The effect of argumentation-based teaching on developing argument skills of prospective teachers, and on their willingness to debate

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Abstract

The study aimed to examine the effect of argumentation-based teaching approach on developing prospective teachers' argument skills, and on their willingness to debate. The study employed the one-group pre-test-post-test experimental research design based on quantitative data. The participants consisted of a total of 192 3rd grade prospective teachers who were selected using maximum variation sampling method from the departments of Social Studies Education, Classroom Education and Mathematics Education in a state university in Turkey in 2019-2020 academic year. The data were obtained using the "Moral Dilemma Stories" developed by Rest (1979), and adapted into Turkish by Akkoyun (1987); and the "Scale of Willingness to Debate" developed by Infante and Rancer (1982), and adapted to Turkish by Kaya (2005). The data were analyzed via descriptive and inferential statistical analysis methods and Argumentation Assessment Rubric developed by Erduran, Simon, and Osborne (2004). The results revealed that the argumentation-based teaching increased the prospective teachers' argument skills and their willingness to debate. It was also found out that making use of such skills as researching, reasoning, discussing, expressing thoughts, and persuading, in student-oriented education systems in a more comprehensive way could be helpful to support the argumentation-based teaching approach.

1. Introduction

In the new millennium, the positive correlation between the welfare, development levels, social and political progress of countries and qualified education outcomes (Hanushek & Woessman, 2010) has turned the focus of the global debate on education in a different direction. Being aware of this reality, countries have shifted their national policies on education from indicators expressed in numbers to the goal of raising qualified people in education. In the process, the main goal of the countries has been to increase the welfare of the society and to raise individuals who seek science-based solutions to the problems and produce scientific knowledge (Bilir et al., 2020). This goal, therefore, has

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triggered countries to find an answer to the question '*How should qualified education be?*' The search for a qualified education has mobilized national and international organizations to direct education policies on a global scale. The work carried out by such organizations revealed a framework for quality education (Organisation for Economic Co-operation and Development [OECD], 2019). This framework has redefined the roles of schools, students and teachers by encouraging the type of individual who can produce knowledge, use it functionally in life, solve problems, and think critically (Ministry of National Education [MoNE], 2018).

Being the mirror of the society in which it is located, and the most basic system of education, schools have recently been regarded as a living organism that interacts with its environment rather than being a physical structure of four walls (Akdağ, 2003). This new role that has been assigned to schools has also influenced students and teachers. Nowadays, both the innovations and developments in learning and teaching theories and approaches (MoNE, 2018), besides the skills deemed valuable in the 21st century, have enabled students to question, research, discuss, and thus create knowledge in learning environments, rather than remaining as listeners only. Within such a modifying process, teachers are as important as students in developing such roles. Rather than being the master of the class, teachers have become guides in the classroom to convey knowledge and provide students with skills such as multi-dimensional thinking, questioning, research, and discussion. Today, while students are expected to know how to think, teachers are expected to know how to teach students to be autonomous, logical, and critical (Rapanta & Macagno, 2016). Thanks to this awareness, teachers will be able to train students who adopt the worldview of multiple truths instead of the unconditional world view based on accepting a single truth (Titiz, 2013).

The existence of a world with multiple truths is possible with creating an ideal classroom environment that provides students with the opportunity to express themselves rather than keeping silence (Kayaaalp & Şimşek, 2020). There are various qualities teachers should have in these thinking-friendly classroom environments (Doğanay & Sarı, 2012). Providing students with higher-order thinking skills such as questioning, critical thinking, decision making or problem solving is only possible with teachers who already have these skills and competencies (Kabataş-Memiş & Çakan-Aktaş, 2020). It is very important for teachers to know the appropriate teaching methods to use in learning environments so that they can design learning environments in a questioning, investigative and critical way. In other words, it is a necessity to use the appropriate teaching methods to raise qualified people in learning environments (Şimşek, 2015). Considering this necessity, 'Argumentation-Based Teaching (ABT)' approach stands out as one of the contemporary teaching models through which prospective teachers can both develop their skills of researching, questioning and expressing themselves within an appropriate discussion culture prior to their professional careers and can use effectively in their professional lives (Kara, Yılmaz & Kıngır, 2020; Küçük & Aycan, 2014).

1.1 Argumentation-based teaching approach

The ABT approach, which allows students to make arguments through scientific inquiries (Choi, Notebaert, Diaz & Hand, 2010), includes discussion and reconciliation processes in which various arguments are formed using questions, claims and evidence (Günel, Akkuş, Hohenshell & Hand, 2004). The ABT is one of the effective approaches that can be used in the development of higher-order thinking skills such as problem

solving, critical thinking and decision-making due to embodying the argumentative method in its nature and through its existing components (Torun, 2020). At the basis of the ABT approach is the argumentation process in which students support their claims about a subject with justifications. Argumentation is a discussion process between individuals with different perspectives (Osborne, Erduran & Simon, 2004; Sampson & Clark, 2008). In this process, the students participate in the discussion and try to convince people with different views by supporting their claims with evidence (Evagorou & Osborne, 2013). The argumentation process, in which scientific information can be discussed individually or in groups (Büyükalan-Filiz & Işıker, 2019), provides students with the opportunity to express, support, evaluate, and review and write their thoughts through discussions (Simpson & Gliem, 2009). Thus, unlike traditional methods that give students no opportunity to think, the argumentation-based learning process do not express in advance the results that students will come up with (Aktaş & Kıvılcan-Doğan, 2018). Rather, students are expected to be able to defend their views against opposing views, without agreeing to the ideas presented to them as they are (Demirel, 2016). At this stage, students have to go through some mental processes such as thinking, reasoning, discussing, evaluating different ideas and justifying their own thoughts with evidence (Erduran, 2020; Fettahlıoğlu & Aydoğdu, 2020; Zambak & Magiera, 2020).

Different argumentation models have been developed by many researchers in order to evaluate the arguments made depending on the structuring of the argumentation process (Zohar & Nemet, 2002; Lawson, 2003; Kelly & Takao, 2002; Schwarz, Neuman, Gil & Ilya, 2003; Sandoval, 2003; Walton, 2009; Puvirajah, 2007). This research used the Toulmin's Argumentation Model (TAP), which expresses argumentation as a process in which reasons are used to support or refute a claim (Toulmin, 2003), and which develops the argument's structuring process to systematically explain the components that make up the argument and the connections between these components. The TMA model is presented in Figure 1.
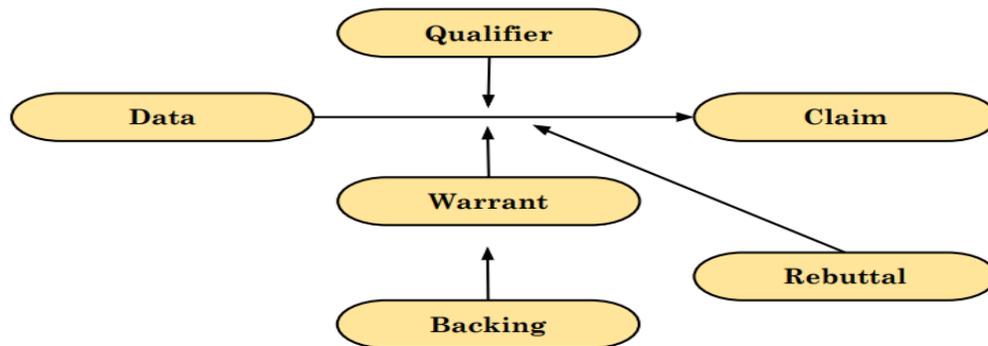
Figure 1. Toulmin's model of argumentation (Toulmin, 2003)

Among the components that make up the structure of Toulmin's Model of Argumentation, a *claim* expresses the asserted opinions, the *grounds* indicates the evidence supporting the claim, the *warrant* refers to the statements explaining the relationship between the claim and the grounds, *backing* refers to the assumptions that strengthen the relationship between the *grounds* and the claim, and the *rebuttal*

indicates the cases where the claims can be invalid, and the *qualifier* refers to situations in which the claim can be true and valid (Toulmin, 2003).

