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CONSTRUCTIVIST LEARNING APPROACH IN SCIENCE TEACHING

FEN BİLGİSİ ÖĞRETİMİNDE YAPILANDIRMACI ÖĞRENME YAKLAŞIMI

Cavide DEMİRCİ 1**

ABSTRACT: Constructivism is not a new concept. It has its roots in philosophy and has been applied to sociology and anthropology, as well as cognitive psychology and education. The aim of this research is to reveal if there is a significant difference between the means of achievement and retention learning scores of constructivist learning approach applied group and conventional training approach applied group. Since an experimental research was treated, no population or sampling group process was stated. In the research, the pupils of sixth class, studying in Yunus Emre Elementary School at city center of Eskişehir, in spring term of 2005- 2006 academic year were chosen. Pre – test scores of experimental and control groups and the means of the scores of science lesson fall term of sixth class were evaluated and appropriate two classes were chosen. 6-A class was chosen as the experimental group and 6-B class was chosen as the control group at random. In this reseach, one of the experimental designs which provide quantiative data about the primary and secondary subproblems called "Pre-test, Post- Test with Control Group Design" were implemented.

Keywords: constructivist learning approach, achievement, retention, science.

ÖZET: Yapılandırmacılık yeni bir konu değildir. Kökeni felsefeye dayanır ve sosyoloji, antropoloji, bilişsel psikoloji ve eğitim üzerine uygulamaları yapılmıştır. Bu araştırmanın amacı, Fen bilgisi dersinin öğretiminde yapılandırmacı öğrenme yaklaşımının uygulandığı grubun başarı ve kalıcı öğrenme puanlarının ortalamaları ile geleneksel öğretimin uygulandığı grubun başarı ve kalıcı öğrenme puanlarının ortalamaları arasında anlamlı bir farkın olup olmadığını ortaya koymaktır. Deneysel araştırma yapıldığından evren ve örneklem tayinine gidilmemiştir. Araştırmada, 2005-2006 öğretim yılı bahar döneminde, Eskişehir ili merkezinde bulunan Yunus Emre İlköğretim Okulu 6. sınıfa devam eden öğrencilerden yararlanılmıştır. Deney ve kontrol gruplarının ön test puanları, 6. sınıf 1. dönem fen bilgisi dersi karne notu ortalamalarına bakılarak birbirine benzeyen iki sınıf seçilmiş, bunlardan 6-A sınıfı deney ve 6-B sınıfı kontrol grubu olarak belirlenmiştir. Araştırmada Birinci ve ikinci Alt problemle ilgili olarak nicel veriler sağlayan deneysel desenlerden "Kontrol Gruplu Ön Test-Son Test Deney Deseni" kullanılmıştır.

Anahtar sözcükler: yapılandırmacı öğrenme yaklaşımı, başarı, kalıcılık, fen bilgisi.

1. INTRODUCTION

In constructivism, which wants individuals do not take knowledge passively from the environment but taking responsibility in learning process and being active, learning theories are used such as cooperative learning, problem based learning and project based learning. Constructivist learning applications predict a rich and interactive learning environment which supplies pupil requires to reach the knowledge, get and analyze it, arrange and use it in order to solve the problems by the way of cooperative learning activities. In the learning process, pupil is expected to produce his/her own product by searching, doing decisions, collaborating, using high level thinking skills and using his/her own creativeness. In this regard, constructivist learning applications encourage the pupils "doing about something" instead of "learning about something".

Constructivism is not a new concept. It has its roots in philosophy and has been applied to sociology and anthropology, as well as cognitive psychology and education. Perhaps the first constructivist philosopher, Giambatista Vico commented in a treatise in 1710 that "one only knows something if one can explain it". As an educational constructivist, the constructivism is a trend, dislesson and theory that was emerged and disseminated during the period between 1980 and 1990 (Welsch & Jenlink, 1998). This term tells that the information is constructed by the pupil. That is to say, the individual does not adopt the information as it is, he restructures his own information. He adopts the information he is provided in combination with his own information under his own

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conditions (Özden 1999). In such a learning approach, past experiences of the pupil play the essential basis. The information exists by structuring upon individuals creative and descriptive actions of the individuals, rather than its relation with the subject areas. It is therefore empirical, subjective and individual (Kaptan & Korkmaz, 2001). The roots of constructivism may be traced to the writings of a little-known eighteenth-century philosopher, Giambattista Vico, who believed that a learner knows only the cognitive structure he/she has constructed (von Glasersfeld, 1989). In XVIII Century, the philosopher Giambatista Vico is in fact defends with his statements of "the one who knows something also provides an explanation". Emmanuel Kant further developed the same idea and said that the human being was active in receiving the information, establishing its relation with previous information and doing its own information. Scientists like John Dewey, Piaget and Vygotsky had contributed to the structuralism in the sense of shaping the construction with their works (Özden, 1999).

