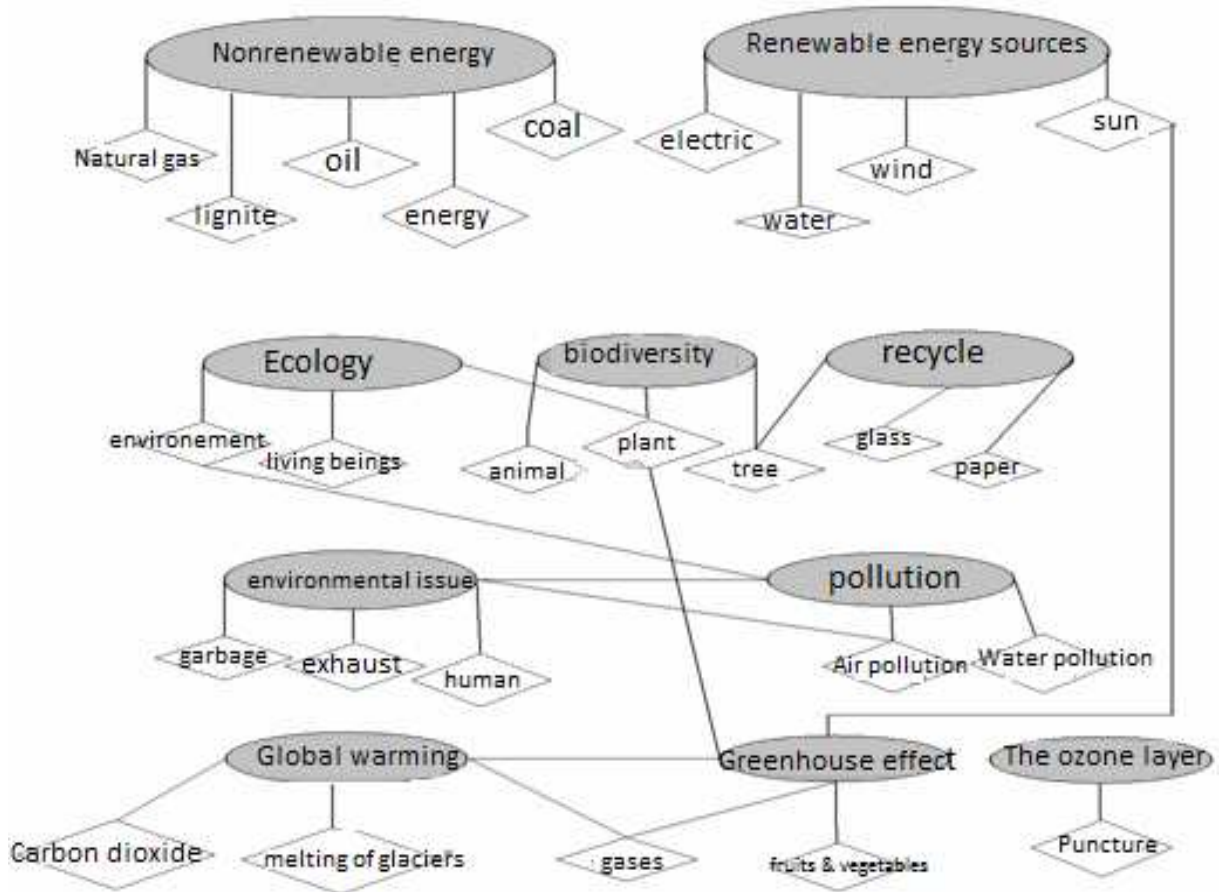

Figure 4 . The concept network map of pre-Wat of the control group (the cut-off point 10-14)
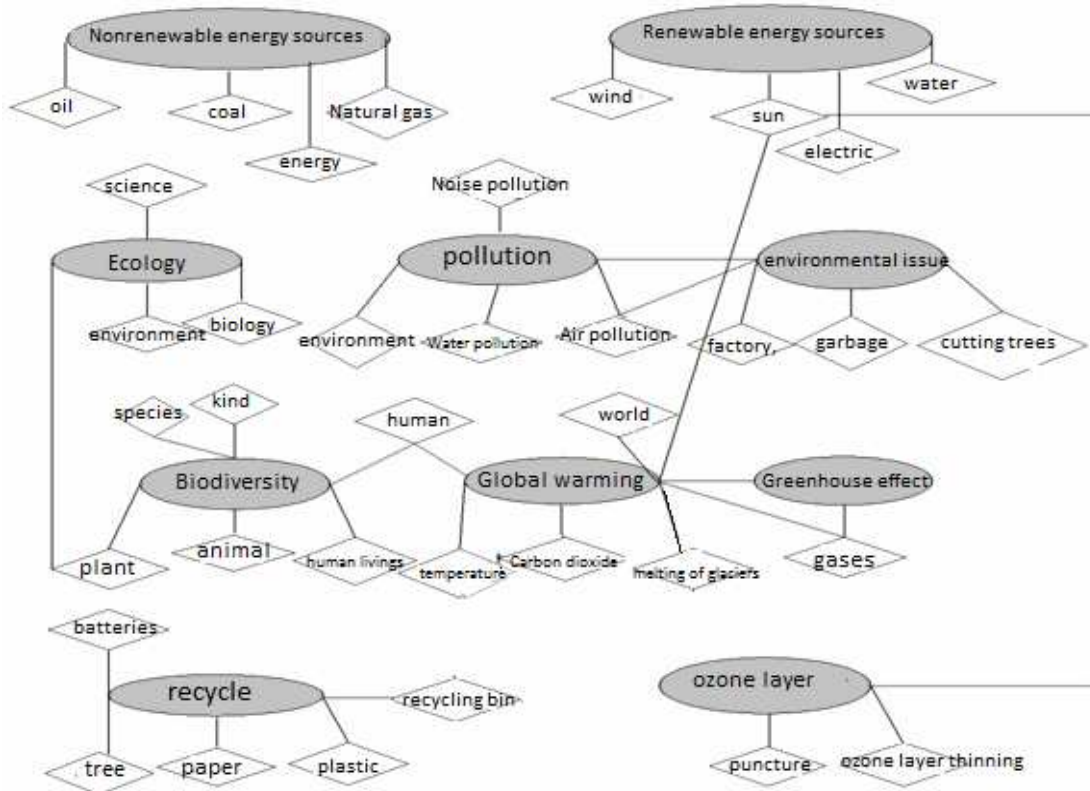
Figure 5: The concept network map of post-Wat of the control group (the cut-off point 10-14)

When pre-wat and post-wat concept map has been examined from every level, there is no significant difference related to the relations of the concepts and producing the qualified answers. This situation shows that the meaningful learning does not perform in the environments where the teacher is active, the students have not got an opportunity to learn living and doing and the concept does not related to real live and everyday life. it seen that the quality of the produced answer word has enhanced, the answer words has been associated with each other and the answers which are directly related to the topic and scientific has produced as a result of posters activities in the experimental group where the process based on the poster activities is planned. these findings derived from qualitative and quantitative aspects concretely reveal the efficiency of the poster activity, contribution to meaningful learning and improving the relations between concepts in students' minds.

Conclusion

When the results of the study aimed to reveal the effect on the changes in teacher candidates' intellectual structure related to some environmental issues have been examined. In the consequence of the poster activities, it is seen that the students' anwers to identify key concept and the number of the answer words associated have been increased. When the frequency tables of pre-wat and post wat have been examined, post-Wat is superior than pre-Wat in terms of quality and nature of the answer words. This result is an evidence of the effectiveness of the poster activity, provide learning of the subject and positively improve the students' intellectual structure. It also supports the similar studies (Bahar, Johnstone&Sutcliffe, 1999; Cardellini& Bahar, 2000; Bahar &Özatlı, 2003, Nakiboğlu, 2008; Yalvaç, 2008; Hastürk, 2013). It is seen that there is no significant difference related to the types of answer words for the students in the control group. These situations related to that the students have been passive during the process, have not made of the subjects and the knowledge and have not exactly associated with each other.