The results of the studies in the relevant literature on the ABT method indicate that applying this approach results in a positive impact on the *academic success* of students (Grimberg, 2008; Yeşildağ-Hasançebi & Günel, 2013; Ceylan, 2010; Kabataş-Memiş, 2011; Uluay, 2012; Polat, 2014) in particular, besides *conceptual understanding* (Büber, 2015; Hasnunidah, Susilo, Irawati & Suwono, 2020; Jang, 2011; Solak, 2016; Yildırır, 2020), *higher-order thinking skills* (Antiliou, 2012; Büyükalan-Filiz & Işıker, 2019; Giri & Paily , 2020; Kabataş-Memiş & Çakan-Akkaş, 2020; Kunsch, Schnarr & Van Tyle, 2014; Nussbaum & Sinatra, 2003; Nussbaum, Winsor, Aqui & Poliquin, 2007; Van Aufschnaiter, Erduran, Osborne & Simon, 2008), *argumentation skills* (Fan, Wang & Wang, 2020; Foong & Daniel, 2013; Hsu, Van Dyke, Chen & Smith, 2015; Faize & Dahar, 2017; Torun & Açıkgül-Fırat, 2020), as well as on *teaching socio-scientific issues* (Dawson & Carson, 2020; Karakaş & Sarıkaya, 2020; Zhu, Lee, Wang, Liu, Belur & Pallant, 2017; Xiao, 2020). However, it has been demonstrated that through the ABT approach, students can learn the subjects better, their self-confidence increases, and they gain a sense of responsibility (Kabataş-Memiş, 2014).

Considering the studies conducted, it is determined that argumentation, which is among the approaches in which research and inquiry-based science education is integrated, concentrates especially in the field of science education (Erduran, 2020; Evagorou, Nicolaou & Lymbouridou, 2020; Najami, Hugerat, Kabya & Hofstein, 2020; Short, Van der Eb & McKay, 2020; Choden & Kijkuakul, 2020; Milanovic & Trivic, 2020), besides the limited number of studies in the field of social studies (Akbaş, Şahin & Meral, 2019; Bulut, Kaçar & Arıkan, 2019; Demir, 2017; Dingler, 2017; Oğuz & Demir, 2016; Torun, 2015). Despite the expressed positive results of the ABT approach, students appear to have difficulty in making an argument on a problem they faced during the argumentation process and cannot form an argument at the same level (Jonassen & Kim, 2010; Sandoval & Millwood, 2005; Torun & Açıkgül-Fırat, 2020). Çetin, Kutluca, and Kaya (2013) emphasized that there are few studies in which the argument level is determined. In this context, it is considered important to provide learning environments where students can gain argumentation skills. Given that the people who will present these learning environments to students are teachers, it is inevitable that teachers should have these skills and prepare appropriate learning environments (Kabataş-Memiş & Çakan-Aktaş, 2020). As a matter of fact, it is necessary that prospective teachers also have such skills as they will be the teachers in the future (Torun & Açıkgül-Fırat, 2020; Kara, Yılmaz & Kıngır, 2020). Namdar and Tuskan (2018) stated that teachers face some difficulties in planning lessons based on argumentation and in relevant classroom practices. In addition, many other researchers have emphasized that teachers have some deficiencies with the argumentation process and that they do not have sufficient experience with argumentation (Erduran, Ardaç & Yakmacı-Güzel, 2006; Simon, Erduran & Osborne, 2006; Özcan, 2016; Yıldırır, 2020). By the same taken, Çetinkaya and Taşar (2018) stated that the studies focus more on the variables of academic achievement, the nature of science, conceptual understanding, and recently on the attitude towards the lesson and discussion, as well as various skills, in particular, and emphasized the fact that the studies conducted with prospective teachers are limited. In addition, it was stated by Baydaş, Yeşildağ-Hasancebi, and Kilis (2018) that it is of extreme importance to demonstrate how much the willingness to debate, which can be measured through the scale, reflects the real situation through practices in real environment.

Considering the positive results of argumentation as a guide and its deficiencies as a gap that should be completed in the literature, this study used Kolberg's moral dilemma stories in determining the prospective teachers' argument-making skills. Based on Kohlberg's work (Naylor & Diem, 1987), the acquisition of moral values according to the moral reasoning approach can be achieved in line with the reasoning processes that are shaped according to the cognitive development of a person (Ekşi & Katılmış, 2011; Doğanay, 2009). In this direction, the students are presented with stories that include dilemmas so that they can develop critical thinking and reasoning (Yiğittir & Kaymakcı, 2012), and bring solutions to problems by thinking and discussing (Karatay, 2011; Yeşil & Aydın, 2007). During the dilemma stories, the reasoning process, logical foundations and evaluations used are as important as the way a person solves the problem (Aydın, 2008). While this process is being carried out, small groups are asked to discuss the stories with moral dilemmas based on 'why and what for' (Suparka & Johnson, 1975) because it is the best way for students to discuss with each other to gain a certain understanding of the problem (Ellis, 2007). During the discussions, whether the answers given by the students are correct or incorrect does not matter. As a result of the applications, the participants who have developed moral reasoning skills can have the ability to negotiate critically and rationally, and can critically evaluate different views and change their opinions when necessary (Çiftçi, 2003). In this process of change, it is believed that using moral dilemma stories based on reasoning and discussion will provide positive changes on students' argument-making skills and willingness to debate. The strengths of this study can be expressed as the comparison of the argumentation skills of prospective teachers from different fields rather than a single field, inclusion of moral dilemma stories in determining argumentation skills, and analysis of the discussion processes of prospective teachers. It can be assumed that this strong structure has shaped this study in a way different from previous studies conducted with the ABT. Thus, we aimed to examine the effect of the ABT on prospective teachers' argument-making skills and willingness to debate. For this purpose, answers were sought to the following research questions:

- ❖ To what extent is the ABT approach effective on prospective teachers' argument-making skills?
- ❖ Does the ABT approach have a significant effect on prospective teachers' willingness to debate?

2. Method

2.1. Research design

This study employed one-group pre-test-post-test experimental design, which is one of the quantitative research approaches (McMillan & Schumaher, 2014). In the single group pre-test-post-test design, the effect of the dependent variable is measured not only after the application but also before the application (Fraenkel, Wallen & Hyun, 2012). An experimental design was preferred because this study aimed to examine the effect of the ABT method on prospective teachers' argumentation skills and willingness to debate.

2.2 Participants

The participants of the study included a total of 192 third grade students in the Departments of Social Studies Education, Classroom Education and Mathematics Education at a state university in the 2019-2020 academic year in Turkey. They were selected via maximum variation sampling model on voluntary basis.

