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Improve academic achievement, reduce misunderstanding lasting materials and fifth grade students in science teaching approach based on the concept map

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ABSTRACT: The purpose of this study was to compare the effectiveness of Map concept teaching with traditional teaching methods on academic achievement, material durability and misunderstanding reduction of science between fifth grade students of Zahedan. The quasi-experimental method is used in this study. Four classes were chosen for the study, two classes as control group (one is guy class and the other is a girl class) and two classes as an experimental group (one is guy class and the other is a girl class) and a pre-test applied to equal experimental and control group. Teaching was done with the traditional and wide methods over 20 sessions of classes in two groups, with the approach of the conceptual map and two classes in control groups. Finally, achievement test scores, retention issues test and misunderstanding test of both groups were compared and were analyzed by using analysis of variance and mix analysis of variance between and inside groups. The results showed that teaching by conceptual map approach is more effective on raising achievement and sustainability issues, as well as reducing misunderstandings of students compared with conventional and common method. In addition results indicate that there is a significant difference between girls and boys in terms of academic achievement, and the impact of a concept map approach on academic achievements of girls is more than boys, but there is no significant difference between male and female groups in the durability of the issues and reducing misunderstandings.

***Keywords*:** academic achievement, misunderstanding, retention issues, Map concept.

INTRODUCTION

Nowadays the purpose of education system is not only transferring safe data collection to learners, but also to develop thoughtful people that instead of content, learned review and scientific methods.One of the most important psychological principles of education is that teachers can not only provide students with knowledge, the students should learn it in their own mind. The teachers can facilitate this process by teaching in a way that making meaningful information and make it relevant to students, by giving them the opportunity to understand the concepts and by teaching the students to learn to be aware of their strategies and apply them in a conscious way.

In many cases, this may not be far from the fact that the teacher do not know why he should teach the content nor the student knows why he should choose the content, the teacher do not know how to choose an accurate and useful content nor the student know how to learn. The teacher just teaches and the students are only temporarily memorizing. We thought to teach and students also learned that just keep memorizing and accept the content from us without argumentation.

Does the teacher typically, evaluate the aims of teaching this material before teaching? Did he ask himself how the content should be taught? Or just deals with memorization method and superficial learning.

Educational content is available to everyone, but important oneis how to teach. Teacher's success is in the use of active teaching methods. Method of teaching - learning process is more important than the subject. Teachers can give students a ladder that leads to a higher understanding, but the students should climb the ladder themselves. Much of what students learn in school is the fact that should be noted. Factual information should be taught efficiently and effectively as possible to remain time and mental energy for significant learning like conceptual and creative problem solving activities.

Therefore the teaching process involves learning to guide students to develop concepts and examples and reduction of the concept to the most important similarity so they can recognize the examples of that concept from others and have the precise mentality about each topic.

Concepts that will be taught to students, the exact definition of concepts and excluding non-essential characteristics of the concept, enabling mental schemas of students and linking with new concepts to the concepts they already had in their minds and providing concepts that are matched with the students patterns are all among the tasks that must be addressed by teachers in teaching concepts.

Problem Statement

In the past few decades, concern have been increasing in many countries due to the lack of adequate preparation of their education, skills and knowledge necessary for citizens to work and live with success in today's complex society (Hammond, 1994: 112). In response to these concerns, improving the educational system, teaching methods and educational planning is considered. At the same time, many accepted ways of teaching and the teaching methods are based on a traditional ones andare according to the behavioral views that knows teaching isbasically "express" and "transfer" of the facts and information to students (like filling an empty glass), while the above measures have been failed to foster talent and skills that students need for their daily lives (Aghazadeh, 1383: 65).

Thus, most of them spend their time on superficial learning. Usually learning has been forgotten over a short period after exam. Undoubtedly, if the students become familiar with meaningful learning tools from the beginning of formal education, and align with this approach; prepare themselves for the exams, substantial savings in the cost of education in the country will be performed and students will also be able to better exploit their God-blessings (Rofous et al, 1993: 84).