Driver, Asoko, Leach, Mortimer & Scott (1994:5) suggested that 'the core commitment of a constructivist position' is 'that knowledge is not transmitted directly from one knower to another, but is actively built up by the learner'. This perspective reflects Piagetian ideas about the way the individual learns through interaction with the environment, taken here to include the social and cultural (including linguistic) environment as well as the physical environment.

For Lonergan, there is no recipe to follow leading pupils inevitably to insights. The achievement of insight, Archimedes' eureka moment, is highly unpredictable, following neither rules nor methodologies. As Lonergan points out, a teacher can not make a pupil understand, but can only present content in a suggestive sequence with the right emphases(1988). It is then up to the pupils to reach understanding, as they do at various times with varying results. Likewise, the teacher can make the same sensory data available to all and can control outer circumstances to a degree; however, insight is governed more by inner conditions such as pupils' habits of mind and previous insights (Roscoe, 2004).

Work into 'everyday cognition' (Rogoff & Lave, 1984), 'situated learning' (Lave and Wenger, 1991)-and related notions of 'practical intelligence' (Sternberg et al., 2000)-suggest that formal scientific knowledge is not usually perceived as relevant to everyday life, and does not tend to be activated in the absence of the (perceived) appropriate context: and so would need to be 'reconstructed' and re-contextualised before it could be used in everyday life situations (Hennessy, 1993: 26).

The constructivisim is a perspective that emerged in evolutionary and informatory psychology, whose prominent figures include Bruner (1990), Kelly (1955), Piaget (1969) Von Glaserfeld (1993) and Vyogotsky (1978). To Piaget Inhelder (1969), the structuralism asserts that each individual creates a mental world in his individual informatory process. The works which has been accomplished by Dewey, Montessari, Piaget, Bruner and Vygotsky have been the historical emergence of the structural learning theory. The constructivisim represents a shift in paradigm towards to the education to informative theory from the behavioral theory. As it has known, the behavioral epistemology (information theory) is based on the intelligence, object areas, information levels and reinforcement. The constructivist epistemology is argued as its structures its own information on the basis of the individual's interaction of his surrounding. The constructivisim is connected with the construction of the information rather than acquiring it. To this theory, it is how the individuals learn that matter. The constructivism is not an accumulation or memorizing the information, but rather it is about thinking and analysis. The constructivisim is about the comprehension and practice, rather than feedback. The constructivism is about the active learning. It is not a process of learning upon passive receipt of the ready-made information from someone else (Narrated by: Özdemir, 2002).

At its core, constructivism-as adopted in Science Education (as opposed to wider interpretations of 'constructivism' in the social sciences, e.g., Beld, 1994; Potter, 1996; Gergen, 1999; Phillips, 2000b; Matthews, 2000)-is a perspective which views human learning as an active process, i.e., something done by, not on or to, the learner herself.

When the pupil's stated learning preference was consistent with the actual learning environment, he/she tended to obtain a higher conceptual understanding level and positive attitude change. Otherwise, when the preferred and the actual learning environment did not match, the pupil tended to

have less improvement in conceptual understanding and to demonstrate a negative attitude change (Liang & Gabel, 2005).

The appraisal in the class where the constructivist approach is adopted is made as follows. It is the process that matter rather than the teacher's appraisal. The criteria of the measurement are determined together with the pupils (Çiçek, 2005).

The meaning of constructivism varies according to one's perspective and position. Within educational contexts there are philosophical meanings of constructivism, as well as personal constructivism as described by Piaget (1967), social constructivism outlined by Vygtosky (1978), radical constructivism advocated by von Glasersfeld (1995), constructivist epistemologies, and educational constructivism (Mathews, 1998). Social constructivism and educational constructivism (including theories of learning and pedagogy) have had the greatest impact on instruction and curriculum design because they seem to be the most conducive to integration into current educational approaches (Jones & Brader-Araje, 2002).

1.1. Piaget and Developmental Psychology

Jean Piaget (1896-1980) is considered to be one of the most influential thinkers in the twentieth century developmental psychology. His approach was based on an evolutionary epistemology analogizing the development of mind to a biological point of view and, so, highlighting the adaptive function of cognition. Von Glasersfeld ranks Piaget in constructivism because "knowledge for Piaget is never (and can never be) a 'representation' of the real world. Instead it is the collection of conceptual structures that turn out to be adopted''(von Glasersfeld, 1989). For Piaget (1952, 1969) the development of human intellect proceeds through adaptation and organization. Adaptation is a process of assimilation and accommodation, where, on the one hand, external events are assimilated into thoughts and, on the other, new and unusual mental structures are accommodated into the mental environment. The process of organization refers to the structuring of the adapted mental material (Boudourides, 2007).

