

## Developing of the Concept Cartoon, Animation and Diagnostic Branched Tree Supported Conceptual Change Text: “Gas Pressure”

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### Abstract

The aim of the study is to develop and introduce concept cartoon, animation and Diagnostic Branched Tree (DBT) supported Conceptual Change Text (CCT) related with “gas pressure” in the level of elementary 8th grade. The CCT is a teaching material based on conceptual change approach. It is preferred in order to achieve conceptual change in various studies. In the CCT, concept cartoons were used in order to provide that students clearly express their prior knowledge. Animations were used to concretize abstract concepts. Also, DBT was used in parallel with the specified in the Science and Technology Instruction Program alternative assessment and evaluation in order to provide that students discuss in the classroom. When taken into account that studies related with “gas pressure” is not enough and misconceptions related with “gas pressure” sufficiently are not studied in the Science and Technology course books, it is believed that the developed CCT in this study is an alternative source material for student and science teachers.

*Key words:* Concept Cartoon; Animation; Diagnostic Branched Tree; Conceptual Change Text; Gas Pressure

### Introduction

Conceptual Change Text (CCT) is a teaching material based on conceptual change approach. It is preferred in order to achieve conceptual change in the various studies (Sevim, 2007; Ünal, 2007; Özmen, Demircioğlu & Demircioğlu, 2009; Şahin, 2010). At the beginning of CCT, a question is asked to make predictions or a situation is given to activate students' prior knowledge. Then the common misconceptions are given and the reasons of why these misconceptions are wrong are described with scientific true expressions. Thus, students have to question their existing knowledge, feel lack of their own knowledge and read the explanation of scientific knowledge. In the end of the CCT, science teacher provides discussion environment in order to students comprehend scientific knowledge (Chambers & Andre, 1997; Pınarbaşı et al., 2006; Sevim, 2007). CCTs have been prepared as a routine text format in many studies. In the recently research, CCTs have been supported with animation, concept cartoon, experiment and discussion questions (Özmen, Demircioğlu & Demircioğlu, 2009; Şahin, İpek & Çepni, 2010). CCTs were prepared concepts such as “photosynthesis” (Köse, 2004), “solutions” (Pınarbaşı et al., 2006; Sevim 2007), “chemical bonding” (Sevim,

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2007; Özmen, Demircioğlu & Demircioğlu, 2009), “chemical bonds” (Ünal, 2007), “electric” (Chambers & Andre, 1997; İpek & Çalık, 2008), “electrochemical cells” (Yürük, 2007), “cell” (Ürey & Çalık, 2008), “endothermic-exothermic reactions” (Türk & Çalık, 2008), heat and temperature (Kurnaz & Çalık, 2008), “work, power, energy” (Cerit Berber & Sarı, 2009), fluid pressure (Şahin, İpek & Çepni, 2010). But CCT about “gas pressure” is not in the literature.

“Gas pressure” concept is one of the abstract science concepts, which students have difficulty understanding and constructing in their minds. Because students cannot see experiments related with “gas pressure” as microscopic. So, they have some problems with the presence of gases and have difficulty understanding “gas pressure” concept (Sere, 1982; Tytler, 1998; Önen, 2005; Ünal, 2005; She, 2005). When literature was examined, it was seen that studies related with “gas pressure” are not enough. In this case brings out the need for studies related with “gas pressure”. Also, when Science and Technology course books were examined that it was attracted attention misconceptions related with “gas pressure” sufficiently are not emphasized (Commission, 2008; URL- 1, 2010). In this study; concept cartoon, animation and Diagnostic Branched Tree (DBT) supported Conceptual Change Text (CCT) related with “gas pressure” concept was developed for the elementary 8th grade students. It is believed that the developed CCT in this study is an alternative source teaching material for student and science teachers.

