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SECONDARY STUDENTS' OPINIONS ABOUT SOUND PROPAGATION

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Abstract:

The aim of this study is to investigate the misconception in "Sound Propagation" topic, within the direction of students' opinions that can be occurred by using different teaching methods all together. The study includes activities based on 5E learning model, conceptual change texts, study sheet supported by analogies, and computer-assisted teaching materials. The sample of this qualitative study is made up of 8 students at 5th grade from a secondary school in Trabzon. Semi-constructed interview is used as data collection tool. Data collected after the analysis of interview are transferred to the reader without any deterioration in meaning. It is found out that, using different methods all together in "Sound Propagation" topic is more effective and misconceptions are removed at the end of the study.

Keywords: analogy, conceptual change, sound propagation, study sheet, 5E learning model

1. Introduction

One of the subjects that students have difficulty in concreting in their minds and have misconceptions is that "Sound Propagation" subject. There have been studies from a range of countries related with defining misconceptions about "Sound Propagation" subject which included Science and Technology Curriculum (Okur, 2009; Çalık, Okur & Taylor, 2010; Demirci & Efe, 2007; Eshach & Schwartz, 2006; Hrepic, 1998, 2004; Linder

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& Erickson, 1989; Linder, 1993; Merino, 1998 a,b; Maurines, 1993). However it can be said that there have been very limited studies conducted related with eliminating these conceptions. From this point of view, within the scope of this study educational material developed with different methods that provide conceptual change, eliminating misconceptions related with "Sound Propagation" is studied and students' ideas are investigated.

2. Related Literature Review

In literature Driver et al. (1994), Hapkiewicz (1992), Hapkiewicz and Hapkiewicz (1993) have found related various misconceptions about sound. These misconceptions are presented in Table 1.

Table 1: Misconceptions about Sound Propagation

Scope	Misconceptions	Studies conducted
Sound and formation of the sound	✓ Sound is a moving object that travels one place to another.	Barman and Miller (1996)
	✓ Sound can be produced without using a concrete item.	Hapkiewicz (1992)
	✓ Human sound occurs as a result of clashing many vocal cords.	Beaty (2000)
	✓ Sound occurs as a result of clashing vocal cords. ✓ Sound occurs with reflection of molecules from a surface.	Demirci and Efe (2007)
	✓ Sound occurs by pushing of air.	Eshach and Schwartz (2006)
	✓ Sound is transmitted as similar to leakage from holes and spaces.	Driver et al (1994)
	✓ Sound is a substance that travels in the air generally by repulsion. ✓ Sound is a substance that is transmitted as some travelling models.	Linder and Ericson (1989)
	✓ Force, source of sound provides mixture of velocity and energy to the setting and communication is occurred via "sound	Maurines (1993)

	particle" in this setting.	
	✓ Sound is perceived as a far object in a far place. ✓ Materials slow down the propagation of sound. ✓ Sound propagates as an object similar to a particle.	Hrepic (1998)
	✓ The more solid matter intensifies, the harder that the sound propagates.	Maurines (1993)
	✓ Sound propagates in space, Sound propagates best in gas.	Zeybek (2007), Eshach and Schwartz (2006)
	✓ Sound is transferred with separate molecules that travel from a setting. ✓ Sound is transmitted from one molecule to another.	Linder and Ericson (1989)
	✓ The velocity of a sound is a result of molecular segregation. ✓ The velocity of sound is connected with a function that changes related with physically blocking of molecules moving in the setting. ✓ Sound velocity is a function of compressibility of a setting.	Linder (1993)
Propagation of Sound	✓ Sound travels within solid matters.	Barman and Miller (1996)
	✓ We can simultaneously see and hear of an event in far. ✓ Sound moves faster in air than solids.	Beaty (2000)
	✓ Sound waves vanishes when interact with a solid surface.	Hapkiewics and Hapkiewics (1993)
	✓ Sound can be propagates in space.	Maurines (1993), Hrepic (2002), Hapkiewicz (1992)
	✓ For propagation for sound, there is no need for	