1.2. Vygotsky and Social Psychology

Vygotsky's main relevance to constructivism derives from his theories about language, thought, and their mediation by society. He holds the anti-realist position that learning could not be based on a direct association but that the process of knowing is rather a disjunctive one involving the agency of other people and mediated by community and culture (Boudourides, 2007).

1.3. Constructivism and Education

Focusing on a more educational description of constructivism, meaning is intimately connected with experience. Pupils come into a classroom with their own experiences and a cognitive structure based on those experiences. These preconceived structures are either valid, invalid or incomplete. The learner will reformulate his/her existing structures only if new information or experiences are connected to knowledge already in memory. Inferences, elaborations and relationships between old perceptions and new ideas must be personally drawn by the pupil in order for the new idea to become an integrated, useful part of his/her memory. Memorized facts or information that has not been connected with the learner's prior experiences will be quickly forgotten (Hanley, 1994).

It is assumed that learners have to construct their own knowledge-- individually and collectively. Each learner has a tool kit of concepts and skills with which he or she must construct knowledge to solve problems presented by the environment. The role of the community-- other learners and teacher-- is to provide the setting, pose the challenges, and offer the support that will encourage construction (Davis, Maher & Noddings, 1990).

1.4. Constructivist Processes and Education

Prior Knowledge: Constructivists believe that prior knowledge impacts the learning process. In trying to solve novel problems, perceptual or conceptual similarities between existing knowledge and

a new problem can remind people of what they already know. This is often one's first approach towards solving novel problems. Information not connected with a learner's prior experiences will be quickly forgotten. In short, the learner must actively construct new information into his or her existing mental framework for meaningful learning to occur.

Real and Authentic Problems: Constructivist learning is based on the active participation of learners in problem-solving and critical thinking–given real and authentic problems.

Constructivist Curriculum: A constructively oriented curriculum presents an emerging agenda based on what children know, what they are puzzled by, and the teachers' learning goals. Thus, an important part of a constructivist-oriented curriculum should be the negotiation of meaning.

Cognitive Conflict and Social Context: Cognitive conflict or puzzlement is the stimulus for learning, and it determines the organization and nature of what is being learned. Negotiation can also occur between individuals in a classroom. This process involves discussion and attentive listening, doing sense of the points of views of others, and comparing personal meanings to the theories of peers.

Constructivist Assessment: Assessment of pupil learning is of two types: formative and summative. Formative assessment occurs during learning and provides feedback to the pupil. It includes evaluations of ongoing portfolios, and demonstrations of work in progress. Pupil collaboration also provides a form of formative assessment. Summative assessment occurs through tests and essays at the end of a unit of study. Summative assessments provide little specific feedback. From a constructivist perspective, formative assessments are more valuable to the learner (Lamon, 2001).

The Teacher's Role: The teacher's role in a constructivist classroom isn't so much to lecture at pupils but to act as an expert learner who can guide pupils into adopting cognitive strategies such as self testing, articulating understanding, asking probing questions, and reflection. The role of the teacher in constructivist classrooms is to organize information around big ideas that engage the pupils' interest, to assist pupils in developing new insights, and to connect them with their previous learning. The activities are pupil-centered, and pupils are encouraged to ask their own questions, carry out their own experiments, make their own analogies, and come to their own conclusions. Becoming a constructivist teacher may prove a difficult transformation, however, since most instructors have been prepared for teaching in the conventional, objectivist manner (Brooks & Brooks, 1993).

1.5. Characteristics of Constructivist Learning and Teaching

Create real-world environments that employ the context in which learning is relevant. Focus on realistic approaches to solving real-world problems. The instructor is a coach and analyzer of the strategies used to solve these problems. Stress conceptual interrelatedness, providing multiple representations or perspectives on the content. Instructional goals and objectives should be negotiated and not imposed. Evaluation should serve as a self-analysis tool. Provide tools and environments that help learners interpret the multiple perspectives of the world. Learning should be internally controlled and mediated by the learner. Provide multiple representations of reality. Represent the natural complexity of the real world. Focus on knowledge construction, not reproduction. Present authentic tasks (contextualizing rather than abstracting instruction). Provide real-world, case-based learning environments, rather than pre-determined instructional sequences. Foster reflective practice. Enable context-and content dependent knowledge construction. Support collaborative construction of knowledge through social negotiation (Murphy,1997).

