



A PILOT STUDY FOR DETERMING THE EFFECT OF ARGUMENTATION-BASED INSTRUCTION ON 6TH GRADE STUDENTS' KNOWLEDGE AND VIEWS ABOUT ORGAN DONATION AND TRANSPLANTATION

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Abstract: This study has been prepared as a preliminary study that will guide similar studies in the future. The aim of this study is to determine the effect of argumentation-based instruction on 6th grade students' knowledge and views about organ donation and transplantation. The study was conducted with 41 secondary school students in Turkey and a pre-test post-test single-group quasi-experimental design was used. Organ donation and transplantation was taught with argumentation-based activities for 2 weeks. The data was gathered by the open-ended questionnaire and content analysis was used in the analysis of the data. Before the application, it was observed that most of the students confused the basic concepts of organ donation and transplantation and they had some misconceptions. They also had incorrect information about the necessary conditions for organ donation and organs/tissues which can be successfully transplanted. After the application, it was observed that the misconceptions decreased significantly, and argumentation-based activities raised students' awareness and willingness to donate. These findings showed that argumentation-based instruction have had a positive effect on the students' knowledge and views about organ donation and transplantation.

Key words: organ donation and transplantation, socio-scientific issue, argumentation, science education

1. Introduction

In the 21st century, the developments in science and technology not only affected the social and cultural structure, but also influenced the understanding of education and caused radical changes. The content of science education, which is closely related to science, technology, society, has also been updated to keep pace with these developments. In Turkey, the science curriculums were prepared student-centered and all of them are aimed to educate science literate individuals (Ministry of National Education [MoNE], 2018). One of the components that play an important role in improving science literacy is socio-scientific issues (Kolsto, 2006; Sadler & Zeidler, 2005; Sadler & Fowler, 2006). Socio-scientific issues include scientific and moral reasoning skills to solve socio-scientific problems related to science and technology (MoNE, 2018). Inclusion of these issues in science learning environments develops skills such as conscious decision making, associating issues with daily life, multi-dimensional and critical thinking (Dawson, 2015; Hodson, 2013; Sadler, 2004; Sadler & Fowler, 2006; Zeidler, Sadler, Applebaum & Callahan, 2009). Therefore, many institutions, organizations (American Association for the Advancement of Science [AAAS], 1990; MoNE, 2018; National Research Council [NRC], 1996) and science educators (Cebesoy & Dönmez-Şahin, 2013; Hodson, 2013; Kolsto, 2006; Sadler, 2004; Topçu, 2015; Zeidler, Sadler, Simmons & Howes, 2005) advocate that these issues should be included in science education. Socio-scientific issues were included in the science curriculum for the first time in 2013 in Turkey. One of the aims of the 2013 science curriculum is to develop scientific thinking habits by using socio-scientific issues (MoNE, 2013). In this program, which was updated in 2018, this aim was extended as developing reasoning ability, scientific thinking habits and decision-making skills by using sociological subjects (MoNE, 2018).

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Socio-scientific issues are open to discussion and include multiple perspectives and solutions. In this respect, it differs from other issues in the science course (Sadler & Zeidler, 2005). This encourages students to make decisions about social issues based on scientific knowledge, to consider the political, personal, or ethical dimension of the issue and to use scientific arguments in this process (Kolsto, 2006; Zeidler et al., 2009). Many science educators advocate that socio-scientific issues and argumentation process are two overlapping fields. Therefore, socio-scientific issues should be supported by argumentation process (Alkiş-Küçükaydin, 2019; Sadler & Zeidler, 2005; Sadler & Fowler, 2006; Topçu, 2015; Zeidler, Walker, Ackett & Simmons, 2002). In the argumentation process, students not only learn science or complete scientific activities, but also participate in the process more effectively (Kuhn, Black, Keselman & Kaplan, 2000). Argumentation can be defined as the process of explaining, predicting, or evaluating the relationship between evidence or theories (Duschl & Osborne, 2002). Using the argumentation in the science class, the teacher can direct students to examine, evaluate and share arguments with classmates, and to see problems arising from different perspectives. In this process, the students listen to their friends' arguments and compare them with their own arguments, gathering more evidence to support own arguments or to refute the other's (Maloney & Simon, 2006). Students learn that they should discuss their ideas based on evidence, not to accept every opinion as it is (Erduran, Simon & Osborne, 2004; Ford, 2008; Newton, Driver & Osborne, 1999). This process develops students' critical thinking skills (Zeidler et al., 2002), and it encourages them to think scientifically and evidently and to defend their views on various sociological issues (Osborne, Erduran & Simon, 2004). It also contributes to the development of behaviors such as tolerance, mutual respect, and sensitivity as it is an environment in which students listen to each other's opinions and criticize them in a scientific framework (Zeidler & Nichols, 2009).