	setting. ✓ As the intensity of setting increases, propagation of sound becomes harder. ✓ The velocity of sound depends on dilation of signals by which the source of the sound occurred. There is a linear relationship between velocity and dilation.	Maurines, 1993
	✓ Sound propagates in setting without air and stops by hitting to a hinder. ✓ Sound propagates more quick if it is not met with a hinder in the air. ✓ As solid matters have less intensity, sound propagates more quickly. ✓ As there is no air in the atmosphere, sound propagates more quick in solid.	Demirci and Efe (2007)
	✓ If sound is high, it takes faster way. ✓ Wind effects frequency of the sound.	Hrepic (1998)
Speed of sound, Intensity of sound, Frequency of sound, Height of sound	✓ The velocity of sound propagation depends on sound's intensity and resonance. ✓ The high and low pitches of sound are the intensity of sound.	Demirci and Efe (2007)
	✓ Hard hitting to an object changes its sound curtain	Beaty (2003)
	✓ The intensity of sound defines sound's thin and thickness.	Zeybek (2007)
	✓ Hitting to an object stronger changes sonority of sound. ✓ Human sounds are uttered by voice cords those of which are uttered different sounds.	Hapkiewicz (1992)

2. Application Process

In this research the qualitative method is used.

2.1 Sampling

This study is conducted with 20 students from four different 5th classes, totally 80 students of a central secondary school in Trabzon city. That researchers could conduct their studies in a more comfortable setting, sample students were volunteer, students were alike from similar physical and cognitive features and the school was suitable for the study in terms of physical opportunities were taken into consideration. Interviews

made within the scope of the study are conducted by selecting from the same sample. While selecting the students for the interview, change levels in the points are taken into consideration. Depending on this, the study is conducted by defining a student from each group that shows maximum and minimum change. Based upon the results of the concept achievement tests applied in advance to students, totally 8 students are included in the interview aged between 11-12 which are 4 students (A_{16}, B_1, C_5, D_{10}) that show maximum change and 4 students (A_6, B_4, C_{17}, D_{14}) that show minimum change.

2.2 Data Collection Tool

Semi-structured interviews are conducted in the study. This interview provides flexibility to researcher. Furthermore, it has also advantages such as pre-developed questions are changeable during the interview or can be explained in detail (Çepni, 2010). The aim of semi-structured interview is to understand participants' point of view with open-ended questions. Researcher tries to create an adaptation with participant and interview is to be conducted in a mutual chat way (Yıldırım & Şimşek, 2000). Some of the interview questions are developed by researchers; some of them are adapted from Eshach & Schwartz's (2006) study into Turkish. In order to conduct interviews healthy, students' are settled down by chatting sometime with them and they are provided to express themselves comfortably. Content validity is provided for semi-structured interview question after the examination of two experts studying in science education. It is cared that interview questions are clear enough and not be misunderstood by students. Collected data is recorded by voice recording device and are turned into written documents later and data validity is tried to be provided by examining to the interviewees. Furthermore, voice recordings are secretly kept in terms of data security. During the interviews, it is stressed that students' will not loss from the study. Their names are kept confidential and symbols are used.

2.3 Data Analysis

In analysis of interview questions, students' answers are transferred to the readers without any change in the meanings. It stated that this kind of analysis is helpful (Çepni, 2010). When interview data transferred to the readers by taking into parenthesis, reader confronts with data and finds the opportunity to interpret what they mean (Çepni, 2010).

Among the student materials within the scope of the study, there are analogy map, study sheets, conceptual change text and computer-assisted materials. The materials used in the study are used in four different classes with a four different methods. Process related to application is given in Figure 1.