In this study, the CCT was supported with different teaching methods and techniques and was recovered from routine text format. Concept cartoon, animation and DBT were integrated to the CCT. Concept cartoon is a teaching method used to be busy with the course. Misconceptions can be introduced as short texts with cartoon characters (Keogh, Naylor & Downing, 2003). Concept cartoon is prepared as a poster and defined as an instructional material to support instruction (Kabapınar, 2005). By concept cartoon way, students have opportunities to compare their scientific knowledge with daily life situations (Keogh & Naylor, 1999a). Every cartoon character should present different ideas for every situation (Keogh & Naylor, 1999a; 1999b; Stephenson & Warwick, 2002; Clark, 2005). Complex and abstract science topics could be expressed simply by concept cartoons (Stephenson & Warwick, 2002). It is recommended that giving names to the concept cartoons and providing students to say their ideas with using cartoon characters’ names, students explain their ideas easily.

Animation is described as the motion of many pictures and graphics in a scenario. It offers various opportunities to education environment. It facilitates understanding, complex natural events more clearly (Taş, 2006). It also gives an opportunity to the students seeing natural events that could not be taken into classroom environment (Ayas, Yılmaz & Tekin, 2001). It can also give an opportunity to do dangerous experiments in a computer environment confidently in a short time and to repeat the experiments (Şengel, Özden & Geban, 2002; Sinclair, Renshaw & Taylor, 2004; Yılmaz & Saka, 2005), and give an opportunity to students to observe experiments virtually in the schools not having the equipments required for the experiments (Yılmaz & Saka, 2005). Animations are effective for concretizing abstract science concepts. It encourages students to be motivated on courses and being active during course time, increases students’ interest towards science and technology (Yiğit & Akdeniz, 2003; Sinclair et al., 2004). Students can observe to the invisible states affecting the realization of events and experiments with animations (Şahin & Çepni, 2009; Şahin, İpek & Çepni, 2010).

DBT was used in parallel with the specified in the Science and Technology Instruction Program alternative assessment and evaluation in order to provide that students discuss in the classroom.

The aim of the study is to develop and introduce concept cartoon, animation and DBT supported Conceptual Change Text (CCT) related with “gas pressure” in the level of elementary 8th grade.

## **Method**

The following steps were followed in developing concept cartoon, animation and DBT supported the CCT:


1. The related topic (gas pressure) is determined from elementary 8th grade Science and Technology Instruction Program. “Gas pressure” concept is studied in the elementary 8th grade first time.
2. Misconceptions related with “gas pressure” were examined in the literature.
3. These gains related with “gas pressure” concept were examined in the elementary 8th grade Science and Technology Instruction Program. In this program, it was emphasized that the movement and weight of gas molecules is effective in “gas pressure”.
4. Animations were used to refute students’ misconceptions and convince to scientific knowledge students. Animations were prepared to observe the movement of gas molecules as microscopic.
5. Animation views were prepared to remove misconceptions in CCT were drawn step by step in draft.
6. Drawn drafts were examined by the expert who is going to prepare the animation in flash program.
7. Misconceptions about “gas pressure” concept in the literature were taken into consideration in the developing CCT (Kariotoglou & Psillos, 1993; Psillos & Kariotoglou, 1999; Besson, 2004; Önen, 2005; Ünal, 2005). Determined misconceptions from the literature were presented as short texts with concept cartoon characters’ thinking bubbles.
8. Also these misconceptions were presented in the DBT.
9. Views of two experts were taken about scientific content of the CCT, animations and DBT.
10. Three worksheets were prepared for that concept cartoon, animation and DBT supported the CCT. These worksheets are presented in this manuscript text.
11. Concept cartoon is used the first phase of the CCT. Four cartoon characters were used for students’ prior knowledge activate and determine their misconceptions. While the best common three misconceptions were presenting in the three cartoon characters’ thinking bubbles, one scientific knowledge were presented in the one cartoon characters’ thinking bubbles.
12. The pilot study of the developing CCT was applied.

## **Instruction Design of the Developing CCT**

Now we will illustrate how to adjust the associated concept cartoon, animation and DBT within the CCT.