Elementary school students often have problems in learning science and in fact most of them are not aware of the necessity and importance of studying science and are unaware of its applications. The biggest problem of students is that the survival of their previous learning in science is small. In other words, after the end of the school year, what they have learned over the years has abandoned and they think that its content is only for that step and in the following year and higher grades, they do not need them.

Many of the students also learned the wrong things at the lower grades and encountered misunderstanding or misinterpretation that this misunderstanding is associated with them to the higher levels of education and will lead to their failure in school.

Therefore, this study is important in the sense that is following the discovery of a method which is suitable for teaching science so the teachers in their effective teaching build knowledge while they become familiar with the concept maps to guide the students by relating new information to what they already learned.

Thus the teacher task is to provide the opportunity for learners to build knowledge. The teacher should make a clear and appropriate connection between the new taught information in the classroom and past experience and future learners.

Using a concept map can be widely used as a basis for getting active learners on how the relationship between concepts and ideas is. This encourages the students to draw a concept map, and engage their minds with concepts and the logical relationship between them and this process will greatly be valuable in teaching and learning processes and the acquisition of cognitive and metacognitive methods and abstract, creative, and critical ideologies. By using the concept map method, students will feel more responsibility for their learning. Using this method will help to teaching change from "teacher-oriented" to "student- oriented" one.

Map concept provides the opportunity to experience and understand the past, when a new concept is considered in the conceptual framework.

Concept mapping can properly be in the constructivism learning class. Students and teachers can also take advantage of using concept maps. Using concept maps in teaching will help teachers become more aware of key concepts and the relationships among concepts. This causes the teacher to have a clear overall picture of relations and the issues between them to offer to his students. In such circumstances, there is a littleprobability that the concepts are misunderstood or neglected.

In addition, using concept maps can help teachers to assess their students' progress. The use of concept maps by students encourages them to understand what they are learning. The concept map will embody the key concepts as well as summarizing concepts and relationships between them, so the process facilitates memorizing and reminding. Understanding psychology call learning with understanding and what is studied as a "significant learning". This learning takes place when students connect new information with his prior knowledge. However, still in most of our training centers teaching means as the transfer of information from books and teachers mind to students' mind, so the product of this method is the learners with mental accumulation of material that most of them do not fit their needs and mind and over the time unhappy of repeating them and causing students disgust from the scientific activities (Mesrabadi, 1384: 13).

Concept map shows both the teacher and the students that when working on homework, learning should be focused a number of key words. There is a lot of evidence that using a conceptual map is a good teaching strategy compared to common practices and it is appropriate that our education system also steps for getting advantage of this educational strategy.

However, we should consider that as with most methods this approach cannot solve all the problems of education; in fact the concept map can never be a magic tool or solution.

Since the principles of constructivism based on knowledge of learning, so is a good starting point for efforts to improve the training process. The problem we face in this study is the effect of concept maps in teaching - learning process of the fifth grade science class that should become clear to what extent the concept maps can enhance academic achievement, content retention and reduce the students misunderstanding.

To this end, by designing an operational teaching model based on concept map, the effectiveness of this approach to increase the academic achievement of students and achieving a significant and lasting learning of taught content and reduction of misunderstanding is checked.

Research Background

Gio (1381) investigated the impact of teaching on Tehran nursing student learning by concept map. The findings showed that: teaching by concept map enhances learning and is also reminding learned material.

Rahmati (1382) has investigated the effect of concept mapas a way of reading comprehension in second language students (English). The results showed that teaching of concept map increases the students' comprehension. Also a positive interaction between students'language proficiency ability and concept map teaching was seen. In other words, students with higher have benefited more from the concept map.

Rahmani et al (1383) were investigated the effect of concept map teaching on theoretical learning of nursing students and meaningful learning of them. The resultsshow a significant positive effect on learning.