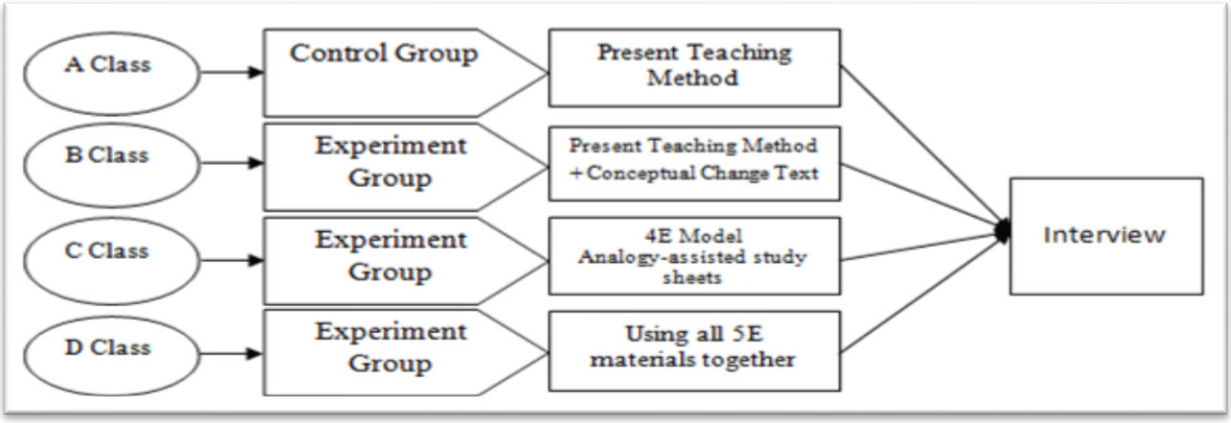

Figure 1: Place of Use of the Educational Materials

As it is understood from the figure above that, Group A is control group and traditional teaching method is used in this class. In class B, in addition to traditional teaching method conceptual change texts are applied as a teaching material to the students. Furthermore, the texts are negotiated by students in class. In class C, teaching is delivered complies with 4E model based upon constructivist learning theory. Firstly, students are given study sheets. Students attention are tried to be taken via caricature, proverb and question at the top of the study sheets. In the second step, students have the activity done. At the end of the activity, students are asked to answer the questions according to the results from the data they gathered. The third step is the stage where in-class negotiations are done and the teacher delivers or verifies the knowledge. The teacher at this stage uses different reinforce activities within the topic. In this stage analogy map is shown to the students and necessary explanations are done. In the fourth stage, students are asked to answer the evaluation questions at the end of the study sheet. In class D, teaching is delivered complies with 5E model based upon constructivist learning theory. The difference of 5E from 4E is the elaborate step. In addition to analogy map shown to C class, animation prepared via flash program is presented in third step and computer-assisted materials are shown in elaboration step as a fourth step. These are conceptual change text and 5 minutes educative video show prepared via Windows Movie Maker. As the fifth step evaluation questions at the end of the study, sheet are used.

3. Findings

Findings gathered through the interviews are transferred to the readers after evaluating every question separately. In the first question of the interview, students are asked

"What is sound? In which settings does the sound propagate? In which settings does the sound not propagate? Why?" students' answers are shown in Table 2.

Table 2: Findings Belong To First Question Of The Interview

Student	Definition of the Sound	The Setting That The Sound Propagates and Its Sample	The Setting That The Sound Not Propagates and Its Sample	The Setting That The Sound Propagates Best and Its Sample
A_{16}	It propagates as in vibrations.	Solid, Liquid, Gas *Sample:* Table, Water, Air	Hole No molecule I don't know	Solid *Because,* there are many molecule
B_1	It occurs by densely massed of the molecules.	Solid, Liquid, Gas *Sample:* Cooker, Water, Air	Hole No molecule Space	Solid *Because,* molecules are proximate to each other
C_5	Energy that spread as waves	Solid, Liquid, Gas *Sample:* Wood, Water, Air	Hole No molecule Space	Solid *Because,* molecules are proximate to each other
D_{10}	It occurs as a result of vibrations and spreads out	Solid, Liquid, Gas *Sample:* Wood, Sea, Air	Hole No molecule Space	Solid *Because,* molecules are more proximate to each other, cramped
A_6	Don't know.	Space *Sample:* Inside the room	Solid, Liquid, Gas Don't know, Don't know	Space *Because,* spread out since its empty
B_4	It is a source of object.	Solid, Gas, Space *Sample:* Wood, Air, Stew pot	Liquid Don't know, Don't know.	Space *Because,* sound is echoing inside the stew pot.
C_{17}	Settings that spread out as waves	Solid, Liquid, Gas *Sample:* Eraser, Water, Air	Hole Space Don't know.	Solid, I don't know.
D_{14}	It spreads out as waves. It occurs with vibrations.	Solid, Liquid, Gas *Sample:* Wood, Sea, Air	Hole, Space No molecule	Solid *Because,* molecules are proximate to each other.