Students are handed out worksheet 1. To increase students’ awareness of “gas pressure” and activate their pre-existing ideas, students are asked what they are thinking about cartoon characters’ ideas. Some time is given students and they write their ideas about statements in the cartoon characters’ thinking bubbles (Figure 1).

**IDEAS ABOUT GAS PRESSURE**




**Ahmet**

The weight of gases is not. So, gases don't pressure.




**Burcu**

If an object move, gases pressure it. For example, air pressure affects to flying bird. But air pressure doesn't affect stayed bird in the tree.



**Melek**

I think, only wind pressure to objects. When weather is sunny, air pressure don't affect to objects.



**Hasan**

All of the moving or motionless objects in the atmosphere are affected from air pressure.

In the above, some students are discussing about gas pressure. Are you joining to students' ideas? Which student/s' idea/s you are adopting? Please, you write your ideas at below.

.....

.....

**Figure 1.** Used in the first phase of the CCT concept cartoon.

Then, students are handed out worksheet 2. Students are wanted to read text phase of the CCT (Worksheet 2). The text phase of the CCT is presented in the following:

Ahmet thinks that gases have not weight, so gases don't pressure objects. Ahmet's idea is false. If we balance a balloon before and it is inflated and after that it is inflated; we can observe that inflated balloon is more weight than deflated balloon. Thus, we can understand that gases have weight. Also, when we blew to a balloon, we can observe the balloon inflate. Blown air pressure to the balloon and it inflate. Hitting any surface, gas molecules pressure to the surface. You can watch "Let's observe the inflatable reason of the balloon" titled animation.

Melek thinks that only wind pressure to objects. Melek's idea is false, also. Because, in the direction of wind movement it horizontally pressure to surface area of wheathercock. Also, Motionless and quite air perpendicularly pressure to gravity in contact with the surface area. You can watch "Wheathercock" titled animation.

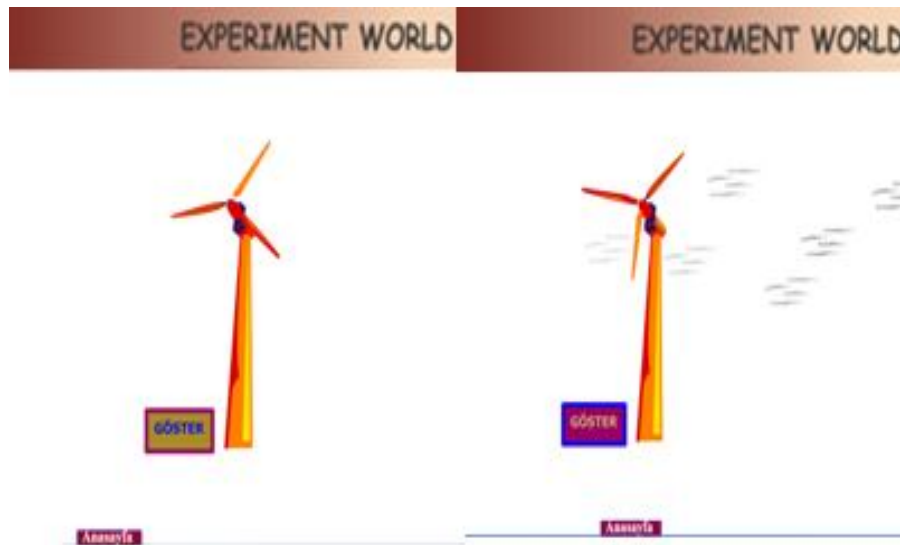
Burcu think that air pressure flying objects, does not pressure don't fly object. Burcu's idea is false. Because the air pressure both flying and flightless objects.

As Hasan think, air pressure to all of the moving or motionless objects in the atmosphere. Because, in both cases, gas molecules in the atmosphere knock all of the objects, thus the air pressure to them.