2.3. Data Collection Tools

The data collecting tools of the study were as in the following:

2.4. The Scale of Willingness to Debate

The "Scale of Willingness to Debate" developed by Infante and Rancer (1982) was used to determine prospective teachers' willingness to debate. Adapted to Turkish by a validity and reliability study by Kaya (2005), the scale consists of 20 items in total and was graded as a 5-point Likert as *Always, Often, Sometimes, Rarely* and *Never*. The reliability coefficient of the original form of the scale was .91, while it was .71 after the scale was translated into Turkish. The internal consistency reliability coefficient (Cronbach's alpha) of the argumentativeness scale for this study was calculated as .82.

2.5. Moral Dilemma Stories

In order to determine the level of argumentation of the prospective teachers, the study included the four dilemma stories in the opinion test, which was developed by James Rest (1979) based on Kohlberg's theory of cognitive moral development (Elm & Weber, 1994) and adapted into Turkish by Akkoyun (1987) as the stories were considered to be suitable for Turkish culture. The dilemma stories used in this study are 'A Doctor's Dilemma', 'An Employer's Dilemma', 'A Fugitive Prisoner's Dilemma', and 'Heinz's Dilemma'. After the prospective teachers read the moral dilemma stories, they were asked to write their opinions using the claim, grounds, warrant, backing, and rebuttal components to express on what reason they based their opinions. Argument levels were measured based on what the prospective teachers wrote.

2.6. The implementation process

Before starting the application, prospective teachers were first informed about the purpose of the research and argumentation-based teaching, and sample argumentation activities were conducted with them in order to make them comprehend the points that need to be considered while creating argumentation. The application process took 6 weeks in total, during which the following four moral dilemma stories were used: A Doctor's Dilemma (Story 1), An Employer's Dilemma (Story 2), A Fugitive Prisoner's Dilemma (Story 3), and Heinz's Dilemma (Story 4). The first week of the application process was reserved for pre-tests, the last week for post-tests, and the rest 4 weeks for moral dilemma stories. In the application process, firstly, prospective teachers were divided into groups of 5 and handed out activities containing moral dilemma stories to be used in the application process. The participants were given a moral dilemma activity every week. During the moral dilemma activities, prospective teachers were asked to make their arguments about the dilemma they faced and to formulate their arguments

individually, first, and then share their arguments with their groupmates, defend their arguments using argument components, and convince their groupmates who defended a different claim. After each group came up with their arguments, the group spokespersons presented the claims they defended to the class, followed by small group discussions held to defend their claims, and a course process was finalized in that way. Some images of the application are presented in Figure 2.

Figure 2. Images from the Application Process

2.7. Data analysis

Figure 3 presents the operations performed prior to proceeding to the analysis of the data.

Figure 3. The process prior to data analysis

Considering the aims of the research and the research questions, the following tests were taken into account in the analysis of the data:

- ✓ Paired sample t test and Wilcoxon test to determine whether there is a significant difference between pre-test and post-test scores regarding students' argumentativeness.
- ✓ The argumentation level assessment rubric to determine the students' argument skills.
- ✓ The effect size value was calculated in order to determine how effective the application was. The value of 0.2 indicates a small effect size, 0.5 a medium

effect, and 0.8 a large effect size (Green & Salkind, 2005; Can, 2017), which were all taken into consideration for the effect size in the study.

✓ In the analysis of the data the argumentation evaluation rubric developed by Erduran, Simon, and Osborne (2004) was used to evaluate the arguments created by the prospective teachers through moral dilemma stories, according to the argument components. Table 1 presents the argument components and levels constituting the argumentation assessment rubric developed by Erduran et al. (2004).

Table 1. Argumentation assessment rubric

Argumentation Level	Argumentation Content / Component
Level 1	A simple claim or a counter claim against a simple claim.
Level 2	A simple claim along with another claim, grounds, warrant or backing, but without any rebuttal.
Level 3	The claims, counter-claims, along with the grounds, warrant, backing and weak rebuttals.
Level 4	The claims, the grounds, warrant, backing and a firm rebuttal
Level 5	The claims, the grounds, warrant, backing and more than one rebuttal.

3. Results

3.1. Results regarding the first research problem

In the first week of the application, *'A Doctor's Dilemma'* (Story 1) was performed as an activity. Figure 4 presents the findings about the levels of argument made by the prospective teachers regarding the activity called a Doctor's Dilemma.
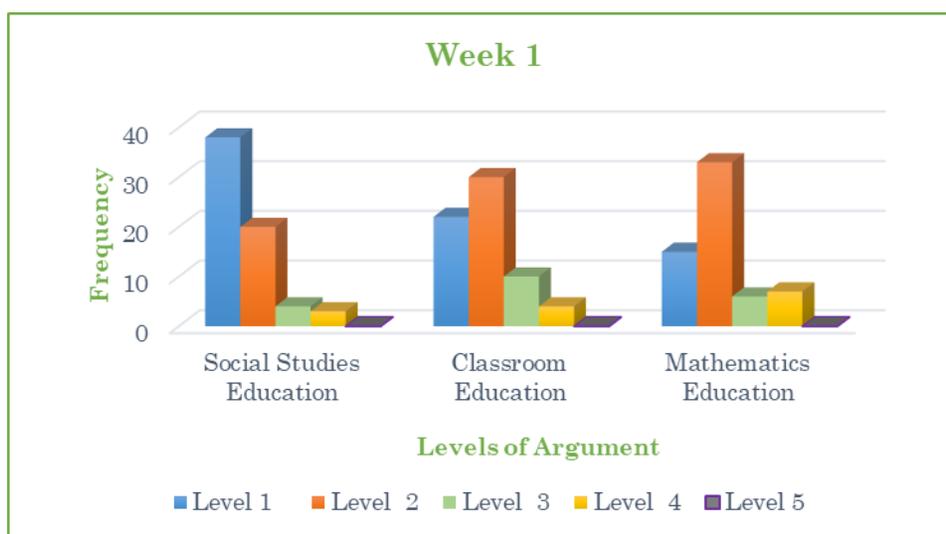
Figure 4. The argument levels of prospective teachers regarding the first week's activity

The analysis of the arguments made by the prospective teachers regarding the Doctor's Dilemma (Story 1) activity revealed that the prospective teachers studying in Social Studies Education formed f = 38 arguments at Level 1, f = 20 at Level 2, f = 4 at Level 3, and f = 3 at Level 4. On the other hand, the prospective teachers studying in Classroom Education made f = 22 arguments at Level 1, f = 30 at Level 2, f = 10 at Level 3 and f = 4 at Level 4, while the prospective teachers of Mathematics Education made f = 15 arguments at Level 1, f = 33 at Level 2, f = 6 at Level 3, and f = 7 at Level 4 (Figure 4).