Mesrabady et al (1384) also examined the effectiveness of the proposed individual construction and collective construction of concept map as an instructional strategy.

The results showed that the grades oftest and academic achievement of all three groups(Group 1 received a pre-made maps, Group 2 individual map concept and Group 3 map concept as a group) increased compared to their pre-test.The increase in the different experimental groups was different and the highest rate of increasing was at an average of individual concept map and the lowest was seen in the group of teacher made map.Another point is that the individual concept impact is more on the academic achievement of students compared to map concept as a group.

Mesrabady (1385) in a research within the enterprise, as the design, implementation and validation of curriculum-based on experimental approach to integration, evaluated the effectiveness of the use of pre-made concept maps on the academic achievement of secondary students in Tabriz. Analysis of the statistical data obtained from this study showed that pre-test and post-test scores of experimental groups compared to the control group in psychology and biology lessons had a significant difference.

Rahmani et al (1386) in another study compared the effect of concept map by consolidated model on Tabriz nursing students' learning at Medical Sciences University of Tabriz and said that: concept map method of as well consolidatedmethod of learning improved cognitive learning of nursing students in the area of knowledge and meaningful learning is also upgraded. But concept map more thanconsolidated method was effective on meaningful learning of students.

Abbasi (1387) in asemi experimental study in a sample of 169 male and female students in Qom studied the effectiveness of the concept plan application to increase students' achievement in scores of the test group inchemistry 2 of secondary school. Analysis of the obtained results showed significant difference between the scores of test group student achievement (under the curriculum based on concept maps) than students in the control group (under the traditional curriculum).

LekzehyMoghadam (1391) in a study investigated the impact of the concept map approach on the progress of students in math of third grade in the city of Rusk.
This study was made by 80 students of third grade secondary school of Rusk city.
Analysis of the obtained data from this study showed that:
1. Map conceptteaching approach is effective in student achievement.
2. The concept map teaching approach is effective to achieve the level of knowledge and understanding of students and its application.
3-teaching approach by concept map impact raising students' interest in mathematics.
Heniz, Feree& Novak (1990) used scores measuring of academic training as an indicator of academic ability. They found that students who have high scores inthese tests, compared to the ones who got lower scores have more progress with the use of concept maps.
Harton et al. (1993) in meta-analysis of 19 qualitative studies concluded that in overall the concept maps effect on academic achievement as well as their attitude is positive.
Fajonewmi (2002) in a quasi-experimental study with pre-test and post-test compared the effect of concept map teaching and lecturing on Nigerian student learning in the biology course.
Results of this study suggest that concept map in comparison with lecture is more effective on student achievement. The other part of the findings of this study also show that the effectiveness of this approach to learning students, boys and girls is the same.
Iee&Nelson(2005) in a study examined the effects of two strategies already prepared concept maps and concept maps on problem solving performance of students. Also in this study the effect of previous knowledge level of the subject on the effectiveness of pre-made concept maps strategies and concept maps were tested on problem solving performance of students. The analysis of obtained data from this study showed that the main effect of concept maps (preformed concept map against the group began to prepare a concept map) is significantly different in science.
The results also showed that subjects who developed their concept mapping, compared to those who have used the prepared concept maps, higher functions in problem solving.
VakiliFard (2006) studiedthe effects of concept map on understanding of information text in second language students with different native languages, at the Montreal University - Canada.
VakiliFard finally announced the following results: test group in understanding the tasks, showed better performance than the control group. All members of the group believed that using concept maps helps better understanding of the context, organization, structure, and identifying main ideas of the text. This also makes it easy to learn the words and the relationships between them. The overall the study is approved the positive effect of concept map in teaching a second language.
Tomen and Taspiner (2006) studied the effect of concept map on the students' progress in teaching English to Turkish-speaking students and reported the following results:
A) Usingconcept maps had created greater success.
B) In proofing (stability) there wasn't any significant difference between the groups.
C) Studentshad problems in making their own concept map. so researchers suggested that it is betterusingthe teacher made concept map in the beginning of learning a second language. In addition, students will be encouraged to create their own maps too.

