Ali Türkdoğan[1]
Adnan Baki[1]
Tayfun Tutak[2]
Karadeniz Technical University[1]
Firat University[2]
aliturkdogan@hotmail.com
abaki@ktu.edu.tr
tayfuntutak@hotmail.com
Trabzon-Turkey

THE DETECTION OF CANDIDATE TEACHERS' MISCONCEPTION IN STUDENT-CENTERED AND COMPUTER-ASSISTED ENVIRONMENT; A CASE STUDY

ABSTRACT

In Turkey the student-centered education has been implemented since 2004-2005 academic year. Primary school teachers have a crucial role for the succession of new math curricula. In this study a CBMT material prepared and applied to get better understanding. When the researcher faced with any mistakes, to investigate whether there is misconception or not, student's writings, graphics drew on computer screen investigated and clinical interviews are made. During the implementation, two misconceptions concerning a point in the coordinate axis were determined. One of them is thinking two points such (x, 0) and (0, y) as a point (x, y).
Keywords: Misconception, Teacher Education, Coordinate Axis, Teacher Candidate, Computer Based Education

ÖĞRENCİ MERKEZLİ BİLGİSAYAR DESTEKLİ ORTAMDA ÖĞRETMEN ADAYLARININ KAVRAM YANILGILARININ TESPİT EDİLMESİ: BİR ÖZEL DURUM ÇALIŞMASI

ÖZET

Yapısalcı kuramı temel alan öğrenci merkezli eğitim Türkiye de 2004-2005 öğretim yılı itibariyle uygulamaya girmiş bulunmaktadır. Matematik öğretiminde sınıf öğretmenlerine önemli görevler düşmektedir. Çalışma kapsamında BDMÖ materyali hazırlanmış ve araştırmacı öğretmen yöntemiyle uygulanmıştır. Yanlışlarla karşılaşıldığında araştırmacı öğrencilerin çalışma yapraklarına yazdıklarına veya bilgisayar ekranına çizdirdikleri grafikleri dikkate alarak klinik mülakat yapmış ve yanlışın kavram yanılgısı olup olmadığını araştırmıştır. Yanılgılar şunlardır 1) (x,y) gibi bir noktayı (y,x) noktası gibi işaretlenmesi. 2) (x,0) ve (0,y) gibi iki noktayı (x,y) gibi bir nokta olarak düşünülmesi.
Anahtar Kelimeler: Kavram Yanılgısı, Öğretmen Eğitimi, Koordinat Ekseni, Öğretmen Adayı, Bilgisayar Destekli Eğitim

1. INTRODUCTION (GİRİŞ)

Learning is defined as the permanent change in the human behavior (Bybee and Sound, 1990). Although every learning theory accepts this definition, each theory has at least one theory about how the process of learning has taken place because the actualization of this process has not been clear yet. (Baki, 2006)

In recent years, one of the most accepted learning theories in turkey is the theory of constructivism. According to the theory of constructivism, knowledge is acquired through the active participation of the student himself with the construction of information by him. Constructivism argues that the process of learning takes place as a result of the individual's assimilating and adapting the information in his mind and it also proposes that the most important thing is the comprehension of the processes in which the information has gone through rather than the acquisition of the behaviors (Jonassen, 1991). This theory specifies that the knowledge and experiences the student has is important in the performance of the behavior is. For this reason, it argues that the determination of student's existing knowledge (Jonassen, 1991; Tobias, 1992) and the usage of this information in the regulation of learning-teaching process, materials (Moreno, 1993) and testing & evaluation process are required.

On these conditions, the teacher has great responsibilities. That is, to be successful for the new curriculum depends the teachers' appreciation of the new curriculum as much as possible. Given the abstract and spiral structure of the mathematics, the arrangement of student-centered learning environment, which provides construction of information come out as a more difficult objective (Soylu ve Soylu, 2005). In this regard, mathematic teachers have great roles. However, the role of class teachers in the process of teaching mathematic cannot be denied. When the limitations of the education class teachers have gone through and the importance of primary school education in the individual's learning are considered, the construction of student-centered learning environment is seen as more and more difficult objective.