In the second week of the application, 'An Employer's Dilemma' (Story 2) activity was applied. Figure 5 presents the findings about the levels of argumentation created by the prospective teachers regarding the dilemma.
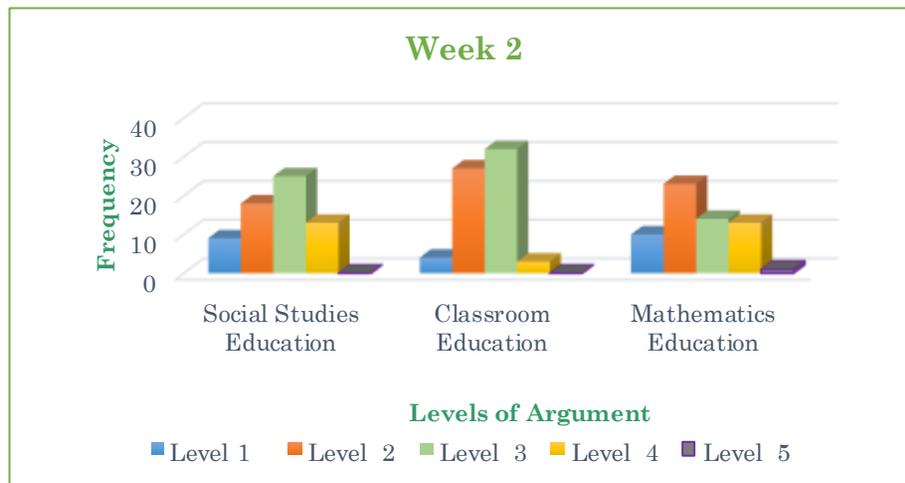
Figure 5. The levels of argument of prospective teachers regarding the second week's activity

The analysis of the arguments made by the prospective teachers regarding the Employer's Dilemma (Story 2) activity revealed that the prospective teachers studying in Social Studies Education formed f = 9 arguments at Level 1, f = 18 at Level 2, f = 25 at Level 3, and f = 13 at Level 4. On the other hand, the prospective teachers studying in Classroom Education created f = 4 arguments at Level 1, f = 27 at Level 2, f = 32 at Level 3 and f = 3 at Level 4, while the prospective teachers of Mathematics Education made f = 10 arguments at Level 1, f = 23 at Level 2, f = 14 at Level 3, and f = 13 at Level 4 (Figure 5).

In the third week of the application, 'A Fugitive Prisoner's Dilemma' (Story 3) activity was applied. Figure 6 presents the findings about the levels of argumentation created by the prospective teachers regarding the dilemma.
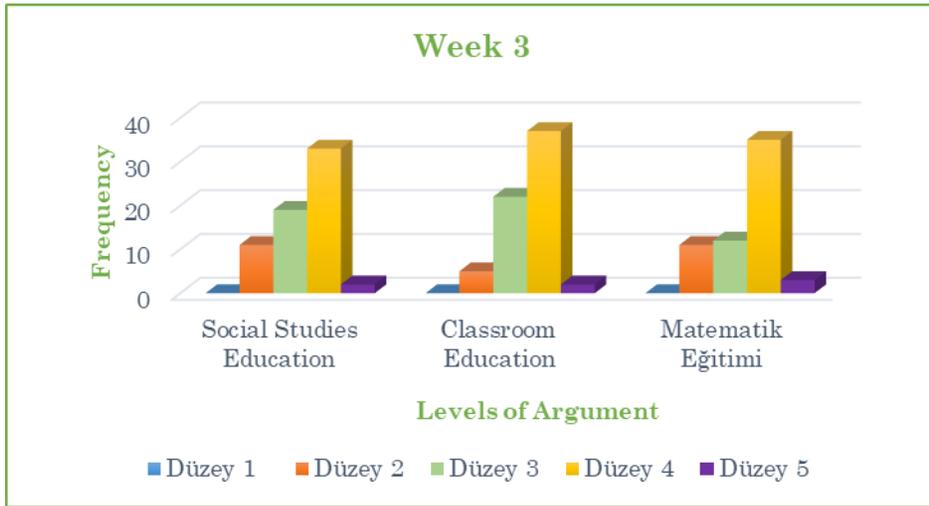
Figure 6. The levels of argument of prospective teachers regarding the third week's activity

The analysis of the arguments made by the prospective teachers regarding the Fugitive Prisoner's Dilemma (Story 3) activity revealed that the prospective teachers studying in Social Studies Education formed f = 11 arguments at Level 2, f = 19 at Level 3, f = 33 at Level 4, and f=2 at Level 5. On the other hand, the prospective teachers studying in Classroom Education created f =5 arguments at Level 2, f = 22 at Level 3, f = 37 at Level 4, and f=2 at Level 5, while the prospective teachers of Mathematics Education made f = 11 arguments at Level 2, f = 12 at Level 3, f = 33 at Level 4, and f=3 at Level 5 (Figure 6).

In the fourth week of the application, 'Heinz's Dilemma' (Story 4) activity was applied. Figure 7 presents the findings about the levels of argumentation created by the prospective teachers regarding the dilemma.
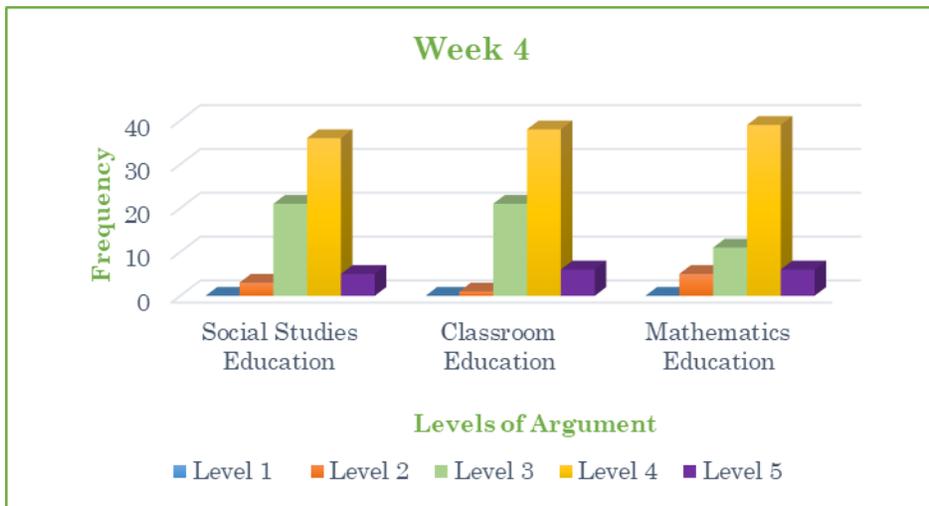
Figure 7. The levels of argument of prospective teachers regarding the fourth week's activity

The analysis of the arguments made by the prospective teachers regarding the Heinz's Dilemma (Story 4) activity revealed that the prospective teachers of Social Studies Education formed f = 3 arguments at Level 2, f = 21 at Level 3, f = 36 at Level 4, and f=5 at Level 5. On the other hand, the prospective teachers of Classroom Education created f =1 arguments at Level 2, f = 21 at Level 3, f = 38 at Level 4, and f=6 at Level 5, while the prospective teachers of Mathematics Education made f = 5 arguments at Level 2, f = 13 at Level 3, f = 39 at Level 4, and f=6 at Level 5 (Figure 7).

The argumentations made by the prospective teachers and their levels regarding the activities during the application (for 4 weeks) are presented in Table 2 and Figure 8 below.