According to Taber (2000), the learning theory claiming that the information cannot be transferred to pupil from teacher directly and that it should be structured by the pupil himself actively is rather successful in explaining why the pupils have alternative concepts. And it gives essential clues about what can be done in order to create conceptual change in pupils by means of more efficient teaching approaches. For this reason, many Science educators have emphasized that using the principles arising from the structuralist learning theory may be more efficient in order to exchange the alternative concepts of the pupils with more scientific concepts and to develop more efficient teaching approach during education (Quoted by Köseoğlu et al, 2002).

In a similar vein, Duit(1996) points out that 'for so me science educators, constructivism has become a new ideology able to solve any teaching/learning problem of sciences'. But, he adds: 'Undoubtedly, it has also become a very worthy orientation for science education, both for teaching and for research in this field'.

1.6. The Problem Sentence

Is there any significant difference between the means of achievement and retention scores of constructivist learning approach and the means of achievement and retention scores of conventional training approach in the lesson of science "Static Electricity" unit?

1.7. Sub- Problems

1) Is there any significant difference between the mean of achievement scores of constructivist learning approach and the mean of achievement scores of conventional training approach in the lesson of science?

2) Is there any significant difference between the mean of the retention scores of constructivist learning approach and the mean of retention scores of conventional training approach in the lesson of science?

1.8. Limitations

This research is limited with; Two classes of Yunus Emre Elementary School in Eskişehir, spring term of 2005- 2006 academic year, the unit called **"**Static Electricity**"** of the sixth class of elementary training, the gain of this unit and the activities during the treatment of this unit, achievement test with 27 items,

2. METHOD

In this reseach, one of the experimental designs which provide quantiative data about the primary and secondary supproblems called "Pre- test, Post- Test with Control Group Design" were implemented.

Table 1: Pre- Test, Post- Test with Control Group Design

Groups	pre-test	Treatment	post- test	retention test
G1(EG)	**T1**	**constructivist learning approach in the science training**	**T1**	**T1**
G2(CG)	**T1**	**conventional training approach**	**T1**	**T1**

G1:The experimental group which the constructivist learning approach was applied. After the applications of pre-testing, it was started to teach lessons. The pupils who are in "experimental group" encouraged to make them more active and responsible in the learning process. The learning activities related to learning approaches such as cooperative learning, problem based learning, and project based learning were applied in the learning process. These activities aimed to give high level thinking skills to pupils. During the teaching science lesson to "experimental group" blackboard was used very rarely. During the learning of science lesson of this group, pupils brought power point presentations and videos to classroom related to subject. Lessons were taught with activities. Pupils applied and prepared the activities related to subject such as projects, doing experiments, drama, models, concept maps, poems and puzzles. They formulated their opinions and created discussion groups. The teacher encouraged the pupils to make research. The pupils arranged the learning environment in order to cooperate in the learning process. During the activities of learning process, it was expected from the pupils that doing research, decisions, and cooperates, using high level thinking skills and their creativeness. The teacher did not give any prepared knowledge to pupils. The teacher

encouraged the pupils by talking them and giving reward to cause them to ask questions each other and doing research. The teacher guided them when the pupils need.

G2: The control group which the conventional training approach was applied. In the conventional approach of teaching, the teacher was active. The teacher used explanation method and pupils listened to him/her. And pupils were asked some questions by the teacher during the process. During the teaching of science lesson in the "control group" blackboard was only used. Lessons were taught by solving examples using the blackboard and the pupils were inactive in this approach.

T1: Achievement test about the subject of **"**Static Electricity**"** unit of "Electricity Conducting Our Lives". Achievement test was used as pre-testing, post testing and retention test. Retention learning test was applied to experimental and control groups two months later after the application of post-test.

The groups were chosen at random as the experimental and the control groups. In the experimental group, the science lesson is traited with the curriculum and the material which were prepared according to the constructivist learning approach. In the control group, the science lesson is treated with conventional training approach. The teacher of the experimental group was educated on how the science education is treated with constructivist learning approach before the application. The training was carried about by the same teacher in the both groups.

2.1. Groups

Since an experimental research was treated, no population or sampling group process was stated. In the research, the pupils of sixth class, studying in Yunus Emre Elementary School at city center of Eskişehir, in spring term of 2005- 2006 academic year were chosen. Pre – test scores of experimental and control groups and the means of the scores of science lesson fall term of sixth class were evaluated and appropriate two classes were chosen. 6-A class was chosen as the experimental group and 6-B class was chosen as the control group at random.