The argumentation process can be conducted in the form of small group discussions or class discussions (Maloney & Simon, 2006; Newton et al., 1999). In his book "The Uses of Argument" that was published in 1958, Toulmin describes how the argumentation process is carried out and its components (Sampson & Clark, 2008). Toulmin's model of argumentation was used in many studies in science education (Lin & Mintzes, 2010). According to Toulmin, argumentation (scientific discussion) includes three main components such as *data*, *claim* and *warrant*, and three auxiliary components such as *backing*, *rebuttal*, *qualifier* (Sampson & Clark, 2008). The scientific discussion begins with a claim, including data and warrants. Various backings are used to prove the accuracy of the claim, situations limiting the claim (qualifiers) are addressed and in case of invalidity of the claim ends with rebuttals (Von Aufschnaiter, Erduran, Osborne & Simon, 2008). Various activities involving these components should be prepared for students to take an active role in the process. When preparing argumentation-based activities, it is suggested to use strategies such as "table of expressions, theories competing with cartoons, theories competing with a story, guess-observe-explain, designing experiments, theories competing with ideas and arguments, argument creation (Osborne et al., 2004).

1. 1. Importance of Research

Socio-scientific issues are open to discussion and do not have the only correct answer. They include ethical and moral dimensions in addition to scientific processes (Sadler & Zeidler, 2005; Zeidler et al., 2009). Organ donation and transplantation, nuclear energy and power plants, renewable energy sources, hydroelectric power plants, GMOs, cloning, balanced nutrition, etc. topics are among them. In recent years, with the increasing interest in socio-scientific issues, some studies have been conducted on this topic. In the literature, there are studies that compile and analyze socio-scientific issue-based studies. As a result of these analyzes in Turkey, it was determined that nuclear energy and GMOs were the most studied research area (Değirmenci & Doğru, 2017), there were few studies on teaching socio-scientific issues (Genç & Genç, 2017), researches were mostly conducted at university level and secondary school level (Değirmenci & Doğru, 2017; Genç & Genç, 2017; Tezel & Günister, 2018). There is no study on the teaching of organ donation and transplantation. In the light of the shortcomings in the literature, this study focuses on teaching organ donation and transplantation which is a socio-scientific issue. The issue of organ donation and transplantation take place in the 6th grade science curriculum and it is aimed to comprehend the importance of organ donation in terms of social solidarity in the curriculum (MoNE, 2008). It is stated that the best time to inform students about this issue is around 10-11 years (Siebelink, Verhagen, Roodbol, Albers & Van de Wiel, 2017). The

research was carried out with the 6th grade students because they were the ideal age group for teaching and the issue was included in the 6th grade science curriculum.

In some studies, on organ donation and transplantation, the views of secondary school students on the subject were examined (Gökçe, Özer & Kilci, 2016; Tetik & Cebesoy, 2018). In some of them, the effect of educational programs prepared for primary/secondary/high school levels on the students' views was investigated (Çetin & Harman, 2012; Milaniak, Przybylowski, Wierzbicki & Sadowski, 2010; Siebelink et al., 2017; Tarhan, Dalar, Yıldırımoğlu, Sayar & Altın, 2012). The effect of out-of-school learning environments on the views of secondary school students (Yavuz-Topaloğlu & Balkan-Kiyıcı, 2018) and the effect of public spots on the awareness and attitude of university students (Duğan & Şahin, 2016) were investigated in the studies. There was no study investigating the effect of argumentation-based instruction on students' knowledge and views about organ donation and transplantation. Students obtain information from a variety of sources and sometimes misleading learnings can occur. It was seen that the students who obtained the right information about the issue were more willing about organ donation and transplantation (Al-Ghanim, 2009). It is thought that this study will increase awareness among students. In addition, in a study, it was found that teachers could not give enough space to such topics in the learning environment due to the lack of socio-scientific issue materials (Hofstein, Eilks & Bybee, 2011). The activities prepared within the scope of the study are expected to guide teachers in this regard.

This study has been prepared as a preliminary study that will guide similar studies in the future. The aim of this study is to determine the effect of argumentation-based instruction on 6th grade students' knowledge and views about organ donation and transplantation. For this purpose, the following questions were sought:

1. What is the knowledge of 6th grade students about organ donation and transplantation before and after the application?
2. What are the views of 6th grade students about organ donation before and after the application?

2. Methodology

In this study, "pre-test post-test single-group quasi-experimental design" was preferred (Shadish, Cook & Campbell, 2002; Yıldırım & Şimşek, 2006). The 6th grades of a public secondary school in Turkey participated in the study. Organ donation and transplantation was taught in all classes with argumentation-based activities. An open-ended questionnaire prepared by the researchers was applied before and after the instruction.

2. 1. Study Group

A convenience sampling method that endows the study with speed and practicality was used in the selection process of the study group (Yıldırım & Şimşek, 2006). The study was conducted with the 6th grade students of a public secondary school in Turkey in the second semester of 2018-2019 academic year. The school has three sixth classes (6-A, 6-B, 6-C). A total of 41 students, 14 students from 6-A class, 14 students from 6-B class and 13 students from 6-C class, participated in the study. Demographic characteristics of the students in the study group are given in Table 1.