Since 2004-2005 Education-Teaching Term, the curriculums aiming the student-centered education have been put into practice. Thereby, some changes have been taken place in the teacher training institution which focuses on training teachers who know and adopt new curriculum.

When the principle "Teachers teach as they have learned" (Moreno, 1993; Baki, 1994) is considered, the preparation and application of student-centered operation for university students' level are required and how the obtained data from teaching process with the helping of appropriate examples from the applications can be used in the regulation of learning-teaching environments in near future should be illustrated.

2. RESEARCH SIGNIFICANCE (ÇALIŞMANIN ÖNEMİ)

With all these in mind, for this research CBMT (CBMT: Computer Based Education Material) material was prepared and applied by the researchers. During the application, some learning difficulties of students are determined. In this study, students' learning difficulties regarding the concept of "a point in the coordinate axis" will be focused on.

3. METHOD (METOT)

From the 2004-2005 education-teaching terms, curriculums aiming the student-centered education have been put into practice. With the principle "the teacher teaches as he has learned" in mind, CBMT was developed for the primary school teacher candidates a part of it was

applied with the help of computer to 40 students in class (8 hours, 2 hours in a week).

Applications were made by one of the researchers. The researcher, who adopts researcher-teacher model, observed how investigator students have filled worksheets and the displays on computer. These worksheets and displays on computer, the help requests from teachers as a result of conflict in a group and the discussion environment which takes place during the courses show that students made some mistakes. Following these findings, researcher investigated whether there was a misconception by talking with the related students (by making clinical interviews).

4. FINDINGS (BULGULAR)

During the CBMT material application, it is observed that some students had misconceptions about profit, slope and specially a point concept in a coordinate axis. In this study, two misconceptions regarding only coordinate axis have been argued.

- **The delusion of thinking (x, y) point as (y, x) point:**

In the traditional education, the order was first degree equations and then, first degree functions and lastly graphics of lines. In the activities developed according to and suitable for the student-centered education, with the order firstly first degree functions; secondly drawing of the graphics and lastly graphic of lines it was aimed at a construction focusing on meta-cognitive skills

Worksheet 1.2, appropriate for this structure, is a kind of activity prepared to describe first degree functions. This activity includes questions about how much water and sugar will be added to the mixture in order to prepare sherbet for "kadayıf" a kind of dessert. Students are asked to fill in the table and to mark the data on the coordinate axis in the direction of table.

Following the first lecture's worksheet 1.1, 1.2 has been distributed and how students filled the worksheets was being inspected. During this observation, it was seen that a group has filled up the worksheets 1.2 as follows;
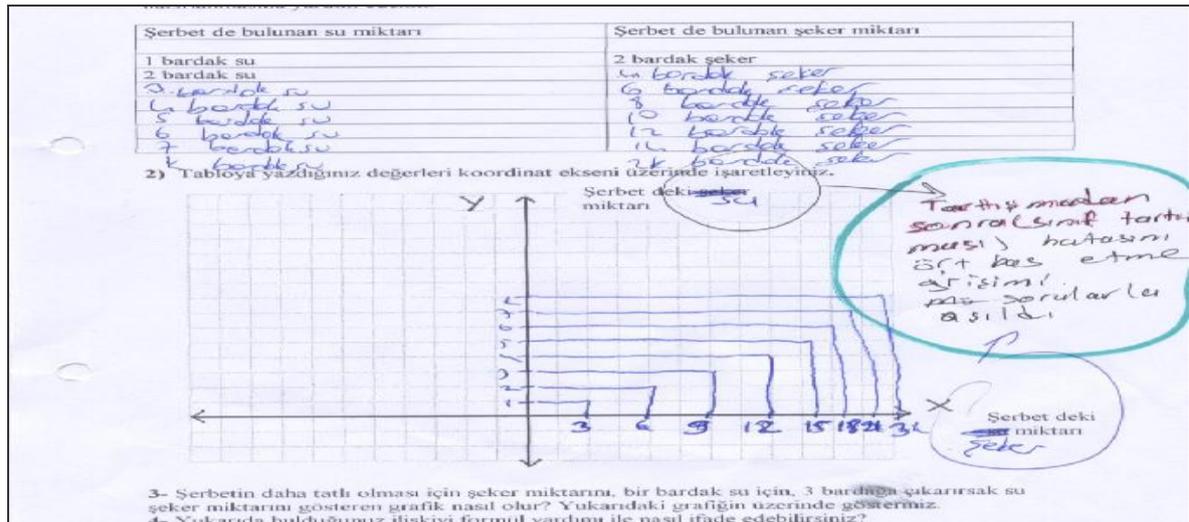