2.1.1. The Data Related to The Mean Value of The Science Lesson Grades of Groups at Sixth Class Fall Term

Data related to the mean value of the science lesson grades of groups at sixth class fall term as for the groups in which constructivist learning approach and conventional training were applied during the "static electricity" subject given on table I.

Table 1 :The Mean Value of The Science Lesson Grades of Groups at Sixth Class Fall Term

Groups	N	$\overline{X}$	standart deviation Ss	t
Experimental	**30**	**2,63**	**1,29**	**,977**
Control	**30**	**2,30**	**1,34**	

p= .941 p>0,05

As seen on the table I, the mean value of the science lesson grades of groups at sixth class fall term is 2,63 for experimental group; 2,30 for the control group. In order to determine the significance of the difference between the experimental group and the control group, the t test of the independent groups was applied by using SPSS statistical analysis program. The following data have been provided at the end of the analysis. Related to the mean value of the science lesson grades of groups at sixth class fall term, ,977 "t" value was not found significant with .941 p value, with 58 degree of freedom and 0.05 significant level. It can said that both groups are equivalent to teach other as for the mean value of the science lesson grades of groups at sixth class fall term.

2.1.2. Data Related to The Pre-Test Grades of The Groups

The results of the "t"test determining the value of pre-test grades, standart deviation and whether there is a significant difference between the grades of the groups in which constructivist

learning approach and conventional training were applied during the "static electricity" subject at elementary school sixth class are given on the table II.

Table 2 : The Mean Value of The Pre- Test Grades of The Groups

Groups	N	pre-test score $\overline{X}$	standart deviation Ss	t
Experimental	**30**	**6,73**	**1,89**	**,680**
Control	**30**	**6,40**	**1,90**	

p= .672 p>0,05

As seen on the table II. , the total mean value pre- test grades are 6,73 for the experimental group; 6,40 is the control group. In order to determine the significance of the difference between the mean values of the total pre- test grades for the experimental and control groups, the t test of the independent groups was applied by using SPSS statistical analysis program. The following data have been provided at the end of the analysis. Related to the total mean values of the pre- test grades, ,680 "t" value was not found significiant with .672 p value, with 58 degree of freedom and 0,05 significant level. It can say that both groups are equilavent to each other as for the mean values of the pre- test.

2.2. Data Collection Intruments

Achievement test: It was prepared and developed by the researher. It was implemented as pre-test, post- test and retantion test 27 items were implemented in the research and the items are four choices. Each correct answer was given 1 point and each wrong answer was given 0 point in the achievement test. In the scope of this study, the aims and attitudes of topic of "static electricity" In science lesson was determined as the same in "Tebliğler Dergisi" of Ministry of National Education. It was prepared at least three test items and every item has four choices. It was prepared 50 items totally and they were sent to experts to get their opinions. They made their decision and suggestions about base of question, the choices, content validity and if the questions measure the success of pupils. After getting these recommendations, items of test was checked again, changed and 48 questions were created. The pilot study of test was applied four classrooms which have 90 pupils in sixth grade. Item analysis was made at the end of this application. It was calculated item difficulty index (pj) and item separation power index (rb) for each item. It was considered the power of high separation in the choice of items. And the items which have smaller than 0.21 points in separation power index were eliminated. They were corrected and included in test if they had 0.20-0.30 points in separation power index. If they had bigger than 0.30 points they were included directly in test. Thus, it was created test form included 27 questions and 2 test questions for every standard. Items of test were related to understanding, application and analyze level. KR-20 reliability of final test was found 0.89.

3. RESULTS AND DISCUSSION

3.1. The Results Belong to The First Sub-Problem and Discussion

In order to test the first subproblem, the mean value of the post-test grades and standart deviations of experimental and control groups were calculated. The data may be seen on the table III.

Table 3: The Mean Value of The Post-Test Grades, Standard Deviations, "t" Value of Experimental and Control Groups

Groups	N	post-test score $\overline{X}$	standard deviation Ss	T
Experiments	**30**	**20,33**	**3,73**	**7,093**
Control	**30**	**13,33**	**3 ,92**	

p= .001 p<0,05

As seen on the table III, the total mean value post-test grades are 20,33 for the experimental group; 13,33 is the control group. In order to determine the significance of the difference between the

mean values of the total post-test grades for the experimental and control groups, the t test of the independent groups was applied by using SPSS statistical analysis program.

The following data have been provided at the end of the analysis. Related to the total mean values of the post-test grades, 7,093 "t" value was found significiant with .001 p value, with 58 degree of freedom and 0,05 significant level. According to the data, it may be said that there is a significant difference in the mean values of difference between pre-test and post-test grades of the experimental and the control groups and the Constructivist learning approach is more efficient than the conventional approach. The findings about this subproblem of the research are cited with some of the research conclusions in the literature.