Table 1. Demographic characteristics of the students in the study group

Class	Gender					
	Female		Male		Total	
	N	%	N	%	N	%
6-A	6	42,9	8	57,1	14	100
6-B	6	42,9	8	57,1	14	100
6-C	7	53,8	6	46,2	13	100
Total	19	46,3	22	53,7	41	100

2. 2. Data Collection Tools

An open-ended questionnaire was developed by the researchers to determine the students' knowledge and views on organ donation and transplantation before and after the application (Appendix-1). First, a draft form consisting of five questions was prepared by using the related literature (Demir-Doğan, Uzun, Kaya, Ekinci & Altımkaynak, 2016; Kavurmacı, Karabulut & Koç, 2014; Özpulat, 2017; Savaşer, Mutlu, Çağlar, Doğan & Canbulat, 2012). The draft form was submitted to expert opinion (two faculty members, four science teachers and two Turkish teachers) for review in terms of language and content, comprehensibility and validity of scope. Necessary corrections were made in accordance with expert opinions. Then, to check the comprehensibility of the questions in the questionnaire, five students randomly selected from 7th grade and were interviewed at the school where the research will be conducted. Such a way was followed because the 7th grade students have learned the subject and the application would be done with the 6th grade students. In line with the interviews, expressions that were not understood or perceived differently by the students were corrected and the questionnaire was finalized. In the final version of the questionnaire, there are five open-ended questions. The first three questions are intended to determine the students' knowledge of the subject and the last two are intended to determine their views.

2. 3. Developing Activities Based on the Argumentation

The teaching of organ donation and transplantation was carried out with the activities prepared by the researchers and including the components of the Toulmin Argumentation Model. A total of four activities, one of which was a preparatory activity, were prepared within the scope of the research (Appendix-2). When developing activities based on argumentation, the strategies suggested in the literature were considered (Osborne et al., 2004). In this context, "My Neighbor's Recommendation" preparatory activity was developed by taking into consideration the theories competing with cartoons, "What Would You Do If You Were?" and "Artificial Organ Transplantation" activities were developed by taking into consideration the theories competing with a story, and "What Do You Think?" activity was developed considering the strategy of expressions table. After obtaining expert opinion from two faculty members and two science teachers working in science education, necessary corrections were made and internal validity was ensured.

2. 4. Teaching Intervention

The teaching of organ donation and transplantation, including the preparatory activity, lasted two weeks (eight class hours). An open-ended questionnaire was applied to the students before and after the application. Teaching process of organ donation and transplantation is given in Table 2.

Table 2. *Teaching process of organ donation and transplantation*

Activities	Application Time
Introducing of Toulmin Argumentation Model	1 hour
"My Neighbor's Recommendation" preparatory activity	1 hour
Giving information about organ donation and transplantation	2 hours
"What Would You Do If You Were?" activity	2 hours
"What Do You Think?" activity	1 hour
"Artificial Organ Transplantation" activity	1 hour

The first lesson, the main components and auxiliary components of the Toulmin Argumentation Model were introduced to the students in accordance with their level and examples were given about them. Then, a preparatory activity was implemented to better understand these components and to facilitate the implementation of the main activities. This activity was prepared for the issue of conscious drug consumption which was included in the textbook before organ donation and transplantation. First, the students were informed about conscious drug consumption, they were watched the video about unconscious drug consumption (Education Information Network, 2012). After examining the news samples brought to the classroom, each student was given an activity sheet called "My Neighbor's

Recommendation". Each student was asked to read the activity individually and to answer the questions under the activity. The students were asked to explain what opinion they supported and to provide examples that would support their claims and refute the counter-claims. At the end of a certain time, the questions in the activity were discussed orally by the class.

Organ donation and transplantation was explained to the students with the help of interactive lecture at Morpa Campus (URLs-1). Then, two theater which one prepared by the theater team of Alanya State Hospital (URLs-2) and the other prepared by the theater team of Artvin State Hospital (URLs-3), were shown to the students. For the next lesson, relevant news samples were collected from different news sites. Equal numbers of news samples supporting and not supporting organ donation were included. In addition, news stories about vegetative state and brain death were also included. The texts in the news were not used as they were, but were shortened and arranged to suit the class level. Ten news samples were distributed to the students and they were asked to review them. Then the "What Would You Do If You Were?" activity sheet was distributed. The students were asked to read the text and relevant questions and write the answers. At this stage, it was stated that they could use newspaper news to support their claims or refute the claim of the others. When this process was completed, the text was read by a volunteer student and the class discussion was started. Volunteer students shared their arguments with the class under the guidance of teachers and presented their evidence to convince their friends. In "What Do You Think?" activity and "Artificial Organ Transplantation" activity, students were allowed to complete the argumentation process with similar steps to the previous activities. Due to the time limit, the whole class was not able to speak in every activity; however, they participated in different activities. Thus, the active participation of each student in the class was encouraged.