Figure 1. A Section from Student Worksheets as an example for the delusion of (x, y) as (y, x)
(Şekil 1. Öğrenci çalışma yaprağından (x, y)'yi (y, x) gibi yapmasına bir örnek)

When the worksheets were examined, it was seen that students had correctly filled in the table, they were asked to fill in, but they comprehended and marked every point (x, y) as point (y, x). In order to understand whether the students had any misconception regarding this issue, they were interviewed;

- Can you talk about what you did?

We wrote water amount on the abscissa and sugar amount on the ordinate (by showing crossing outs on the coordinate axis).

- Why? It was already written water on the ordinate and sugar on the abscissa. Why did you change?

In fact, we thought it the opposite. We marked reversely. We understood our mistake when our friend wrote and sketched on the board, but we could not correct our mistake. You wanted us to use pen. We tried to correct by changing water and sugar statements on the axis. Can we take a new paper?

It became clear that students realized their mistakes after discussion process and changed sugar and water statements to correct their mistakes. However, they could not find chance to eliminate their mistake since they were using pen.

Students' mistakes on worksheets while marking provided us to fix the mistake. After that, discussions on the worksheets provided us with the opportunity to comprehend student' opinion and understandings and to determine the misconception. In a study aimed to fixation of high school students' misconceptions, Yıldırım saw that students can read point (x, y) as point (y, x) when it is asked for students write a relation as binaries. In this context, obtained results coincide with the Yıldırım's results (Yıldırım, 2003).

Third lesson (Üçüncü Ders):
- **"Combination of two points states "(x, 0) and (0, y) (x, y) points" delusion"**

Students are wanted to write "graphic 2.4" and press "enter" and so y=2x+4 graphic has been sketched. By asking students which function it is, they are asked to find which kind of directions should be used to draw the graphic of the next functions y=3x+4.
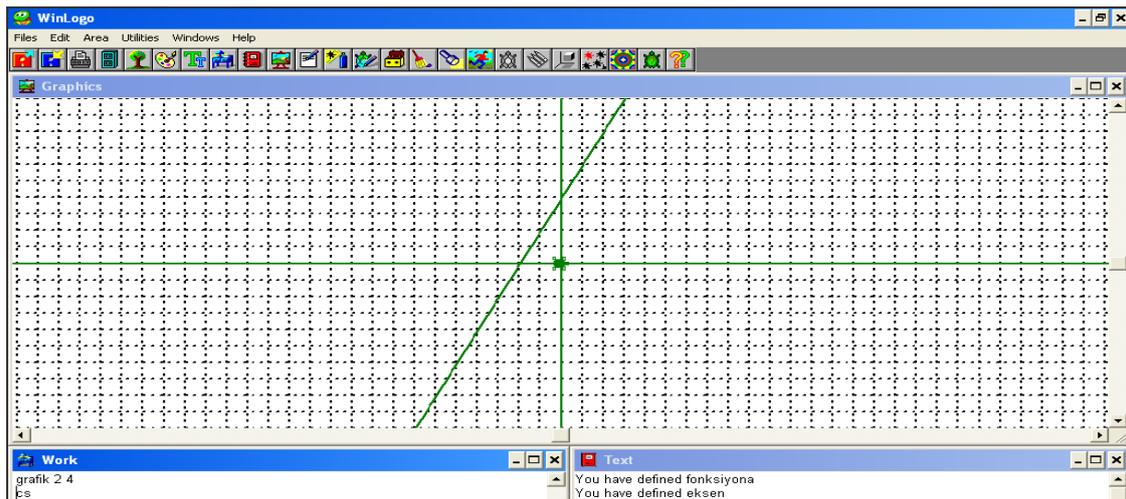