C_5 coded student answers are given in Table 3, which shows the maximum change group.

Table 3: C_5 Coded Student's Answers to the Interview

Interview Question	Student's Answer
I: What is sound?	C_5: Sound is a kind of energy that spreads out as waves.
I: In which settings does sound propagates, in which not?	C_5: It spreads out in solid, liquid, gas; not spreads out in space.
I: Why it propagates in solid, liquid and gas and does not propagate in hole?	C_5: It spreads out in solid, liquid and gas because there are molecules. Hole is a space hole; it does not spread out for this reason. There is no molecule.
I: In which setting does sound propagate best?	C_5: In solid setting
I: Why?	C_5: It is because molecules are dense in solid setting.
I: Can you give examples to solid, liquid, gas and hole setting?	C_5: Wood is for solid, water for liquid, air for gas and space for hole.

Answers of A_6 coded student's that takes places in the group that shows the minimum change is given in Table 4.

Table 4: A_6 Coded Student's Answers to the Interview

Interview question	Student's answer
I: What is sound?	A_6: Sound. I forgot is but we studied in the lesson. I do not know.
I: In which settings does sound propagates, in which not?	A_6: It spreads out in space; not spreads out in solid, liquid and gas.
I: Why it propagates in solid, liquid and gas and does not propagate in hole?	A_6: In space…It spreads out since its empty.
I: Ok, why others does propagates?	A_6: I forgot it. I do not know.
I: In which setting does the sound propagates best? Why?	A_6: Space but I forgot he reason.
I: Can you give examples for solid, liquid and space settings?	A_6: For space, it is inside of the room. For the space it is inside the room. I forgot for the solid, liquid and gas setting.

It is created in light with the ideas of the students that show maximum (A_{16}, B_1, C_5, D_{10}) and minimum (A_6, B_4, C_{17}, D_{14}) change for second, third and fourth questions of the interview. These ideas are summarized in Table 5.

Table 5: Finding Belongs To Second, Third and Fourth Questions of the Interview

Std.	2. Question Comparison of Solid-Gas Settings	3. Question Comparison of Liquid-Gas Settings	4. Question Comparison of Space-Gas Settings
A_{16}	I hear better in the second setting. Because second setting is solid. Solid setting transmits the sound better.	Since second setting is liquid I hear better than the first setting. There are more molecules in liquid.	I hear sound in the Moon worse than the Earth. I do not know the reason.
B_1	There are two settings; the first one is gas second one is solid. Solid setting helps me to hear the sound better. Solid transmits the sound best.	There are two settings; the first one is gas second one is liquid. Sound propagates better in air than the liquid setting.	There is air setting in the earth. There is no air in the space. Sound cannot be transmitted. I cannot hear the sound in the moon.
C_5	I can hear better when I rest to the ground. Ground is a solid setting, first setting is air. Solid transmits the sound best.	Here the first setting is gas, second one is liquid. Sound is transmitted best in liquid than the gas setting.	I cannot hear the sound in the moon. Sound does not propagate in space.
D_{10}	First setting is gas, second setting is solid. Solid setting is dense, that means molecules are closer. It transmits better.	Liquid setting is denser than gas setting, which means molecules are closer so I can hear the sound best in the second setting.	Moon is a space setting, earth is a gas setting. I cannot hear sound in the moon. There is no molecule that transmits sound.
A_6	I can hear well. But I do not know the reason. I think solid setting and space setting are compared.	I cannot hear the sound. Because it is liquid I cannot hear the sound. I think liquid and air setting.	I can hear the same. I can hear what is spoken in the earth so I can hear in the moon. I do not know the reason.
B_4	I can hear better than the first case. When I rest my ear to the ground, there is more sound the first setting is space second setting is solid	I can hear better. First setting is liquid, second setting is solid. I do not know the reason	I cannot hear. Because there is no gas in the moon I mean air. We cannot breathe in the moon. I do not know the settings.
C_{17}	I hear badly. Because sound is not propagated in space. First setting is solid, second setting is space.	I hear well. First setting is liquid, second setting is solid. I do not know the reason.	I cannot hear the sound. If we think that we are in the space, sound does not propagate. The moon is space earth is gas.