2. 5. Analysis of the Data

Content analysis was used in the analysis of the data obtained from open-ended questionnaire. Content analysis is carried out to convert qualitative data into quantitative data and includes the process of examining content according to predetermined criteria and categorizing it to make sense (Çepni, 2012; Tavşancı & Aslan, 2001). In content analysis, the data are analyzed in four stages: "coding, finding themes, arranging codes and themes, defining and interpreting findings (Çepni, 2012). In this context, the answers in the pre-test and post-test were carefully read and coded by the researchers independently and categorized according to common points. Frequency and percentage values of each category were calculated and shown in the table. In addition, sample student statements through descriptive analysis were also included. While presenting examples from the students' views, due to ethical values, their identities were kept confidential and each was given a code name. Because of the study was conducted with the participation of 41 students, code names S1, S2, S3,..., S41 were given to the students (S: student).

2. 6. Validity and Reliability

The responses of the students to the pre-test and post-test were coded independently by the researchers. Then, these independent encodings were compared and the reliability percentage was calculated with the formula proposed by Miles & Huberman (Miles & Huberman, 1994). As a result of the calculation, a value of 80 or higher indicates that the assessment is reliable (Miles & Huberman, 1994; Miles, Huberman & Saldana, 2014). The percent agreement between coders was 89. This shows that the assessment was reliable. Non-compliance points were reviewed together and a common decision was reached.

3. Findings

In this section, the findings obtained in line with the sub-problems of the study are given. The first sub-problem of the research is "What is the knowledge of the 6th grade students about organ donation and transplantation before and after the application?". Within the scope of this sub-problem, students were asked three questions. First, they were asked to explain what they know about the concepts of "organ donation, organ transplantation, brain death and vegetative state". The answers were divided into four categories as "correct, partially correct, wrong/ irrelevant, no answer". The categories of the students' answers to the pre-test and post-test are given in Table 3.

Table 3. Students' knowledge of some concepts of organ donation and transplantation

Concepts	Categories	Pre-test		Post-test	
		f	%	f	%
Organ Donation	Correct	-	-	13	31,7
	Partially correct	11	26,8	16	39,1
	Incorrect/ irrelevant	24	58,6	10	24,4
	No answer	6	14,6	2	4,8
Organ Transplantation	Correct	7	17,1	19	46,4
	Partially correct	15	36,6	20	48,8
	Incorrect/ irrelevant	7	17,1	1	2,4
	No answer	12	29,2	1	2,4
Brain Death	Correct	8	19,6	33	80,5
	Partially correct	6	14,6	3	7,3
	Incorrect/ irrelevant	15	36,6	5	12,2
	No answer	12	29,2	-	-
Vegetative State	Correct	5	12,2	28	68,3
	Partially correct	8	19,6	10	24,4
	Incorrect/ irrelevant	14	34,1	3	7,3
	No answer	14	34,1	-	-

Organ donation; *when an individual is alive, he or she will voluntarily allow his organs to be used after death for the treatment of other patients and he or she document it* (Ministry of Health of Turkey, 2018). According to Table 3, no student was able to correctly define the organ donation in the pre-test. Some students (26.8%) gave partially correct answers, while the majority (58.6%) gave incorrect or irrelevant answers. In the post-test, it was noteworthy that some of the students (31.7%) correctly defined organ donation and that there was a decrease in the number of students who defined organ donation incorrectly or irrelevant (24.4%). When the answers of the students were examined, it was found that the students giving the wrong answers mostly confused the concepts of organ donation and organ transplantation. Some examples of students' responses are as follows:

S4: *After a person's brain death occurs, the organ donation card is checked. With the permission of the family, this person's organs are allowed to be transferred to others* (Correct answer).

S32: *When a person is alive, he fills out a form. After his death, with the consent of his family, his organs can be donated to people in need* (Correct answer).

S9: *A person is donating organs to a sick person* (Partially correct answer).

S17: *To go to the relevant institution or hospital to donate some of our organs* (Partially correct answer).

S31: *Giving any person an organ that he needs, transplant the organ* (Wrong/ irrelevant answer).

S38: *They take one person's organ, put it on another* (Wrong/ irrelevant answer).

Organ transplantation is a medical procedure in which a damaged or unable to function organ in a person's body is replaced by a healthy organ that was taken from a living person, a brain-dead person or a dead person (Akiş et al., 2008; Rajaei & Bioki, 2017). According to Table 3, in the pre-test, almost half of the students could not explain the concept of organ transplantation or misrepresented it. In the post-test, this ratio decreased considerably, while the number of correct responders (46.4%) increased significantly. Some examples of students' responses are as follows:

S19: *If a person's brain death has occurred, his or her healthy organs are removed by surgery and attached to people in need of the organ. For organ transplantation, the permission must be obtained from the family of the person whose brain death occurs* (Correct answer).

S37: *The attachment of an organ from the deceased to the person in need. While the person is alive, one of the double organs such as kidney and lung can be removed and attached to another person* (Correct answer).

S20: *A person giving his or her organ to someone else. This organ is removed and attached to the other patient* (Partially correct answer).

S30: *Organ removal from one person and attached to another person* (Partially correct answer).

S12: *Anything from your body is given to anyone else* (Wrong/ irrelevant answer).

S32: *If a person is alive and donates organs to another person, this is called organ transplantation* (Wrong/ irrelevant answer).