Figure 2. The Graphic of y=2x+4 Function
(Şekil 2. y=2x+4 fonksiyonunun grafiği)

A group of students claimed that the order made them draw the graphic passing through the point of (-2, 4) at the end of first direction. Thus, a mistake was realized by the researcher. When the

students examined the graphic, in the Figure 2 on the computer screen, they had considered the passing the graphic through the points (-2, 0) and (0, 4) as passing through the (-2, 4).
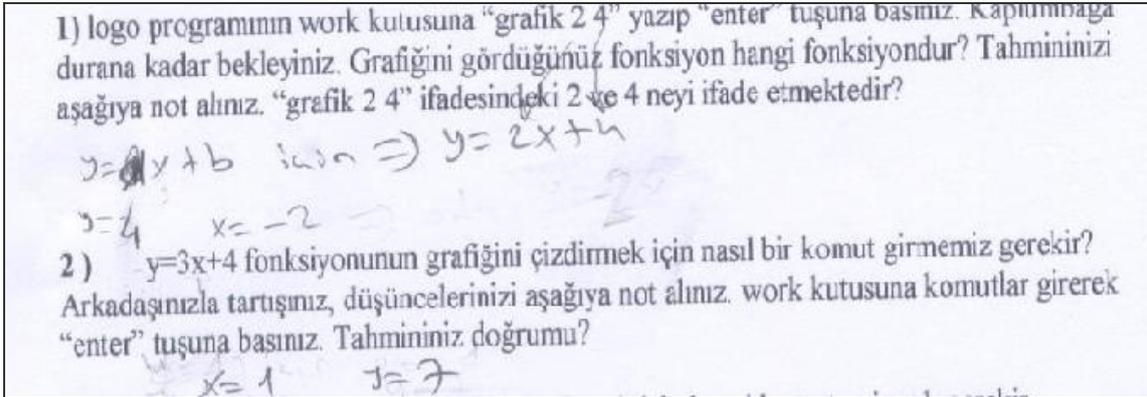

Fiure 3. Section from Student Worksheets 16
(Şekil 3. Öğrenci çalışma yaprağı 16'dan bölüm)

Consequently, in the second stage, in order to make draw the graphic of the function of y=3x+4, they are required to determine a point where function passes through and enter the order. Despite of the fact that there is infinite number of lines passing through one point, they had thought that it was sufficient to know only one point which passes through the function, in order to determine the function.

By finding the value y=7 for x=1 in the statement y=3x+4, students had also entered graphic-1 7 order, examined the graphic and became convinced that the program was not correct (See Figure 4).
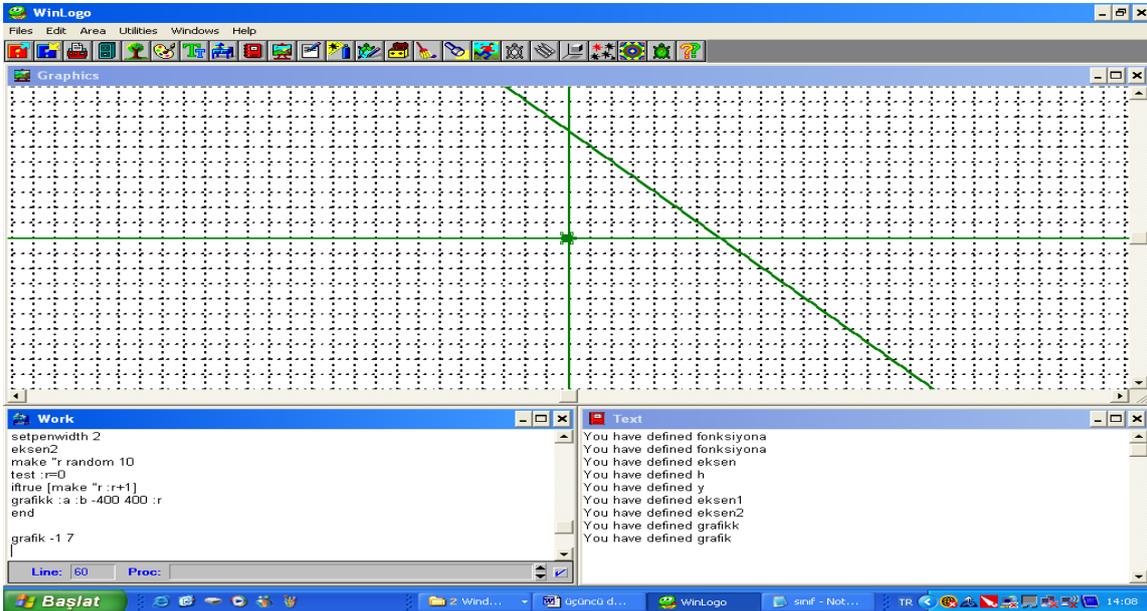