Table 2. The argumentations made by the prospective teachers and their levels regarding the activities during the application

Week	Activity	Level 1 (f)	Level 2 (f)	Level 3 (f)	Level 4 (f)	Level 5 (f)
Week 1	Story 1	75	79	20	14	0
Week 2	Story 2	23	68	71	29	1
Week 3	Story 3	0	27	53	103	7
Week 4	Story 4	0	9	54	114	17
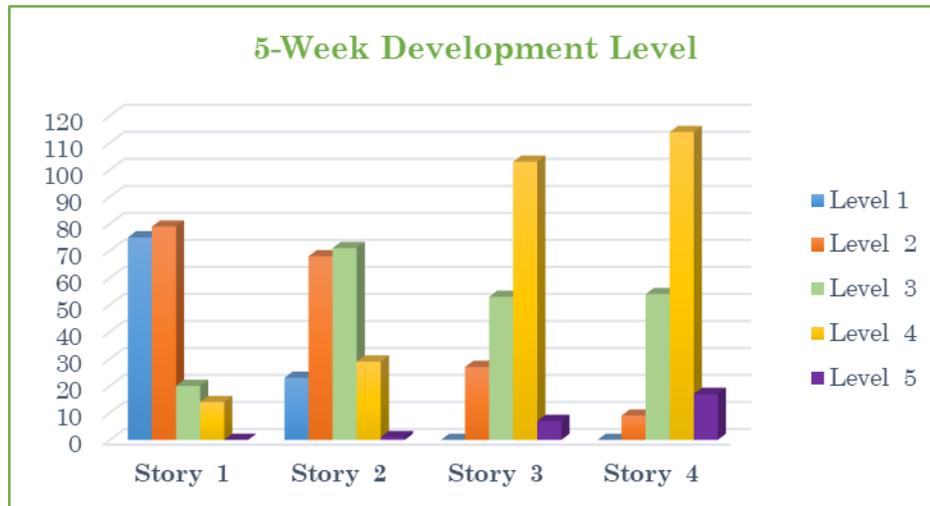
Figure 8. Argumentation levels created by prospective teachers during the application

Table 2 presents that prospective teachers made f = 75 arguments at Level 1 in the first week's activity (Story 1), f = 23 in the second week's activity (Story 2), f = 0 in the third week's activity (Story 3), and f = 0 in the fourth week's activity (Story 4). At Level 2, on the other hand, the prospective teachers made f= 79 arguments in the first week's activity (Story 1), f = 68 in the second week's activity (Story 2), f=27 in the third week's activity (Story 3), and f=9 in the fourth week's activity (Story 4). At level 3, the prospective teachers made f= 20 arguments in the first week's activity (Story 1), f = 71 in the second week's activity (Story 2), f=53 in the third week's activity (Story 3), and f=54 in the fourth week's activity (Story 4). At level 4, the prospective teachers made f= 14

arguments in the first week's activity (Story 1), f = 29 in the second week's activity (Story 2), f=103 in the third week's activity (Story 3), and f=114 in the fourth week's activity (Story 4). Finally, at level 5, the prospective teachers made f= 0 argument in the first week's activity (Story 1), f = 1 in the second week's activity (Story 2), f=7 in the third week's activity (Story 3), and f=17 in the fourth week's activity (Story 4)

Based on the results, we concluded that the prospective teachers in all three departments produced more arguments at Level 1 and Level 2 in the first week of the application process. In the second week, however, the prospective teachers of Social Studies Education and Classroom Education made more argumentations at Level 3, whereas those in Mathematics Education department seemed to have produced more arguments at Level 2. Still, in the third and fourth weeks of the application process, the prospective teachers studying in all three departments produced arguments at Level 4 by using all of the argument components (claim, grounds, warrant, rebuttal and backing). Also, the prospective teachers produced arguments at Level 5, in which more than one rebuttal was used, in the fourth week of the application. In this context, it can be assumed that as the process progresses in such a way to enable the prospective teachers to get used to the argumentation process, their level of argument-making increased and they produced better quality arguments.

3.2. The results regarding the second research problem

In order to determine the effects of argumentation-based teaching on prospective teachers' willingness to debate by using moral dilemma stories, the prospective teachers were given the 'Willingness for Argumentation Scale' as a pre-test and a post-test. Table 3 presents the descriptive statistics and paired samples t test results regarding pre-test and post-test data of prospective teachers of Classroom Education and Social Studies.

Table 3. The descriptive statistics and paired samples t test results regarding pre-test and post-test data of prospective teachers of classroom education and social studies

Department	Scale	N	$\overline{X}$	Ss	Sd	t	p
Social Studies	Pre-test	65	69.47	9.26	64	-3.185	.002
	Post-test	65	74.50	9.55			
Classroom Education	Pre-test	66	65.16	9.42	65	-5.923	.000
	Post-test	66	74.16	8.99			

Table 3 shows the descriptive statistics of the data obtained from the pre-test and post-test of the scale, indicating that the post-test mean scores of the prospective teachers are higher than the pre-test mean scores. Paired Samples t test was conducted to determine whether the difference between pre-test and post-test mean scores was statistically significant. Table 3 demonstrates that there was a statistical significance between the pre-test and post-test scores of students' willingness to debate according to the data obtained from the scale (*Social, $t_{(64)}$= -3.185, p= .002; p < .05; Classroom, $t_{(65)}$= -5.923, p= .000; p <.05*). The effect size value calculated as a result of the analysis shows that this difference is small for Social Studies Education (d = 0.39), while at medium level for classroom education (d = 0.72). Table 4 and Table 5 present the descriptive statistics for Mathematics Education data and Wilcoxon Test results.

Table 4. Descriptive statistics of the scores obtained from the pre-test and post-test data of the scale

Department	Scale	N	$\overline{X}$	Ss
Mathematics	Pre-test	61	66.19	10.73
	Post-test	61	74.39	9.85

Table 4 shows the descriptive statistics of the data obtained from the pre-test and post-test of the scale, indicating that the post-test mean scores of the prospective teachers are higher than the pre-test mean scores. The Wilcoxon test was conducted to determine whether the difference between pre-test and post-test mean scores was statistically significant. Table 5 presents the Wilcoxon test results.

Table 5. The Wilcoxon test results of the scores obtained from the pre-test-post-test data of the scale

Department	Scale	N	Average Rank	Average Total	z	p
	Negative Rank	14	28.11	393.50		
Mathematics	Positive Rank	47	31.86	1497.50	-3.967	.000
	No Significance	0				

Table 5 shows that there is a statistical significance between pre-test and post-test scores of prospective teachers' willingness to debate according to the data obtained from the scale (*Mathematics, z=-3.967, p= .000; p < .05)*. The effect size value calculated as a result of the analysis shows that it is at a medium level for Mathematics Education (r = 0.50). Figure 9 presents the pre-test and post-test mean scores of the prospective teachers for willingness to debate.
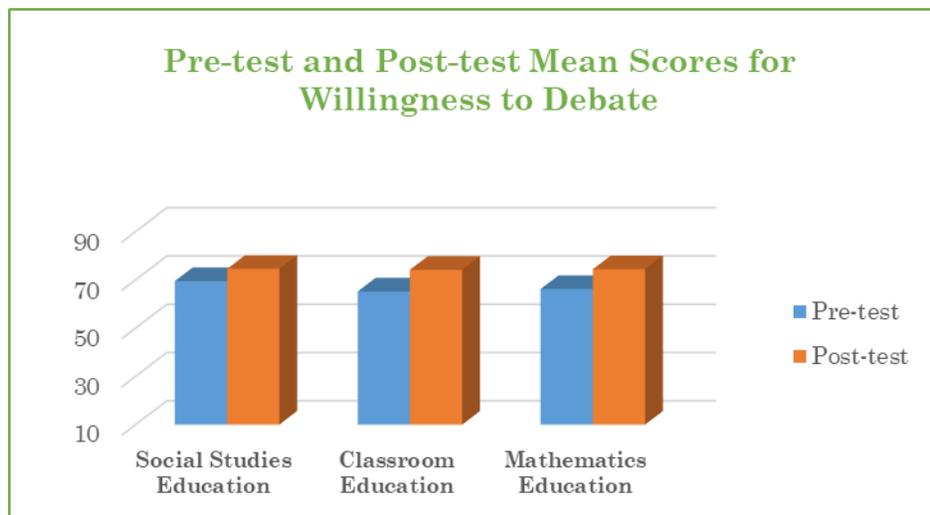
Figure 9. Pre-test and post-test mean scores for willingness to debate

Figure 9 indicates that there is a change between pre-test scores and post-test scores in terms of the willingness of prospective teachers (Social Studies, Classroom and Mathematics Education) to debate. It was determined that the difference, which emerged in terms of willingness to debate, occurred in the fields of Classroom Education, Mathematics Education and Social Studies Education, respectively.