Brain death is the irreversible disappearance of all brain functions (Trakya University Organ Transplantation Center of Turkey). According to Table 3, in the pre-test, more than half of the students could not explain the concept of brain death or misrepresented it. In the post-test, there was a notable increase in the number of correct disclosures (80.5%). Some examples of students' responses are as follows:

S12: *It is the death of all functions in the brain* (Correct answer).

S14: *A person is medically dead. This person has no chance of living again* (Correct answer).

S27: *It is not coming back to life* (Partially correct answer).

S2: *If brain tumor or similar things are not taken into consideration and treatment is not performed, brain death occurs* (Wrong/ irrelevant answer).

S14: *It is that things in the brain are erased from memory, forgetting* (Wrong/ irrelevant answer).

Vegetative state is that the patient has lost some brain function. The patient can continue to live without being connected to the breathing apparatus provided that the necessary care is provided. Also, the patient has a possibility of regaining his vital functions though at low (Trakya University Organ Transplantation Center of Turkey). When Table 3 is examined, in the pre-test, it is seen that most of the students could not explain the concept of vegetative state or misrepresented it. In the post-test, there was a significant increase in the number of correct explanations (68.3%). In the pre-test, it was found that the concepts of vegetative state and brain death were often confused and the students had wrong information; In the post-test it was found that these errors were largely eliminated. Some examples of students' responses are as follows:

S4: *A person is living without being connected to a breathing apparatus. There is a possibility that the person will return to normal life* (Correct answer).

S29: *This is not like brain death. This person is not considered medically dead. There is a possibility of returning to normal life even after many years* (Correct answer).

S41: *A person has a chance to live* (Partially correct answer).

S28: *The patients who have lost their mental health* (Wrong/ irrelevant answer).

S32: *A person makes unusual movements* (Wrong/ irrelevant answer).

In the second question of the questionnaire, the students were asked the necessary conditions for organ donation. The categories of the students' answers in the pre-test and post-test are given in Table 4.

Table 4. *The necessary conditions for organ donation*

Categories	Pre-test		Post-test	
	f	%	f	%
The person must be mentally healthy	-	-	33	80,5
The family must give permission	2	4,9	35	85,4
The person must be of appropriate age	10	24,4	-	-
The person must be at the age of 18 at least	10	24,4	40	97,6

Law no 2238 dated 29.05.1979 states the legal dimension of organ donation (Ministry of Health of Turkey, 2018). According to article 6 of the law, certain conditions are required for organ donation like as "the person must be mentally healthy" and "the person must be at the age of 18 at least". According to article 14 of the law, even if a person makes an organ donation in his or her health, the permission of the first-degree relatives (the family), if not, the permission of any relative, is required for the removal of the organs after death. In line with the law, the answers "the person must be mentally healthy, the family must give permission, the person must be at the age of 18 at least" were

accepted as correct. According to Table 4, there was no student explaining the necessary condition "the person must be mentally healthy" in the pre-test. It was determined that two students (4.9%) explained the necessary condition "the family must give permission", some of them (24.4%) knew the age criterion correctly, some of them (24.4%) mentioned the age but could not explain the appropriate age. In the post-test, it was seen that some of the students explained some of the conditions for organ donation and the majority of them explained all the conditions correctly. When the answers given to the conditions for organ donation were examined, it was determined that the students had some misconceptions about this issue. These misconceptions are given in Table 5.

Table 5. The students' misconceptions about the organ donation

Categories	Pre-test		Post-test	
	f	%	f	%
Tissue compatibility	7	17,1	3	7,3
Blood type compatibility	6	14,6	1	2,4
Healthy people	22	53,7	4	9,8
Adults	3	7,3	-	-
Double organs	12	29,3	2	4,9
Suitable weight	4	9,8	-	-
No physical disability	2	4,9	-	-
People who died	7	17,1	-	-

When Table 5 is examined, the most common misconceptions in the pre-test "tissue compatibility (17.1%), blood group compatibility (14.6), healthy people (53.7), double organs (29.3) , people who dead (17.1%)". Some students gave irrelevant answers that "adults, suitable weight, no physical disability". Causes such as physical disability, be alive or dead, having any illness, etc., do not prevent organ donation. Conditions such as tissue compatibility, blood group compatibility and healthy organ are the desired conditions for organ transplantation. According to the law, anyone who is over 18 years of age and who is mentally healthy can donate organs. Therefore, these answers in the table were evaluated as misconceptions. In the post-test, it was found that the number of students who had misconceptions about organ donation decreased to a great extent and some misconceptions completely disappeared.

The third question in the questionnaire, the students were asked which organs or tissues can be successfully transplanted in Turkey. The answers given by students in the pre-test and post-test are given in Table 6.