The research has been conducted by Şengül (2006) and it was observed an increase both the experimental group which the constructivist learning approach was applied and the control group which the conventional training approach was applied. However, the increase of achievement score in the experimental group which the constructivist learning approach was applied at was more than in the control group.

Saygın, Altınboz & Salman (2006), researched the constructivist approach's effect on achivement of learning the cell unit of the pupils. Pupils applied to constructivist learning approach was seemed more succesfully than pupils applied to conventional training approach in the cell unit.

These results proved that constructivist learning was more affected on the increase of achievement score than conventional training.

3.2. The Results Belong to The Second Sub-Problem and Discussion

In order to test the second sub-problem, the mean value of the retention test grades and standart deviations of experimental and control groups were calculated. The data may be seen on the table IV.

Table 4 : The Means, The Standart Deviation and The "t" Value Retention Scores

Groups	N	retention score $\overline{X}$	standart deviation Ss	T
Experimental	**30**	**13,30**	**2,31**	**12,716**
Control	**30**	**6,26**	**1,96**	

p= .001 p<0,05

As seen on the table IV, the total mean value of retention learning grades are 13,30 for the experimental group; 6,26 is the control group. In order to determine the significance of the difference between the mean values of the total retention grades for the experimental and control groups, the t test of the independent groups was applied by using SPSS statistical analysis program. The following data have been provided at the end of the analysis. Related to the total mean values of the retention grades, 12,716 "t" value was found significiant with .001 p value, with 58 degree of freedom and 0,05 significant level. According to the data, it may be said that there is a significant difference in the retention scores of the experimental and the control groups and the constructivist learning approach is more efficient than the conventional approach. The findings about this subproblem of the research are cited with some of the research conclusions in the literature.

Atam (2006), researched effects of software was prepared for heat and temperature unit in the science and technology lesson on achivement and retention of 5th grade pupils. Between the retention scores of experimentel group and control group were determined a significant difference. Experimentel group's retention score was seemed higher than control group's.

Özerbaş (2007) made a study about effects of constructivist approach's on pupils' achivement and retention of knowledge. In the experimental group retention of knowledge of pupils was determined much better than control groups'.

These results proved that constructivist learning was more affected on the increase of retention score than conventional training.

4. CONCLUSION

There is a significant difference in the mean value of the post-test grades and retention learning test grades in the science lesson between the constructivist learning approach applied group and conventional training approach applied group. The constructivist learning approach is more efficient than the conventional approach. Retention scores of pupils applied to constructivist learning approach in their science class was determined higher than the retention scores of pupils applied to conventional training. As a result, the applications of constructivist learning were affected on the achievement and retention.

According to result of this study, it can be argued that if the constructivist learning approach is used in the lesson of science in six grade class, it can be useful to increase pupil success and retention learning. The evidence of this study is consistent with these researces's results: Sengül (2006), Saygın, Altınboz and Salman (2006), Atam (2006), Özerbaş (2007), Bay & Karakaya (2009), Demirci & Yavuz (2009).

SUGGESTIONS

The suggestions can be given according to these research results.

1. It shouldn't be forgotten that this study is related to sixth grade science lessons and pupils. In the different grades of education and different lessons similar studies can be done.

2. This study is limited to "static electricity" topic of science lesson in sixth grade. It can be researched different activities of constructivist learning on the effect of pupil success.

3. Teachers can use strategies and techniques, which support constructivist approach.

4. In the science education while evaluating the learning products, evaluating the process can be valued.

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GENİŞLETİLMİŞ ÖZET

Yapılandırmacılık yeni bir konu değildir. Kökeni felsefeye dayanır. Sosyoloji, antropoloji, bilişsel psikoloji ve eğitim üzerine uygulamaları yapılmıştır. Yapılandırmacılığın anlamı kişilerin bakış açılarına ve durumlarına göre değişiklik gösterir. Eğitimsel alanda incelendiğinde yapılandırmacılığın çeşitli felsefi anlamları bulunmaktadır. Piaget'nin (1967) kişisel yapılandırmacılığı, Vygtosky (1978) tarafından vurgulanan sosyal yapılandırmacılık, Von Glasersfeld'in (1995) savunduğu radikal yapılandırmacılık, yapılandırmacı bilgi kuramları ve eğitimsel yapılandırmacılık bunlardan bazılarıdır(Özden, 1999). Sosyal yapılandırmacılık ve eğitimsel yapılandırmacılık öğretim ve program düzenlemelerinde en büyük etkiyi yaratan türler olmuşlardır. Çünkü mevcut eğitim yaklaşımlarına en uygun olanlar bu türlerdir(Jones & Brader-Araje, 2002).