4. Discussion

This study examined the effect of argumentation-based teaching on prospective teachers' argumentation skills and willingness to debate. The first result shows that as the application process progresses, the argumentation level of the prospective teachers increases and they produce better quality arguments. The results of this study and those of the studies in the literature on the ABT have parallel features (Aktaş & Kıvılcan-Doğan, 2018; Dawson & Carson, 2020; Erduran et al., 2004; Fan, Wang & Wang, 2020; Yıldırır, 2020; Wissinger, 2012; Nussbaum & Edwards, 2011). The low levels of the arguments formed by the prospective teachers during the initial weeks can be attributed to the fact that they have not encountered a lesson process in which the argumentation approach was applied before and they were not knowledgeable enough about the approach. As a matter of fact, it has been stated by different researchers that having a prior training on argumentation may be a factor affecting the level of argumentation, and that individuals' understanding of argumentation and acquiring the necessary argumentation skills will increase the quality of their arguments (Erduran et al., 2004; Osborne et al., 2004; Venville & Dawson, 2010; Zohar & Nemet, 2002; Torun & Şahin, 2016; Torun & Açıkgül-Fırat, 2020). When the argumentation development process was investigated in different studies in the literature, Karakaş and Sarıkaya (2020) emphasized that group activities improve argumentation, and it is, therefore, important to include group activities. As a result of their study to improve students' argumentation skills and boost the use of argumentation by teachers, Erduran et al., (2004) found that the levels of arguments produced by students during the process increased. Likewise, Wissinger (2012) observed in the study conducted in the social studies course that students were able to learn the argument schemes and ask critical questions during discussion, thereby increasing their levels of argumentation. The argumentation process gives students the opportunity to gain skills such as argumentation and reasoning while constructing scientific knowledge (Erduran & Jimenez-Aleixandre, 2007). Unlike the studies in the literature, moral dilemma stories were used in this study in determining prospective teachers' argumentation skills. A number of reasons can be assumed to explain how the argumentation-based teaching, which is conducted through moral dilemma stories (Gardiner & Gander, 2015) and improves the reasoning skills of individuals who are confronted with dilemma situations, boosts the argumentation skills of prospective teachers. Moral dilemma stories lead an individual to think more deeply in terms of mental and moral aspects by requiring cognitive inquiry (Power, Higgins & Kohlberg, 1989), which is the core of argumentation (Ekşi & Katılmış, 2011). During the contemplation process, in addition to the way people solve problems, the reasoning process, logical bases and evaluation steps used while reaching the solution (Aydın, 2008) constitute the basic components of argumentation. In other words, steps such as claim, grounds, and rebuttal that should be involved in the argumentation process will enable prospective teachers to make judgments in the process of participating in moral dilemma activities, and to find solutions to problems by thinking and discussing (Karatay, 2011). Thus, a claim put forward by the prospective teachers regarding the problem in the moral

dilemma stories necessitates the grounds to support this claim and a rebuttal against different ideas. This helps prospective teachers to develop argumentation skills in time.

Another result of the study is that there is a significant difference between the pre-test and post-test scores of prospective teachers' willingness to debate, indicating that argumentation-based teaching has a positive effect on prospective teachers' willingness to debate. The development of prospective teachers' willingness to debate can be gathered around various reasons. Yet, debating with each other is the best way for students to gain a certain understanding of the problem (Ellis, 2007). During the argumentation-based teaching process, which contains discussion in its essence, students are asked to explain by giving reasons and through discussing with other students what a person should do (Superka et al., 1976) in the face of moral dilemmas, and it is believed to develop students' willingness to debate. In addition, the fact that moral dilemma stories are related to real life situations leads prospective teachers to focus on the story and come up with a solution specific to the existing problem because they will feel obliged to respond to dilemmas presented in real life. As a matter of fact, the answers given to moral dilemmas emerge at the end of a process of reasoning (Ünlü, 2019). The prospective teachers experienced the process of making arguments cognitively and sought logical solutions. The most important step contributing to this search is the argumentation process that allows different ideas to be shared democratically with the appropriate discussion culture, rather than producing the correct or wrong answers during the application, for in the argumentation process, students can present their claims with appropriate evidence, and have the chance to convince the others with counter-opinions through their own rebuttal. However, students' efforts to make the right decision in the learning environment during the discussion process enable students to think, reason, and focus on the subject, providing them with a more qualified learning experience (Chen, Benus & Hernandez, 2019). Thanks to such opportunities, the discursive skills that students develop during the dialogue / discussion process with their peers are not only valuable, but are also important for students to form effective arguments and to defend them through assessing from different angles (Shi, Matos & Kuhn, 2019). People who have developed moral reasoning skills as a result of practices can have critical and rational negotiation ability, evaluate different ideas by criticizing and change their opinions when necessary (Çiftçi, 2003). However, when looking at the different studies focusing on improving the willingness to debate through the ABT method, it was emphasized by the researchers that the argumentation process improved the students' argumentation skills and encouraged them to debate (Ceylan, 2010; Demirci-Celep, 2015; Çınar, 2013; Öztürk, 2013; Demirel, 2016; Osborne et al., 2004; Öğreten & Uluçınar-Sağır, 2014; Simon, et al., 2006; Zohar & Nemet, 2002). Similarly, Baydaş, Yeşildağ-Hasancebi & Kilis (2018) found that ABT was effective on students' willingness to debate, and that there was a positive relationship, albeit low, between willingness to debate and participation in the discussion. In addition, studies conducted with teachers and prospective teachers by different researchers concluded that the argumentation process prompted individuals to interact, discuss and listen to each other (Baydaş, Yeşildağ-Hasancebi & Kilis, 2018; Ceylan, 2010; Hiğde & Aktamış, 2017; Simon et al., 2006; Yıldırır & Nakiboğlu, 2014).

It can be assumed that the reasons presented in the literature on the effect of the argumentation process on students' willingness to debate and the reasons found in this study are similar. Contrary to the positive results of the ABT method on the willingness to debate, there are other studies indicating that the argumentation process does not make a difference in students' willingness to debate, and that students act hesitantly in case of discussion and their level of discussion is low (Aktaş, Kıvılcan-Doğan, 2018;

Demircioğlu, 2011; Rod-Watson, Swain & McRobbie, 2004; Sampson, Grooms & Walker, 2011). In this context, it is believed that it will be possible to enhance the impact of the ABT method on the willingness to debate with new studies.