D_{14}	I can hear than the first setting. Because ground is solid. Solid transmits the sound better. First setting is air second setting is solid.	I can hear better than the first case. Because sound propagates better in liquid than the air first setting is air second is liquid.	I cannot hear. Sound does not propagate in space. It propagates in earth because of the air. First setting is space second is air

From the group that shows the most frequent change for the second question of the interview D_{10} and the least frequent change B_4 are given in Table 6 and Table 7 in sequence.

Table 6: Detailed Answer of the D10 Coded Student to the Interview

Interview Question	Student's Answer
I: Think of a man is digging a hole with a driller in the middle of a big and silent park. You hear the sound of the driller although you are far away from the man. If you think that you rest your ear to the ground and listen to the sound. How do you hear than the first case? Explain it.	D_{10}: I can hear better than the first case.
I: Why?	D_{10}: Because air setting, sorry solid setting is denser than air setting. I can hear best when I rest my ear to the solid setting because sound is transmitted best.
I: What do you mean by saying dense?	D_{10}: Molecules are closer to each other.
I: Ok, what is the first setting and what is the second setting?	D_{10}: First setting is gas, second setting is solid.

Table 7: Detailed Answer of the B4 Coded Student to the Interview

Interview Question	Student's Answer
I: "Think of a man is digging a hole with a driller in the middle of a big and silent park. You hear the sound of the driller although you are far away from the man. If you think that you rest your ear to the ground and listen to the sound. How do you hear than the first case? Explain it"	B_4: I hear better.
I: Why?	B_4: Because I hear a bit medium level, when I rest my ear I hear better.
I: There are two setting. How is the first setting?	B_4: It can be space.

I: Second setting	B_4: Solid
I: Which two setting s are compared?	B_4: Space and solid
I: Ok, why do we hear best in solid setting?	B_4: I do not know the reason.

From the group that shows the most frequent change for the third question of the interview B_1 and the least frequent change B_4 are given in Table 8 and Table 9 in sequence.

Table 8: Detailed Answer of the B1 Coded Student to the Interview

Interview Question	Student's Answer
I: You see that a sea boat is approaching towards you while you are swimming in the sea. You hear the sound of the boat while your head is out of the sea. How do you hear the sound when you sink your head to the sea than the first case? Explain."	B_1: I can hear better.
I: Why?	B_1: Because sound propagates best in liquid than the air substance.
I: There are two setting, what is the first setting, what is the second setting?	B_1: First setting is air second setting is liquid setting.

Table 9: Detailed Answer of the B4 Coded Student to the Interview

Interview Question	Student's Answer
I: You see that a sea boat is approaching towards you while you are swimming in the sea. You hear the sound of the boat while your head is out of the sea. How do you hear the sound when you sink your head to the sea than the first case? Explain."	B_4: I can hear well.
I: Why?	B_4: Because sound propagates in liquid than the air. I cannot say any more.
I: Ok, what are the two settings are compared?	B_4: Air I mean gas with liquid.
I: What is the first setting, what is the second setting?	B_4: First setting is gas second setting is liquid.
I: What do you deduce at last?	B_4: Better is liquid, less propagates in air.

From the group that shows the most frequent change for the third question of the interview A_{16} and the least frequent change C_{17} are given in Table 10 and Table 11 in sequence.

Table 10: Detailed Answer of the A16 Coded Student to the Interview

Interview Question	Student's Answer
I: "Think that you are in the surface of the moon. When you talk with him in the surface of the moon, can you hear his talking as you are in the earth? Explain?	A_{16}: No. I hear worse.
I: Why?	A_{16}: I do not know the reason
I: Ok, what are two setting are compared here? What is the first setting what is the second setting?	A_{16}: There are air gas and solid setting here I think.