Table 6. Organs or tissues which can be successfully transplanted in Turkey

Organs or Tissues	Pre-test		Post-test	
	f	%	f	%
Brain	12	29,3	2	4,9
Liver	8	19,6	38	92,7
Small intestine	-	-	23	56,1
Pancreas	-	-	28	68,3
Heart	20	48,8	35	85,4
Stomach	9	21,9	1	2,4
Pulmonary	28	68,3	39	95,1
Renal	33	80,5	40	97,6
Cornea	4	9,8	27	65,9
Skin	2	4,9	24	58,5
Bone marrow	8	19,6	29	70,7

* Most of the students wrote more than one answer to this question

In Turkey, some organs such as heart, renal, liver, small intestine, pulmonary, pancreas can be transplanted; and also some tissues such as cornea, skin, bone marrow can be transplanted (URLs-2). According to Table 6, in the pre-test, among the organs or tissues that can be transplanted, the most frequently written was the heart (48.8%), pulmonary (68.3%) and kidney (80.5%). Some organ or

tissue names were written less, while some of them were not. It was also observed that some students gave wrong answers such as brain (29.3%) and stomach (21.9%). Therefore, it can be said that students have incomplete information or misconceptions about organ transplantation. In the post-test, it was seen that the incomplete information or misconceptions were greatly reduced, and the names of transplantable organs or tissues were explained by most of the students.

The second sub-problem of the research is "What are the views of the 6th grade students about organ donation before and after the application?". Within the scope of this sub-problem, the fourth and fifth questions in the questionnaire were asked to the students. In the fourth question, the students were asked "whether they think of donating organs and the reason for these thoughts". Students' views on organ donation are given in Table 7.

Table 7. Students' views on organ donation

Would you consider donating organs?	Pre-test		Post-test	
	f	%	f	%
Yes	23	56,1	36	87,8
No	5	12,2	1	2,4
Undecided	13	31,7	4	9,8

In the pre-test, 56.1% of the students stated that they intend to donate organs, 12.2% do not intend to donate, and 31.7% are undecided about this. In the post-test, 87.8% of the students stated that they intend to donate, 2.4% do not consider donating, and 9.8% are undecided about this. It is noteworthy that the number of students who consider donating organs increased and the number of undecided students decreased in the post-test. The students were asked the reason for these thoughts. The reasons are given in table 8.

Table 8. Reasons for students' views on organ donation

Views	Reasons	Pre-test		Post-test	
		f	%	f	%
Yes	The desire to save the lives of others	19	46,3	24	58,5
	Sense of solidarity	1	2,4	4	9,8
	Organs will rot after people die	2	4,9	8	19,5
	Willingness to hope	1	2,4	-	-
	Willingness to make others happy	4	9,8	3	7,3
	There are the people who need organ donation	2	4,9	5	12,2
	Willingness to help	2	4,9	4	9,8
	Religious feelings	-	-	1	2,4
	For everyone to live healthy	-	-	1	2,4
No	Not wanting to live with a single organ	2	4,9	-	-
	The thought that own health will deteriorate	2	4,9	1	2,4
	Not religiously appropriate	3	7,3	1	2,4
Undecided	Donating to people without relatives	2	4,9	1	2,4
	The possibility of experiencing a setback during the transplant	2	4,9	1	2,4
	The possibility of organ incompatibility	2	4,9	-	-
	Not wanting to live with the missing organ	3	7,3	2	4,9
	No answer	2	4,9	-	-

According to Table 8, in the pretest, approximately half of the students (46,3%) stated that they want to donate with the desire to save the lives of others. The rate of them who stated the same opinion in the post-test increased to 58,5%. In the post-test, some of the students also stated that they wanted to donate because the organs will rot after people die (19,5%) and there are the people who need organ donation (12,2%). Some examples of students' views are as follows:

S4: Yes, because I want to save the lives other people and I want them to live happily too.

S34: Yes, because I'm saving someone else's life. I do not want the person who needs the organ to despair. And so, solidarity increases.

S40: Yes, when I die, my organs will rot and won't work. If there is a patient, I would like to have the necessary organs removed from me. If I was dead, I would like other people to live.

In the pre-test and post-test, students stated that they do not intend to donate organs because of "not wanting to live with a single organ, the thought that own health will deteriorate and not religiously appropriate". Some examples of students' views are as follows:

S10: No, if I give my organs, my own health will deteriorate or even I can die.

S36: No, because if I give one of my double organs, one of my organs will remain, and I can die when something happens to that organ. For example, there are two renals, but I do not want to live with a single renal.

Undecided students mostly stated that they do not wanting to live with the missing organ. Some examples of students' views are as follows:

S21: I am undecided because organ donation is not an easy thing. While my organs are removed by surgery, my chance of death is 90% guaranteed.

S28: I am undecided because I would donate if I had a relative or family member, but I don't know if I would donate to someone I do not know.

S31: I'm undecided because I'm afraid to live with the missing organ and make fun of myself.

In the last question of the questionnaire, the students were asked "their views on the importance of organ donation" and the categories related to the answers are given in Table 9.

Table 9. Students' views about the importance of organ donation

Categories	Pre-test		Post-test	
	f	%	f	%
Provides social unity	2	4,9	8	19,5
Provides assistance	4	9,8	12	29,3
Increases brotherhood	2	4,9	5	12,2
Increases social solidarity	5	12,2	15	36,6
Strengthens social relations	2	4,9	8	19,5
Makes society happy and peaceful	4	9,8	4	9,8
Increases love and respect	2	4,9	6	14,6
Increases confidence	-	-	4	9,8
Irrelevant answer	15	36,6	4	9,8
No answer	10	24,4	2	4,9

According to Table 9, in the pre-test, some students stated that donating organs is important to increase social solidarity (12,2%). The high number of students who gave irrelevant answers (36.6%) or no explanation (24.4%) is remarkable. In the post-test, the students emphasized that organ donation is important to increase social solidarity (36.6%), to provide assistance (29.3%), to provide social unity and to strengthen social relations (19.5%). It can be said that there was a significant increase in the number of students who expressed the importance of organ donation for the society and its contribution to the society.