5. Conclusions and Suggestions

It has been observed that the ABT method, which involves both teachers and students as stakeholders in the learning process, made an important contribution to the search for qualified, versatile and innovative education in the 21st century world. It is very important that ABT, which is shaped by moral dilemma stories, surrounds students with higher-order thinking skills such as research, questioning, reasoning, generating ideas, using evidence and evaluating them, and directing them to create quality arguments and be active in the discussion process. The positive effects of the ABT are reflected in the results of this research as in many studies. Figure 10 presents the result of the ABT method, which was formed with moral dilemma stories in this study.
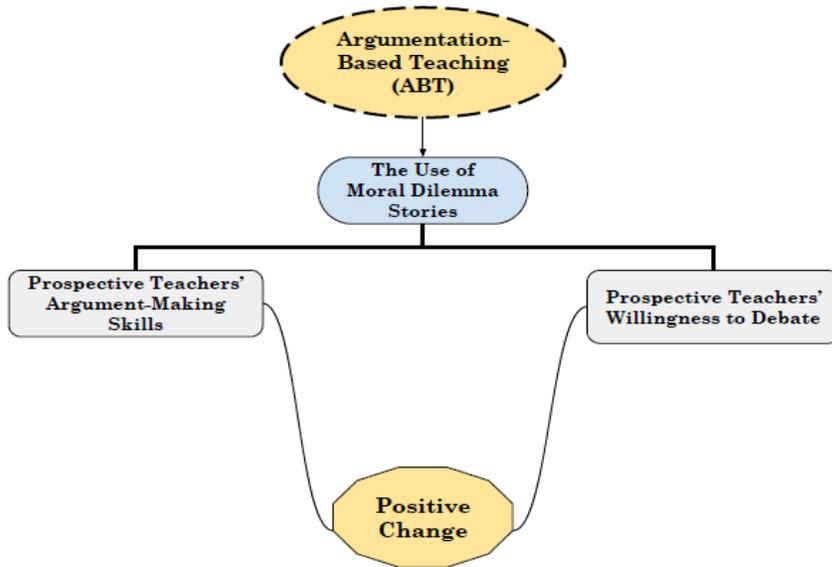
Figure 10. Results of the study

The limitation of this study is that it was carried out in a six-week period and that only four moral dilemma stories were used as an activity to determine the argumentation skills of the prospective teachers.

Considering the findings and results of the research, the following recommendations have been made for researchers and practitioners:

- ✓ Many other studies can be conducted on the ABT and willingness to debate in order to clarify its effect on the willingness to debate.
- ✓ This study was conducted through moral dilemma stories. Similar studies can be conducted on different argumentation scenarios.

    ✓ This study focused on the effect of the ABT method on argument formation and the willingness to debate. Similar studies may be conducted to develop higher-order skills

References

Akbaş, Y., Şahin, İ. F., & Meral, E. (2019). Implementing argumentation-based science learning approach in social studies: academic achievement and students' views. *Review of International Geographical Education Online (RIGEO), 9*(1), 209-245. doi: 10.33403/ rigeo. 529139

Akdağ, B. (2003). Geleceğin okul modelleri. *Felsefeci Dergisi*, *5*, 13-24. Retrived from https ://docplayer. biz.tr/14880179-Akdag-bulent-gelecegin-okul-modelleri-felsefeci-dergisi-sayi-5-2003-geleceg in-okul-modelleri-dr-bulent-akdag.html

Akkoyun, F. (1987). Empathic tendency and moral judgment. *Journal of Psychology*, *6*(21), 91-97.

Aktaş, T., & Kıvılcan-Doğan, Ö. (2018). The effect of argument driven inquiry model on academic performances and argumentative attitudes of 7th grade students. *Mersin University Journal of the Faculty of Education, 14*(2), 778-798. doi: 10.17860/mersinefd.342569

Antiliou, A. (2012). *The effect of an argumentatıon diagram on the self-evaluatıon of a creatıve solution* (Unpublished doctoral dissertation). Retrieved from https://search.proquest.com/do cview/ 1627759322?pq-origsite=summon (3674379).

Aydın, M. Z. (2008). *Case study method in moral education and moral education at school* (3rd edition). Ankara: Nobel.

Baydas, O., Yesildag-Hasancebi, F., & Kilis, S. (2018). An investigation of university students' discussion process in argumentation based inquiry approach, *Inonu University Journal of the Faculty of Education*, *19*(3), 564-581. doi: 10.17679/inuefd.341522

Bilir, V., Tatlı, A., Yıldız, C., Emiroğlu, B. B., Ertuğrul, D., & Sakmen, G. (2020).The effect of argumentation techniques used in argumentation based learning approach on 8th grade secondary school students' image of scientist. *GUJGEF, 40*(2), 481-510.

Büber, A. (2015). *The effects of argümantation based learning activites on conceptual understanding of 7th graders about "Force and motion" unit and establishing thinking friendly classroom environment* (Unpublished master's thesis). Dokuz Eylül University, İzmir.

Bulut, B., Kaçar, T., & Arıkan, İ. (2019). Argumentation-based learning in social studies teaching. *Journal of Education and Learning, 8*(3), 89-94. https://doi.org/10.5539/jel.v8n3p89

Büyükalan-Filiz, S., & Işıker, Y. (2019). Effect of argumentatıon-based teaching on students' critical thinking skills ın elementary school science class 4. *Social Sciences Studies Journal (SSS Journal), 5*(30): 546-556.

Can, A. (2017). *SPPS ile bilimsel araştırma sürecinde nicel veri analizi* (5. Baskı). Ankara: Pegem Akademi.

Çetin, P. S., Kutluca, A. Y., & Kaya, E. (2013). Öğrencilerin argümantasyon kalitelerinin incelenmesi. *Fen Bilimleri Öğretimi Dergisi, 2*(1), 56-66. http://fead.org.tr/dergi

Çetinkaya, E., & Taşar, M. F. (2018). Examining the argumentation researches at the science education in Turkey. *Hacettepe University Journal of Education*, *33*(2), 353-381. doi:10.16986/HUJE. 2017030625

Ceylan, Ç. (2010). *Implementing the science writing heuristic (SWH) approach in science laboratory activities* (Unpublished master's thesis). Gazi University, Ankara.

Chen, Y., Benus, M., & Hernandez, J. (2019). Managing uncertainty in scientific argumentation. *Science Education, 103*(5), 1235–1276. https ://doi.org/10.1002/sce.21527

Choden, T., & Kijkuakul, S. (2020). Blending problem based learning with scientific argumentation to enhance students' understanding of basic genetics. *International Journal of Instruction*, *13*(1), 445-462. https://doi.org/10.29333/iji.2020.13129a

Choi, A., Notebaert, A., Diaz, J., & Hand, B. (2010). Examining arguments generated by year 5, 7, and 10 students in science classrooms. *Research in Science Education*, *40*, 149–169.

Çiftçi, N. (2003). The cognitive-moral developmental theory of Kohlberg: moral and democracy education. *Values Education Journal* , *1*(1), 43-77.

Çınar, D. (2013). *The Effect of argumentation based science instruction on 5th grade students' learning outcomes* (Unpublished doctoral dissertation). Necmettin Erbakan University, Konya.

Dawson, V., & Carson, K. (2020). Introducing argumentation about climate change socioscientific issues in a disadvantaged school. *Research in Science Education*, *50*(3), 863-883. https://doi.org/ 10.1007/ s11165-018-9715-x

Demir, F. B. (2017). *The arguments of social studıes teacher candıdates workbased traınıng process, according to the determinantın of the level of argument* (Unpublished master's thesis). Kastamonu University, Kastamonu.

Demirci-Celep, N. (2015). *The effects of argument-driven inquiry instructional model on 10th grade students' understanding of gases concepts* (Unpublished doctoral dissertation). Middle East Technical University, Ankara.