Fen eğitiminde son yıllarda en fazla kabul gören yaklaşımlardan biri yapılandırmacılıktır. Yapılandırmacı yaklaşım öğrenci merkezlidir. Yapılandırmacı yaklaşımın özünde, öğrenenin bilgiyi yapılandırması ve uygulamaya koyması vardır. Yapılandırmacılıkta bilginin tekrarı değil, bilginin transferi ve yeniden yapılandırılması söz konusudur. Öğrenenler bilgiyi etkin bir şekilde alarak var olan zihinsel şemaları ile öğrenmeye yön verirler. Önceki öğrenmeleriyle yeni bilgilerini bütünleştirerek kendi yapılandırdıkları bilgilerini özümserler. Öğrenme, karmaşık ve gerçek bağlamlarda gerçekleşir. Bu şekildeki bir öğrenme yaklaşımında öğrencilerin geçmiş deneyimleri önemli temel oluşturur. Yapılandırmacılık bilgiyi depolama ya da ezberleme değil onun hakkında düşünme ve analiz etmedir.

Yapısalcı sınıflarda eğitim programı, kavramlara ağırlık verir (Köseoğlu et al, 2002). Bütünden parçaya doğru ilerlenir. Geleneksel sınıflarda eğitim programı temel becerilerin kazanılmasına ağırlık verir. Parçadan bütüne doğru ilerlenir. Yapısalcı sınıflarda öğretim sürecinde öğrencilerin istekleri, ilgileri, ihtiyaçları ve çeşitli konularla ilgili soruları geniş yer tutar. Geleneksel sınıflarda önceden belirlenmiş bir öğretim programına sıkı sıkıya bir bağlılık söz konusudur. Yapısalcı sınıflarda eğitim programı ile ilgili etkinlikler, geniş ölçüde birincil derecedeki kaynaklara dayanır. Geleneksel sınıflarda eğitim programıyla ilgili etkinlikler ders kitaplarıyla sınırlıdır. Yapısalcı sınıflarda öğrenciler, kendi öğrenmelerinden sorumlu olan, çevreden edindikleri bilgilere kendi zihinlerinde anlam veren ve bu nedenle de öğretimde aktif olan bireyler olarak algılanırlar. Geleneksel sınıflarda öğrenciler öğretmenin bilgiyle dolduracağı boş kutular veya boş depolar olarak algılanırlar. Yapısalcı sınıflarda öğretmenler, öğrenme sürecinde bir öğrenen olarak, öğrencilerle karşılıklı etkileşime girerler ve öğrenme çevresini düzenlerler. Geleneksel sınıflarda öğretmenler, bilgiyi öğrencilere aktaran yegane kaynak olarak algılanırlar. Yapısalcı sınıflarda öğretmenler öğrencilerin belli bir konu hakkında çeşitli görüş ve fikirlerini anlamak için çaba sarf ederler. Geleneksel sınıflarda öğretmenler, öğrenci başarısını ve öğrenmesini değerlendirmek için sorulara kesin ve tek doğru cevap beklerler. Yapısalcı sınıflarda öğrenci değerlendirmesinin öğretim sürecine entegrasyonu sağlanır ve değerlendirme eğitim programı devam ederken öğretmen gözlemleri veya öğrenci çalışmalarının toplanması ve sergilenmesi gibi çağdaş yaklaşımlarla gerçekleştirilir. Geleneksel sınıflarda öğrenci değerlendirilmesi, tamamıyla öğretimden ayrı bir süreç olarak algılanır ve genellikle testlerle eğitim programının sonunda gerçekleştirilir. Yapısalcı sınıflarda öğrenciler, sınıfta genellikle grup içinde ve diğerleriyle birlikte çalışırlar. Geleneksel sınıflarda öğrenciler, genellikle yalnız çalışırlar.

Yapılandırmacı bir sınıfta öğretmenin işi ders anlatmak değildir. Öğretmenlerin; öğrencilerin kendi kendilerine değerlendirme yapabilmelerini, anlamalarını, sorular sormalarını ve yansıtıcı olmalarını sağlayacak, onları bilişsel öğrenme ortamına alıştıran bir uzman rehber gibi davranmaları gerekir. Öğretmenlerin bilgileri öyle bir organize etmeleri gereklidir ki, bu bilgiler hem öğrencilerin ilgileri doğrultusunda olmalı hem de onların önceki bilgileriyle ilişkilenebilir nitelikte olmalıdır. Tüm etkinlikler öğrenci merkezli olarak hazırlanmalıdır. Öğrencilerin kendi sorularını rahatça sorabilecekleri, kendi deneylerini yapabilecekleri ve kendi çıkarımlarına ulaşabilecekleri koşullar sağlanmalıdır. Tüm öğretmenler geleneksel yöntemlere alışkın olduklarından, yapılandırmacı bir öğretmene dönüşmeleri oldukça zordur (Brooks ve Broks, 1993) .