4. Conclusion, Discussion and Recommendations

In this study, the effect of argumentation-based instruction on 6th grade students' knowledge and views about organ donation and transplantation was investigated. The issue of organ donation and transplantation was taught through argumentation-based activities for two weeks. An open-ended questionnaire was applied as pre-test and post-test before and after the teaching.

First, the students were asked to explain what they know about the concepts of "organ donation, organ transplantation, brain death and vegetative state". In the pre-test, it was determined that there were no students who made the definition of organ donation correctly, some students gave partially correct answers, and most of them gave incorrect or irrelevant answers. In the post-test, it was determined that the number of students with correct answers increased and the number of students with incorrect or

irrelevant answers decreased. When the answers of the students were examined, it was found that the students giving the wrong answers mostly confused the concepts of organ donation and organ transplantation. After the application, misconceptions have been greatly reduced. When the explanations about organ transplantation are examined, in the pre-test, it was observed that almost half of the students could not explain the concept of organ transplantation or misrepresented it and in the post-test the number of correct responders increased significantly. While more than half of the students could not explain the concepts of brain death and vegetative state or misrepresented these concepts in the pretest, there was a significant increase in the number of correct explanations in the post-test. Before the application, it was observed that most of the students confused the concepts of brain death and vegetative state and they had misconceptions. After the application, it was observed that the misconceptions decreased significantly. These results show that argumentation-based activities are effective in learning basic concepts about the issue.

Second, the students were asked the necessary conditions for organ donation. While few students explained some of the necessary conditions in the pre-test, most of the students could explain all the necessary conditions in the post-test. When the answers given to the conditions for organ donation were examined, it was determined that the students had some misconceptions about this issue. The most common misconceptions in the pre-test were "the person should be healthy" and "the organs should be double". According to the law, anyone who is over 18 years old and who is mentally healthy can donate organs. After the person dies, organs can be removed with the permission of his family. The health status of the person is not questioned for organ donation. In addition, organs which are double such as renal and pulmonary can be donated, as well as single organs such as liver, heart and small intestine. This may have caused students to confuse organ donation and organ transplantation. In the post-test, it was seen that the number of students who had misconceptions about organ donation decreased to a great extent and some misconceptions completely disappeared.

Third, the students were asked which organs or tissues can be successfully transplanted in Turkey. In the pre-test, among the organs or tissues that can be transplanted, the most frequently written was the heart, pulmonary and kidney. The fact that students had this information before the application may be due to the more common news about these organs in the media. Some students wrote non-transplantable organs such as the brain and stomach. Therefore, it can be said that students have incomplete information or misconceptions about organ transplantation. In the post-test, it was seen that the incomplete information or misconceptions were greatly reduced, and the names of transplantable organs or tissues were explained by most of the students. The first three questions in the questionnaire are aimed at determining students' level of knowledge regarding organ donation and transplantation. It was determined before the application that most of the students had lack of information or misconceptions about the issue. There are a limited number of studies conducted in the literature on the topic of organ donation and transplantation at the secondary school level. In some of these studies, it was observed that secondary school students did not have sufficient knowledge about the issue (Gökçe et al., 2016; Tetik & Cebesoy, 2018; Tetik & Cebesoy, 2019), while in others, students had wrong views (Tetik & Cebesoy, 2018; Tetik & Cebesoy, 2019). The results of these studies conducted with secondary school students and the results of this study are in parallel.

Fourth, the students were asked whether they think of donating organs. In the pre-test, 56.1% of the students stated that they intend to donate organs, 12.2% do not intend to donate, and 31.7% are undecided about this. In the post-test, 87.8% of the students stated that they intend to donate, 2.4% do not consider donating, and 9.8% are undecided about this. The increase in the number of students considering donating can be interpreted that argumentation-based activities raised students' awareness and willingness to donate. In the research carried out by Yavuz-Topaloğlu & Balkan-Kiyıcı (2018), students' views about organ donation before and after visiting the dialysis center were examined. It was seen that the visit had a positive effect on student views. The findings of this study and current study are similar. In the continuation of the fourth question, the students were asked the reasons for their thoughts on organ donation. The students mostly stated that they want to donate with the desire to save others' lives, the organs will not work after death and the existence of people who need organ donation". The students stated that they do not intend to donate organs because of "not wanting to live with a single organ, the thought that own health will deteriorate and not religiously appropriate".