Table 11: Answer of the C17 Coded Student to the Interview

Interview Question	Student's answer
I: "Think that you are in the surface of the moon. When you talk with him in the surface of the moon, can you hear his talking as you are in the earth? Explain?	C_{17}: I cannot hear.
I: Why?	C_{17}: Because if we think that we are in space, sounds are not heard in space so I cannot hear.
I:? Ok, what are two setting are compared here? What is the first setting what is the second setting?	C_{17}: Moon setting is space, earth is gas.

By taking students' opinions into consideration, related with the fifth question of the interview, answers of the students that show maximum and minimum change are integrated in Table 12.

Table 12: Findings Belongs To Fifth Question of the Interview

Student	Space Setting
A_{16}	Space is far away to us; I cannot hear the sound.
B_1	I cannot hear. Sound does not propagate in space.
C_5	I cannot hear. There is no molecule in the space.
D_{10}	I cannot hear. There is no molecule to transmit the sound.
A_6	I cannot hear. Because I am not in space.
B_4	I can hear a little. Because the moon is close the earth.
C_{17}	I cannot hear. There is sound hole in the space.
D_{14}	I cannot hear. There is no molecule in the space.

From the group that shows the most frequent change for the fifth question of the interview A_{16} and the least frequent change D_{14} are given in Table 13 and Table 14 in sequence.

Table 13: Detailed Answer of the A16 Coded Student to the Interview

Interview Question	Student's Answer
I: "Can you see the big explosions in the space? Can hear their sound? Explain?"	A_{16}: No.
I: Ok, can you hear these explosions' sound?	A_{16}: No.
I: Why do not you hear?	A_{16}: Because they are far to earth.

Table 14: Detailed Answer of the D14 Coded Student to the Interview

Interview Question	Student's Answer
I: "Can you see the big explosions in the space? Can hear their sound? Explain?"	D_{14}: No.
I: Ok, can you hear these explosions' sound?	D_{14}: I cannot hear.
I: Why do not you hear?	D_{14}: Because there are holes in the space. There is no air in the space. Since there is no molecule I cannot hear.

4. Discussion and Conclusion

Findings gathered within the scope of the study are examined in direction with the answers of the students' to the interview questions. In the question it is asked that whether sounds occur as a result of explosions in the space are heard or not, it can be interpreted that students do not know space has cavernous structure from their answers "sounds cannot be heard because of remoteness of space to earth". This case can be an indication that their misconceptions are not eliminated. The reason for not eliminating the alternative concepts in class A, it can be thought that present education materials used in our education system are not suitable for classroom settings, their inefficiencies and cannot concretised the abstract concepts. One of the application conducted related with propagation of the sound in solid, liquid and gas setting, in the activity that propagation of sound in solid setting one student hit the desk with his hand the other student tried to understand the propagation by listening to this sound with his ear. Later, in order to show that the propagation of sound in liquid setting, two stones are crashed each other in a bucket full of water and student are asked to listen the sound.

Lastly, when the propagation of sound in gas setting is explained, it is said that students' talking with each other is asked to be taken into consideration and sound is propagated in air (gas). As these activities are conducted in classroom setting, it can be thought that students can have alternative concept that sound is propagated best in air (gas). At the end of this application, it is defined that students compare in what setting sound propagates best. When the answer of A_6 coded student to the interview that "It propagates in space; does not propagate in solid, liquid and gas. It propagates in space because it is empty" is investigated we can see that misconceptions are not eliminated.

When the expressions of students, that show most frequent change in B class in which conceptual change texts are applied with present education system, are investigated it is seen that students give correct answers together with reasons. In comparison of solid, liquid and gas settings questions, reasons of second and third questions cannot be explained, however C_{17} coded student give correct answer as "I cannot hear because if we thought that we are in space so sounds are not heard in the space." According to the answers of the students to the fifth question of the interview, as they stated that sound is not transmitted since space is an empty setting and there are no molecules it is seen that these texts are effective in eliminating misconception. Effectiveness of conceptual change texts in this way is supported by conducted studies (Chambers & Andre, 1997; Çaycı, 2007; Geban & Bayır, 2000). It can be said that eliminating alternative concepts existed in B class and explaining the reason of problem conceptual change text by giving examples from daily life and concreting the abstract concepts, students motivations are increasing. When related literature is investigated about conceptual change texts, there are results that support the research (Çakır, Uzuntiryaki & Geban, 2002; Çalık, 2006; Diakidoy, Kendeou & Ioannides, 2003; Uzuntiryaki & Geban, 1998; Ünal, 2007). Conceptual change text used in this study developed as narrational conceptual change text which especially takes the attention of secondary level students and provides them to read without feeling bored, can be thought as factor for eliminating alternative concepts and increase conceptual understanding.