Research questions

1 – Is the method of teaching with concept mapping approach compared to conventional methods, influence the academic achievement of students in science at fifth grade in District 1 of Zahedan?
2. Is teaching by concept map approach compared to conventional methods affects the durability science content of male and female students in grade five District 1 in Zahedan?
3. Does the concept map approach compared to conventional methods, reduce misunderstanding in the fifth grade girls and boys learning District 1 in Zahedan?

Methods

The study is semi-experimental. The study population is the male and female students in fifth grade District 1 ofZahedan. Among the boys and girls elementary school ofZahedan, randomly 2 School (onegirl's school and one boys' school) was selected. In each school a class randomly were selected as a tests group and one another as control one.
The following table (1) Statistics of pre-test and post-test participants are given.

Table 1. The frequency of the study population

post-test		pre-test		groups
girl	boy	girl	boy	
36	36	36	36	test
36	36	36	36	control
72	72	72	72	total

Data for this study was 20 questions of the achievement test and test series that were prepared based on the objectives of the concept maps. The test also has 10 questions was designed by the researchers to measure the misunderstanding.

Questions of pre-test, post-test, test series and testing of some misunderstanding for control and test groups were similar.

The study subjects to learn the lessons of the fifth year of primary school were involved two groups of boys and girls and two control groups of boys and girls. In the test groups, subjects were trained by the researcher, under the curriculum based on the use of concept maps application and concept map, in contrast to the control subjects were trained according to common and usual curriculum.

Finally, statistical data by using descriptive and analytical analysis of variance and variance analysis between the inside- mixed groups were analyzed with SPSS software.

Research Questions Analysis

First question: Is teaching with concept map approach compared to the conventional teaching methods influence more on the academic achievement of students of fifth grade boys and girls of Zahedan?

Analysis of variance was used to examine this question. The results of variance analysis provided in tables (2) and (3) to compare the differences between groups for student achievement:

Table 2. Average and Standard deviation (SD) of scores achievement in the two groups (conventional and concept map methods)

Standard deviation	Average	The number	groups	
1/44	*17/83*	*36*	concept map method	Girl
1/84	*14/47*	*36*	Conventional method	
1/82	*16/97*	*36*	concept map method	Boy
1/77	*16/72*	*36*	Conventional method	
1/69	*17/40*	*72*	concept map method	total
2/12	*15/60*	*72*	Conventional method	

As Table 2 shows, the average of student scores achievement which trained by concept map approach (17/40) is higher than students trained by using conventional and traditional method (15/60).

Table 3. Analysis of variance (ANOVA) test for the achievement

Sig	F	Mean square	df	Sum of squares	Changes Source
0/00	*6/31*	*117/36*	*1*	*117/36*	Group
0/00	*5/81*	*17/36*	*1*	*17/36*	Gender
0/00	*39/29*	*39204*	*1*	*39204*	Interaction and gender

According to the results of table (3) there is a significant difference between the two groups trained by conventional and concept map methods. Thus, it can be said that the concept map method compared to conventional methods is more influenced in increasing academic achievement ($p<0/01$, $F=6/31$). Also there is a significant difference between two groups of boys and girls attending traditional concept and mapping classes in the 99 percent level ($p<0/01$, $F=5/81$). That means there is a significant difference between girls and boys in terms of academic achievement. Also Interaction effect of Group × Gender is also have a significant difference in the level of 99 percent ($P<0/01$, $F=39/29$).

As shown in Table 2, the difference between the average scores of male students in the concept map, compared with traditional teaching methods is 0/25, while the difference for female students is 3/36, so the effect of concept map in girls is more than boys.