Undecided students mostly stated that they do not want to live with the missing organ. In similar studies conducted in the literature, the participants were asked whether they think of donating organs and the reason for these thoughts (Al-Ghanim, 2009; Çetin, Turgut & Kaçar, 2014; Gökçe et al., 2016; Özputat, 2017; Sadic, Sadic, Krupic, Fatahi & Krupic, 2016; Tetik & Cebesoy, 2018; Tetik & Cebesoy, 2019; Yavuz-Topaloğlu & Balkan-Kiyici, 2018). The reasons stated by the participants and the reasons stated by the students in this study are similar.

Fifth, the students were asked their views on the importance of organ donation. The most stated view in the pre-test was that organ donation is important to increase social solidarity. It is noteworthy that there are many students who gave irrelevant answers or no explanation. In the post-test, the students emphasized that organ donation is important to increase social solidarity, to provide assistance, to provide social unity and to strengthen social relations. (%). It can be said that there was a significant increase in the number of students who expressed the importance of organ donation for the society and its contribution to the society. In this context, it can be said that the instruction increased awareness about the importance of organ donation. Gökçe et al. (2016) asked secondary school students and their families whether they care about organ donation and found that they care about organ donation. In their research, Tetik & Cebesoy (2019) asked secondary school students what they think about the importance of organ donation. The most stated view by students was that organ donation is important to provide social solidarity. The results of this research are in line with the studies conducted in the literature.

While the number of patients waiting for organ transplantation is increasing all over the world, organ donation is inadequate and cannot meet the need. It can be said that the biggest obstacle to organ donation is ignorance and prejudices (Cantarovich, 2018). Informing students about the subject from an early age and preventing their prejudices can increase their willingness to donate (Al-Ghanim, 2009). Therefore, starting from primary school, students in different grade levels should be given trainings on this subject. The 6th grade science curriculum includes an acquisition related to organ donation and the recommended time for teaching this subject in the curriculum is very limited (MoNE, 2018). The number of acquisitions in the curriculum and the recommended time for teaching the subject should be increased. In addition, in the 6th grade textbook, it has been observed that the concepts of brain death and herbal life are not sufficiently covered and the difference between the two concepts is not explained. These concepts should be included more in the textbook. This research is limited to 6th grade students of a public secondary school in Turkey. Similar studies can be carried out on different groups at the same or different grade levels. Studies can be conducted on larger samples. What students know and think about organ donation can be investigated. Thus, students' misconceptions, prejudices and their source can be revealed.

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Appendix 1.**QUESTIONNAIRE ON ORGAN DONATION AND TRANSPLANTATION**

Dear Students,

Questions are below to determine your knowledge and thoughts on the subject of "Organ Donation and Transplantation". Your answers to the questions will only be used in the research conducted and will not be used to give you a grade. You will make the biggest contribution to the research to achieve the goal. Thank you very much for your sincerity, interest and help in answering the questions.

1. Describe the following concepts.

Organ Donation:

*Organ
Transplantation:*

Brain Death:

Vegetative State:

2. What are the necessary conditions for organ donation? Please explain.
3. Which organs or tissues can be successfully transplanted in Turkey? Please write their names.
4. Would you consider donating organs?
 YES NO UNDECIDED
→ Can you explain the reason of this thought:
.....
.....
.....
5. Explain what you think about the importance of organ donation.
.....
.....
.....

Appendix 2.

MY NEIGHBOR'S RECOMMENDATION

Mrs. Ayse

Hello Mrs. Ayse!
You don't look so
good. Are you sick?

Mrs. Fatma

Yes, Mrs. Fatma. I have
a terrible headache.
I rested but it still has
not passed.

I use some medications
regularly. Would it be right to
use the medicine you
recommended without asking
the doctor? I could not decide...

*I have a medicine for
headache. Last day, my friend
who has a headache like you,
used it. The pain of his head
has passed. Do you want to
try it too?*

1. Should Mrs. Ayse use the medicine recommended by her neighbor? (Claim)
.....
.....
2. Can you explain why you think so? (Warrant)
.....
.....
3. If Mrs. Ayse's indecision continues, how would you persuade her? How do you support your opinion? (Backing)
.....
.....
4. If Mrs. Ayse does not accept your opinion, what can you tell her? (Rebuttal)
.....
.....

WHAT WOULD YOU DO IF YOU WERE?

Ecem is 4 years old... She had a car accident and her brain was severely damaged. She has been struggling to live in intensive care for days in the hospital. On the 18th day of her treatment, the doctors told the little Ecem's father that his daughter's brain death had occurred. They also said that his daughter had no chance to live, that the life support device had to be unplugged. They state that his daughter's organs are compatible with five different children and ask her father if he wants to donate Ecem's organs. The father has to make a decision. Should the father allow to be unplugged the life support device to which his daughter is connected and should he donate his daughter's organs? Or should he keep waiting, not letting the doctors pull the plug? This is a very difficult decision. On the one hand, his daughter whom he loves so much, on the other hand, children who are waiting for organ donation...

1. *Should Ecem's father accept doctors' offer for organ donation ? (Claim)*

2. *Can you explain why you think so? (Warrant)*

3. *If the father's indecision continues, how would you persuade him? How do you support your opinion? (Backing)*

4. *If Ecem's father does not accept your opinion, what can you tell him? (Rebuttal)*