Figure 4. The Graphic 2 which is observed on the screen
(Şekil 4. Grafik 2'nin ekran görüntüsü)

According to the order they entered, the graphic had to pass through the point they determined. That is, in order to make students draw the function y=3x+4, as x=1 and y=7 the graphic of these points should pass through the point (1, 7) from the overview of the students. The students' comprehension is the fact that the point (1, 7) shows points (1, 0) and (0, 7) on the coordinate axis.

This situation shows "obtaining a point by combining two points" delusion. It is seen that students can determine a point on the coordinate axis when the markings in the first three worksheets are examined. For this reason, it is not exactly correct to assert that these students do not know a point concept on the coordinate axis. If so, what is the problem?

Students omit the requirement of the fact that a point has to be as binaries on the coordinate axis. For them to state or even show any point with non-zero element was very easy even for the people who make the mistake above. However, when it is necessary to read a point on abscissa and ordinate, expressing this point as a binary became difficult. They can read a point on the x or y axis like a number 4, 5, 6. When a number is told and asked them to mark it, they cannot comprehend this operation will be meaningless on the coordinate axis. This shows that describing coordinate axis as the combination of two number lines and using numbers for marking on the axis cause students to think a number has also a sense on the coordinate axis. It is possible to think students' mistakes as a result of the lack of care. In addition to this, dialogs and iterative operations in the second stage eliminate this possibility in a high proportion. For this reason, one of the causes of this misconception can be pronounced the way coordinate axis is described.

In literature, it is encountered subject and studies about subject as arithmetic operations, (Şandır vd. 2007), rational numbers (Şandır vd. 2007; Soylu ve Soylu, 2005; Ubuz, 1999), geometric inequalities, equality solutions, algebraic (Ersoy, Erbaş, 2005; Dede ve Peker, 2007), limit (Akbulut ve Işık, 2005). These studies include examples and methods of similar study areas made in the world and it is seen that it was focused on especially algebraic transition and arithmetic operations. However, it was not encountered a deep study about coordinate axis. This study is important also for this standpoint.

5. RESULT AND RECOMMENDATIONS (SONUÇ VE ÖNERİLER)

By the application of CBMT (CSEM), it is revealed that students can mark (x, y) point as (y, x) and consider (x, 0) and (0, y) points as (x, y) point.

To teach students a point concept in the coordinate axis in a more expressive way, the definition of the coordinate axis should not be given as combination of two points, but as a basic concept. That is, demonstrating every point on the coordinate axis (especially points on the axis) as binary can help overcome these problems.

In this respect, with the help of the books in which coordinate axis are not described by the help of number line and where every point on number line is marked as binary, lessons should be organized by teachers who adopted this idea, should be prepared and by constructing experiment control groups, reliability of it should be investigated.

Especially when the spiral structure of the mathematic is considered, whether the misconceptions, the students of the primary school teaching department have, are the same misconceptions with the ones appeared and determined in the huge crowd of people of second step of primary education and high school. The academic personnel, who give this lecture, should be informed about the determined misconceptions, and they should be provided with the materials to correct them. Thus, more effective learning environment can be constructed. By sharing this model operation with mathematic teacher candidates, which provides students to participate in the activities

actively through computer and worksheets, it is possible for them to obtain advanced view about both configuration and misconception.