Bu araştırmanın amacı, Fen Bilgisi dersinin öğretiminde yapılandırmacı öğrenme yaklaşımının uygulandığı grubun başarı ve kalıcı öğrenme puanlarının ortalamaları ile geleneksel öğretimin

uygulandığı grubun başarı ve kalıcı öğrenme puanlarının ortalamaları arasında anlamlı bir farkın olup olmadığını ortaya koymaktır.

Alt problemlerle ilgili olarak nicel veriler sağlayan deneysel desenlerden "Kontrol Gruplu Ön Test-Son Test Deney Deseni" kullanılmıştır. Gruplar, rastgele deney ve kontrol grubu olarak seçilmiştir. Deney grubunda bu araştırma kapsamında yapılandırmacı öğrenme yaklaşımına uygun olarak hazırlanan öğretim programı ve ders materyalleri kullanılarak fen bilgisi öğretimi yapılırken, kontrol grubunda geleneksel öğretim sürdürülmüştür. Öğretmene uygulamadan önce yapılandırmacı öğrenme yaklaşımı ile fen bilgisi konusunun nasıl işleneceği hakkında bilgi verilmiştir. Deney ve kontrol grubunda öğretim etkinlikleri aynı öğretmen tarafından sürdürülmüştür.

Deneysel araştırma yapıldığından evren ve örneklem tayinine gidilmemiştir. Araştırmada, 2005-2006 öğretim yılı bahar döneminde, Eskişehir ili merkezinde bulunan Yunus Emre İlköğretim Okulu 6. sınıfa devam eden öğrencilerden yararlanılmıştır. Deney ve kontrol gruplarının ön test puanları, 6. sınıf 1. dönem fen bilgisi dersi karne notu ortalamalarına bakılarak birbirine benzeyen iki sınıf seçilmiş, bunlardan 6-A sınıfı deney ve 6-B sınıfı kontrol grubu olarak belirlenmiştir.

Başarı testi deney ve kontrol grubunda ön test, son test ve kalıcılık testi olarak kullanılmıştır. Bu testteki maddeler 27 sorudan oluşmuştur. Test maddeleri dört seçeneklidir. Başarı testinde her doğru yanıta (1) puan, her yanlışa (0) puan verilmiştir. Araştırmacı tarafından geliştirilmiş olan başarı testi ölçeğinin KR-20 güvenirliği 0.89'dur.

Fen bilgisi dersinde yapılandırmacı öğrenme yaklaşımının uygulandığı deney grubu ile geleneksel öğretimin uygulandığı kontrol grubunun sontest puanlarının ortalamaları arasında ve öğrenmenin kalıcılığı puanlarının ortalamaları arasında anlamlı bir fark bulunmuştur. Bu fark, deney grubunun lehinedir. Yapılandırmacı öğrenme yaklaşımı uygulamaları ile öğretim daha etkili olmuştur. Fen bilgisi dersinde yapılandırmacı öğrenme yaklaşımının uygulandığı sınıftaki öğrencilerde öğrenilenlerin kalıcılığı daha yüksek çıkmıştır.

Sonuç olarak, yapılandırmacı öğrenme yaklaşımının uygulamaları, başarı ve kalıcı öğrenme üzerinde etkili olmuştur. Bu sonuçlara dayanarak aşağıdaki öneriler sıralanabilir.

1) Araştırmanın fen bilgisi konularıyla ilgili olduğu ve ilköğretim 6. sınıf öğrencileri ile gerçekleştirildiği unutulmamalıdır. Fen bilgisi dersine ilişkin farklı konularda ve farklı eğitim düzeylerinde benzer araştırmalar yapılabilir.

2) Araştırma Durgun Elektrik konusunda yapılan etkinliklerle sınırlıdır. Yapılandırmacı öğrenme yaklaşımına uygun farklı etkinliklerin öğrenci başarısı üzerindeki etkileri araştırılabilir.

3) Öğretmenler derslerinde yapılandırmacı öğrenme yaklaşımını destekleyen farklı strateji ve teknikleri kullanabilirler.

4) Fen Bilgisi öğretiminde yapılandırmacı öğrenme yaklaşımının uygulandığı öğretim programlarında öğrenme ürünleri değerlendirilirken, süreç değerlendirmeye önem verilebilir.