After that students read the first paragraph of the CCT, students are watched “Let’s observe the inflatable reason of the balloon” titled animation (see Figure 2). Then students are read the second paragraph of the CCT and it is provided that students watch “Wheathercock” titled animation (see Figure 3).

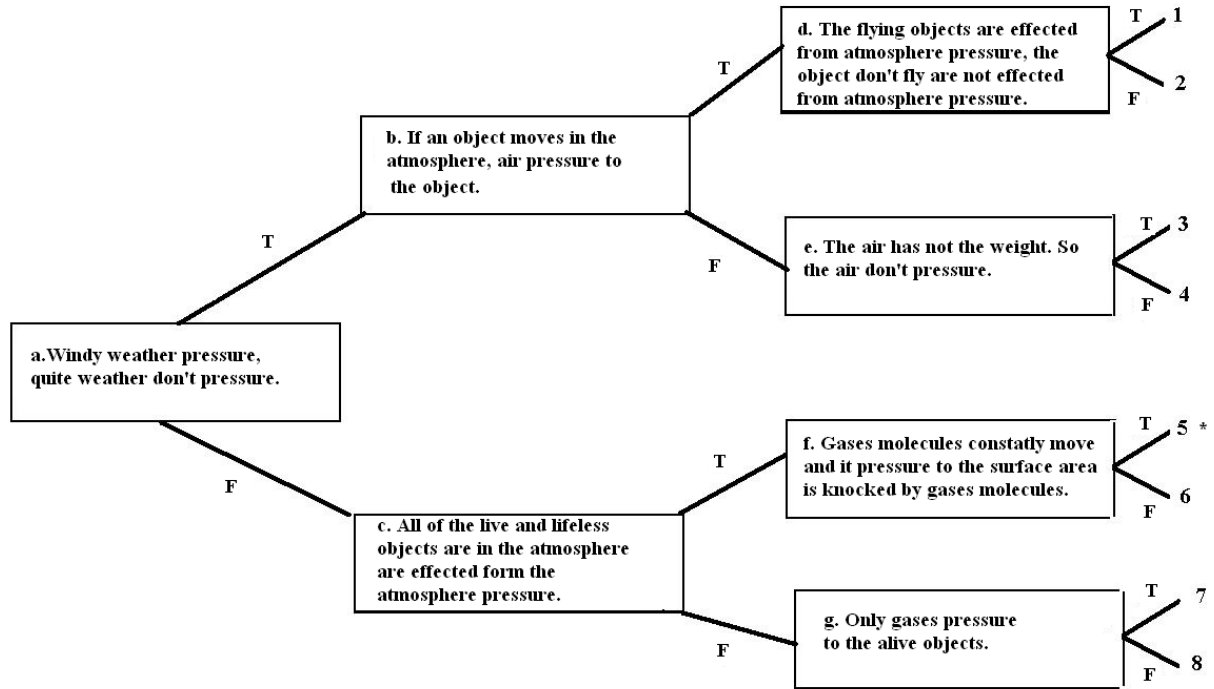


**Figure 2.** “Let’s observe the inflatable reason of the balloon” titled animation screen view.



**Figure 3.** “Wheathercock” titled animation screen view.

In the end phase of the CCT, the worksheet of the DBT is presented students. The DBT is given in the Figure 4. By following the True (T) or False (F) branches, students are wanted to mark themselves number of the exit door in the DBT. It is provide that students discuss presented each statements in the DBT and scientific true knowledge are explained.



**Figure 4.** Diagnostic Branched Tree about Gas Pressure.

### Implications for Practice and Research

To teach gas pressure, combining concept cartoon, animation and DBT within CCT is illustrated here. With the CCT, it is aimed to refute students' possible misconceptions with showing text explanations, animations and DBT. The study is a hypothetical paper. For this reason, to investigate its applicability in a comparative manner, further research should be undertaken. Since teachers may learn how to incorporate their students' pre-existing knowledge by taking the current study into account, they are able to design their own sample teaching to other. CCT can be enriched with different teaching methods and techniques. We believe this study is useful for other authors and next studies.

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