Worksheets enable students to make guesses regarding subjects or concepts, in other words, it enabled to determine and discus the misconception. Therefore, during the process of teaching the subject, it can be suggested to use worksheets. Thus, especially in graphic drawing, active participation of students (using pencil) can be enabled.

NOTICE (NOT)
Bu çalışma, XXIII Cese Conference on "Comparative Education Society in Europe, Athens Sempozyumunda 7-10 July 2008 tarihinde bildiri olarak sunulmuştur.

REFERANCES (KAYNAKLAR)
1. Akbulut, K. ve Işık, A., (2005). Limit Kavramının Anlaşılmasında Etkileşimli Öğretim Stratejisinin Etkinliğinin İncelenmesi ve Bu Süreçte Karşılaşılan Kavram Yanılgıları, Kastamonu Eğitim Dergisi Cilt 13 No: 2 S. 497-512
2. Baki, A., Çepni, S., Akdeniz, A.R. ve Ayas, A., (1999). Öğretmen Eğitimine Felsefi Bakışlar, III. Ulusal Fen Bilimleri Eğitimi Sempozyumu, MEB Basımevi, S. 238- 243.
3. Baki, A., (2006). Kuramdan Uygulamaya Matematik Egitimi, Derya Kitapevi, Trabzon.
4. Bybee, R.W. and Sound, R.B., (1990). Piaget for Educators Second Edition, WavelandPres, inc. Ilinois, P. 106-111
5. Çınar, O., Teyfur, E. ve Teyfur., M., (2006). İlköğretim Okulu Öğretmen ve Yöneticilerinin Yapılandırmacı Eğitim Yaklaşımı ve Programı Hakkındaki Görüşleri, İnönü Üniversitesi Eğitim Fakültesi Dergisi Cilt: 7 Sayı:11 Bahar 2006
6. Dede, Y. ve Peker, M., (2007). Öğrencilerin Cebire Yönelik Hata ve Yanlış Anlamaları: Matematik Öğretmen Adaylarının Bunları Tahmin Becerileri ve Çözüm Önerileri, İlköğretim Online No: 6, S. 35-49
7. Ersoy, Y. ve Erbaş, K., (2005). Kassel Projesi Cebir Testide Bir Grup Türk Öğrencinin Genel Başarısı ve Öğrenme Güçlükleri, İlköğretim Online 4(1)
8. Moreno, L. and Waldeg, G., (1993). Constructivism and Mathematical Education. International Journal of Mathematics Education in Science and Technology. Vol.24, P. 653-661.
9. Jonassen, D.H., (1991), Evaluating Constructivist Learning. Educational Technology. No:31, P. 28-32.
10. Soylu, Y. ve Soylu, C., (2005). İlköğretim Besinci Sınıf Öğrencilerinin Kesirler Konusundaki Öğrenme Güçlükleri: Kesirlerde Toplama, Çıkarma, Çarpma ve Kesirlerle ilgili Problemler, Erzincan Eğitim Fakültesi Dergisi No: Cilt 7
11. Şandır, H., Ubuz, B. ve Argün, Z., (2007). 9. Sınıf Öğrencilerinin Aritmetik İşlemler, Sıralama, Denklem ve Eşitsizlik Çözümlerindeki Hataları. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi No: 32 S. 274-281
12. Tobias, S., (1991). An Eclectic Examination of Some Issues in the Constructivist – ISD Controversy. Educational Technology, No:31, P. 41-43
13. Ubuz, B., (1999). 10. ve 11. Sınıf Öğrencilerinin Temel Geometri Konularındaki Hataları ve Kavram Yanılgıları, Hacettepe Üniversitesi Eğitim Fakültesi Dergisi No:16, P. 95-104
14. Yıldırım, A.F., (2003). Lise Öğrencilerinin Lise-1 Fonksiyonlar Konusundaki Kavram Yanılgılarının Belirlenmesi, K.T.Ü. Fen Bilimleri Enstitüsü Yüksek Lisans Tezi.