From the answers of the students in C class, in which analogy and study sheets were used together, it is seen that a significant difference in conceptual understanding level. We can give the answer of the C_5 coded student as an example "I can hear better when I lean to ground. Molecules are denser in solid, so they transmit sound better". Analogies have features like simplifying concepts, making them more understandable, concreting the abstract concepts and explaining the unknown from the known (Chambers & Andre, 1997; Çalık, 2006). Empowering education materials by combining study sheets, which have features like taking the attention to the related topic and forming the necessary setting for realizing desired learning, with analogies can be

reason for increased conceptual understanding of the students at C class. As a result it can be said that analogy-supported study sheets are effective in eliminating alternative concepts of the students (Artun, 2009; Artun & Coştu, 2011; Artun & Coştu, 2013; Çalık, 2006). The reasons that activities rely on group work and cooperative learning, students learn the concepts by doing, content of educational material reflects a part from daily life, application of them are easy and based on gadgets that can be available every time can be shown in eliminating alternative concepts. Literature also supported this interpretation (Cahyadi, 2004; Coştu & Ünal, 2004; Huddle, White & Rogers, 2000; Nottis & McFarland, 2001; Özmen & Yıldırım, 2005; Saka & Yılmaz, 2005; Tsai, 1999; Toluk & Orkun, 2004). From the computer-assisted education materials, using Flash animation and video films can be resulted in students' animate events concretely and understand them at scientific level. Furthermore, it can also be said that education materials applied during the lesson effect students' participation positively. It is observed that students are competing each other to take a part in the activities. As it is seen from these explanations, to provide conceptual change and eliminating alternative concepts, D class's understanding increased to high level, in which educational materials based on 5E learning model,

When the answers of D class students to whom the lesson is thought according to 5E learning model in which the education materials used together that provide conceptual change, it is seen that answers gathered from experiment group are more scientific and explanatory. We can give the answer of the D_{10} coded student as an example "Liquid setting is more intense than gas setting, molecules are denser that is why I hear sound better in the second setting". It can be said that D class are provided study sheet, analogy, conceptual change text and computer-assisted education materials are used together and the course is designed according to the steps of 5E learning model. On the other hand, it is observed that students cautiously watched the video film and animation developed with Flash program. In Flash animation show, transmission of sound and setting differences are presented visually and it is tried to increase the student's understanding at high level by animating the simulation that is encountered in daily life (Çalık, 2006; Artun, 2009; Artun & Coştu, 2011; Artun & Coştu, 2013). In the same way, it is thought that showing the conceptual change text supporting by quoting subtitle from the video film provides contribution to students to concentrate on the course (Coştu, Çepni, Taş & Köse, 2006; Friedler, Merin & Tamir, 1992; Özmen & Kolomuç, 2004; Saka & Akdeniz, 2006; Ünal, 2007). Another reason for eliminating alternative concepts can be that, different from the other groups new concepts learned in the elaboration step of 5E model give opportunity to applying new cases. In many studies based on 5E learning model show parallelism with the studies in

the literature that conceptual change is ensured and alternative concepts are eliminated (Bayar, 2005; Kör, 2006; Yaman, Demircioğlu & Ayas, 2006).

As a result, it can be said that present education delivered in A class is unsuccessful in providing misconception, although B class gives more reasonable answers in as much as to A class it includes missing and conceptual change texts used in this group are insufficient alone. It can be stressed that D and C classes are more successful in providing misconception than the other groups. As a result of the comparing the answers, most of the students in D class, in which all education materials are used together, give scientific and reasonable answers. For this reason, it can be said that education materials applied to D class are the most successful in providing misconception.

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