The comparison of the mind maps created by the cut-off point technique concretely revealed the positive improvement in both the relationships of the students' concepts with each other and their relationships with the produced response words after the application.

Besides, T-test applied in order to prove the quality of the answer words given by the students in the control group and in the experimental group to the key concepts in word association test has been given favorable results for the experimental group. Moreover, supporting this argument with a technique such as

concept map which visually reveals the concepts in the student's mind emphasizes the importance of working.

In the result of the study, it is found out that the poster activities has developed very important skills such as the improving the intellectual structure related to the identified environmental issues, contributing to meaningful learning, acquiring knowledge and skills related to the poster activity, learning by doing and living, taking responsibility, learning from real life and everyday life and research and investigation abilities.

Recommendation

The poster activities which have an important place in developing the students' critical skills such as reviewing the literature and organizing the data the applications can be performed by taking part in the science curriculum.

Performing poster activities for other disciplines such as physics, chemistry, biology, social sciences and mathematics the meaningful and permanent learning can be provided.

The poster activities training can be given in practical manner.

Taken place to the techniques concretely identifying the learners' intellectual structure such as word association test and concept map in the process of learning and teaching, it can be found whether the meaningful learning can occur or not.

The Educators, considering the students' cognitive style and intellectual structure organize the educational activities for elementary school.

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