Second question: Is teaching by concept map approach compared to conventional methods affects the durability science content of male and female students in grade five District 1 in Zahedan?

To examine the question, the mixed ANOVA test was used among the group. The results of mixed ANOVA test for differences between groups on content durability provided in the table (4) and (5):

Table 4. shows the mean and standard deviation of the two groups (test and control) and (male and female) in three stages of durability test

Test 3		Test 2		Test 1		number	groups	
SD	Average	SD	Average	SD	Average			
1/58	*18/02*	*1/23*	*16/50*	*1/48*	*15/08*	*36*	concept map method	Girl
1/55	*14/23*	*1/31*	*14/36*	*1/29*	*15/07*	*36*	Conventional method	
1/15	*18/02*	*1/08*	*16/47*	*1/62*	*14/97*	*36*	concept map method	Boy
1/49	*14/12*	*1/17*	*14/22*	*1/50*	*14/83*	*36*	Conventional method	
1/15	*18/02*	*1/15*	*16/48*	*1/55*	*15/03*	*72*	concept map method	total
1/51	*14/18*	*1/23*	*14/29*	*1/40*	*14/96*	*72*	Conventional method	

As Table 4 shows, the difference between the average of the concept map in test 1 (15/03) and Test 3 (18/02) compared to the average of conventional group intest 1 (14/96) and Test 3 (14/18) is more remarkable. From the table (5) it has concluded that there is a 99% increasing in the durability of the material (p<0/01, F=66/07). The Interaction durability of the material × Group also is significant at 99% level (P<0/01, F=190/95). This means that there is a significant difference between test and control groups. But Interaction durability of content × gender is not significant at 95% level (P>0/05, F=0/21). Sothere is not a significant difference between boys and girls in the durability of the material. Thus teaching by concept map approach increases the durability of materials in science between fifth grade boys and girls students of Zahedan.

Table 5. mixed ANOVA test for the durabilityof the material

Significance level) p(	F	Freedom degree	Mean square	Variables
0/01	*66/07*	*1*	*88/88*	Material Durability
0/00	*190/95*	*1*	*256/88*	Material Durability * group
0/65	*0/21*	*1*	*0/28*	Material Durability * gender
		141	*1/34*	error

Third question: Does the concept map approach compared to conventional methods, reduce misunderstanding in the fifth grade girls and boys learning District 1 in Zahedan?

Analysis of variance was used to examine this question. The results of analysis of variance to compare the differences between groups for reducing the amount of misunderstanding are provided in the table (6) and (7).

Table 6. The mean and standard deviation of both groups

standard deviation	average	number	Groups	
1/22	*7/75*	*36*	concept map method	Girl
1/94	*5/53*	*36*	Conventional method	
1/33	*7/92*	*36*	concept map method	Boy
1/98	*5/33*	*36*	Conventional method	
1/27	*7/83*	*72*	concept map method	Total
1/95	*5/43*	*72*	Conventional method	

As Table 6 shows, the average misunderstanding scores of students that trained by concept map teaching approach (7/83) is higher than the students trained by conventional methods (5/43).

Table 7: ANOVA test for the misunderstanding factor

Sig	F	Mean square	df	Sum of squares	Changes Source
0/00	*2/29*	*207/84*	*1*	*207/84*	Group
0/96	*0/02*	*0/01*	*1*	*0/01*	Gender
0/00	*75/29*	*6333/51*	*1*	*6333/51*	Interaction and gender

According to the results of table (7) there is a significant difference between the two groups trained with the approach of the concept map and conventional method. Thus, it can be said that the teaching by concept map approach compared to conventional methods reduce more the misunderstanding (P<0/01, F=3/29). Also between two groups of male and female of conceptual map classes and conventional methods, there is no significant difference in reduction of the amount of misunderstanding at 95% level (P>0/05, F=0/02). However, thereis also a significant difference in interaction Group × Gender at the level of 99 percent (P<0/01, F=75/29).

Discussion and Conclusion

The first question of study:Is teaching with concept map approach compared to the conventional teaching methods influence more on the academic achievement of students of fifth grade boys and girls of Zahedan?

For the above question, the results suggest that methods of teaching by concept map approach compared to conventional methods is effective in academic achievement of students of fifth grade in Zahedan, That can be deduced that by concept map approach in teaching we can see student achievement and reduction of Academic failure and psychological and economical problems of the students and their parents and thereby we increase student motivation and reduce the problems of education; which the conclusion has harmony with Maclajlin and derory view (2000), which emphasized the teaching method as one of the success factors as well as the findings of the study of Giou (1381), Mesrabady (1384) and (1385) and Rahmani et al. (1386), LekzehyMoghadam (1391), Heniz and Feree and Novac (1990), Harton et al. (1993), Fajunaomi (2002) and Tomen and Taspens (2006) that all emphasized on the effectiveness of the map conceptapproach for the student achievement.

Second question of study: Is teaching by concept map approach compared to conventional methods affects the durability science content of male and female students in grade five District 1 in Zahedan?

The results of this study suggest that teaching methods by concept map approach is effective to increase the durabilityof materials in science between students of fifth grade of Zahedan; it means that the use of concept maps is a proper solution to create meaningful and sustainable learning that by logical connection between concepts, Caused the students' knowledge persistence. The results of the study is consistent with Giov (1381), Rahmati (1382), Rahmani et al. (1383) and (1386).

Third question of the study: Does the concept map approach compared to conventional methods, reduce misunderstanding in the fifth grade girls and boys learning District 1 in Zahedan?

The results of this study suggest that map concept teaching approach compared to conventional methods has more impact to reduce misunderstanding of fifth grade students in science at District 1 of Zahedan; This means that by concept map approach in teaching, both teachers and students learn to recognize their mistakes and correct it perevent misunderstanding.

This conclusion is a new finding that nodiscussion and research has been paid on it.

Conclusion

Learning by conventional method for all is inevitable in the period of time; because it is a good way to provide basic information and science transfer and even, in some circumstances is the most appropriate of teaching methods. But in this method, critical thinking opportunities had not been given to students. According to the findings, a concept map teaching approach compared to conventional methods is effective in academic achievement, materials durability and misunderstanding reduction. So as a result, lack of academic achievement leads to academic failure and this is one of the major problems of education in academic centers that in addition to the billions of material damage, have created many emotional, mental and social problems for students, discovering a factor that can increase the success rate of students and material durability and reduce the misunderstanding is very important. There isn't any doubt with regard to the results of the research that concept maps are very powerful tools for teaching, learning and evaluation of concepts, especially various scientific subjects. To draw a concept map, the student must obtain the necessary information for what he/she wants to draw

the map and then by using the obtained information, draw a concept map. On the other hand in drawing concept maps, the student put the obtained information within the familiar concepts of his mind and do concept mapping. These two factors cause that the student easily put data together in new classification and under each other that the possibility of new concepts associated with previous concepts increases and in total, comprehensive understanding of the created relationships increases. On the other hand, in the conventional method that the emphasis is more on lectures, there is more than a flow of information from teacher to students and teachers with words and concepts in the construction of their own cognitive try to form learners' cognitive construction. So in this case, the risk of lack of coordination between the previous and new concepts in the learnerscognitive construction will be high and a connection may be established in the learners cognitive construction that is incapable of understanding them. Adverse outcomes also can noted as creating meaningful learning, increase the depth of learning, achieve higher levels of cognitive (analysis, synthesis and evaluation) and abstract thinking. Encourage students to draw concept map leads to engaging their mind with concepts and logical connection between them and this have great value in the teaching, learning processes and the acquisition of cognitive and metacognitive strategies, on this basis, it is appropriate to take advantage of this educational strategy in the education system of our country.

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