Demircioglu, T. (2011). *To investigate the effect of argument-driven inquiry on pre-service science teachers' laboratory ınstructıon* (Unpublished master's thesis). Çukurova University, Adana.

Demirel, R. (2016). The effect of scientific argumentation students' conceptual understanding and willingness for argumentation. *Kastamonu Education Journal*, *24*(3), 1087-1108

Dingler, M. (2017) Arguing for democracy: A multimodal approach to argumentative writing İnstruction in the social studies classroom, *The Social Studies, 108*(3), 111-119. https://doi.org/ 10.1080/00377996.2017.1324393

Doğanay, A. (2009). Değerler eğitimi. Cemil Öztürk (Ed.), *Sosyal bilgiler öğretimi demokratik vatandaşlık eğitimi* içinde (pp. 225-256). Ankara: Pegem.

Doğanay, A., & Sarı, M. (2012). Prediction level of the constructivist learning environment on the characteristics of thinking-friendly classroom. *Çukurova University Institute of Social Sciences, 21*(1), 21-36.

Ekşi, H., & Katılmış, A. (2011). Values education approaches. *Journal of religious*, 245, 1-3.

Ellis, C. (2007). Telling secrets, revealing lives: Relational ethics in research with intimate others. *Qualitative Inquiry*, *13*(1), 3-29.

Elm, D. R., & Weber, J. (1994). Measuring moral judgement ınterview or the defining ıssues test? *Journal of Business Ethics*, *13*(5), 341-355.

Erduran, S. (2020). Argumentation in science and religion: match and/or mismatch when applied in teaching and learning? *Journal of Education for Teaching*, *46*(1), 129-131. https://doi.org/ 10. 1080/02607476.2019.1708624

Erduran, S., & Jimenez-Aleixandre, M. P. (2007). *Argumentation in science education: Recent developments and future directions. New* York: Teacher's College Press.

Erduran, S., Ardac, D., & Yakmaci-Guzel, B. (2006). Learning to teach argumentation: Case studies of pre-service secondary science teachers. *Eurasia Journal of Mathematics, Science and Technology Education,* 2(2), 1-14. doi: 10.12973/ejmste/75442

Erduran, S., Simon, S., & Osborne, J. (2004). TAPping into argumentation: Developments in the application of Toulmin's argument pattern for studying science discourse. *Science Education, 88*(6), 915-933. doi: 10.1002/sce.20012

Evagorou, M., & Osborne, J. (2013). Exploring young students' collaborative argumentation within a socioscientific issue. *Journal of Research in Science Teaching, 50*(2), 209-237. https://doi.org/10.1002/tea.21076

Evagorou, M., Nicolaou, C., & Lymbouridou, C. (2020). Modelling and argumentation with elementary school students. *Canadian Journal of Science, Mathematics and Technology Education*, 20, 58-73. https://doi.org/10.1007/s42330-020-00076-9

Faize, F. A., & Dahar, M. A. (2017). Developing argumentation skills among undergraduate students using inquiry led argument framework. *Pakistan Journal of Education*, *34*(2), 37-54. doi: 10.30971/npje.v34i2.376

Fan, Y. C., Wang, T. H., & Wang, K. H. (2020). Studying the effectiveness of an online argumentation model for improving undergraduate students' argumentation ability. *Journal of Computer Assisted Learning*, *36*(4), 1-14. doi: 10.1111/jcal.12420

Fettahlıoğlu, P., & Aydoğdu, M. (2020). Developing environmentally responsible behaviours through the implementation of argumentation and problem-based learning models. *Research in Science Education 50*, 987–1025. https://doi.org/10.1007/s11165-018-9720-0

Foong, C. C., & Daniel, E. G. (2013). Students' argumentation skills across two socio-scientific issues in a confucian classroom: Is transfer possible?. *International Journal of Science Education*, *35*(14), 2331-2355. https://doi.org/10.1080/ 09500693.2012.697209

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). New York: McGraw-Hill.

Gardiner, H. W., & Gander, M. J. (2015). *Çocuk ve ergen gelişimi.* (A. Dönmez & N. Çelen, çev.) Ankara: İmge.

Giri, V., & Paily, M. U. (2020). Effect of scientific argumentation on the development of critical thinking. *Science & Education*. https://doi.org/10.1007/s11191-020-00120-y

Green, S. B., & Salkind, N. J. (2005). *Using Spss for windows and macintosh: Analyzing and understanding data.* Upper Saddle River, New Jersey 07458.

Grimberg, B. (2008). Promoting high-order thinking through the use of the science writing heuristic. In B. Hand (Ed.), *Science Inquiry, Argument and Language* (pp. 87-98). Rotterdam: Sense Publisher.

Gunel, M., Akkus, R., Hohenshell, L., & Hand, B. (2004). *Improving student performance on higher order cognitive questions through the use of the science writing heuristic.* Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Vancouver, B.C., Canada.

Hanushek E. A., & Woessmann, L. (2010). Education and economic growth. In: Penelope Peterson, Eva Baker, Barry McGaw, (Editors), *International Encyclopedia of Education*. *2,* 245-252. Oxford: Elsevier.

Hasnunidah, N., Susilo, H., Irawati, M., & Suwono, H. (2020). The contribution of argumentation and critical thinking skills on students' concept understanding in different learning models. *Journal of University Teaching & Learning Practice, 17*(1), 1-11. https://ro.uow.edu.au/jutlp/vol17/ iss1/6

Hiğde, E., & Aktamış, H. (2017). Examination of pre-service science teachers' argumentation based science lessons: Case. *Elementary Education*, *16*(1), 89-113.

Hsu, P.S., Van Dyke, M., Y. Chen, Y., & Smith, T.J. (2015). The effect of a graph-oriented computer-assisted project-based learning environment on argumentation skills. *Journal of Computer Assisted Learning*, 31, 32–58. doi: 10.1111/jcal.12080

Jang, J. Y. (2011). *The effect of using a structured reading frame work on middle school students' conceptual understanding with in the science writing heuristic approach* (Unpublished doctoral dissertation). University of Iowa, Iowa.

Jonassen, D. H., & Kim, B. (2010). Arguing to learn and learning to argue: Design justifications and guidelines. *Education Technology Research and Development, 58*(4), 439-457. doi:10. 1007/s11423-009-9143-8

Kabataş,-Memiş., & Çakan-Akkaş, B. N. (2020). Developing critical thinking skills in the thinking-discussion-writing cycle: The argumentation-based inquiry approach. *Asia Pacific Education Review*, *21*(3), 441-453. https://doi.org/10.1007/s12564-020-09635-z

Kabataş-Memiş, E. (2011). *Effects of the argumentation based science learning approach and self evaluition primary school students? Science and technology course achievement and retention of the achievement* (Unpublished doctoral dissertation). Atatürk University, Erzurum.

Kabataş-Memiş, E. (2014). Elementary students' ideas about on implementation of argumentation based science learning approach. *Journal of Kastamonu Education*, *22*(2), 401-418.

Kara, S., Yılmaz, S., & Kıngır, S. (2020). The effect of argumentation based science learning approach on the academic achievement and argumentation quality levels of primary students. *Kastamonu Education Journal, 28*(3), 1253-1267. doi: 10.24106/kefdergi.3785

Karakaş, H., & Sarıkaya, R. (2020). The effect of argumentation-based teaching carried out for environment-energy on the argumentatin skills of prospective teacher. *University Journal of Education, 48*, 346-373. doi:10.9779/pauefd.524850

Karatay, H. (2011). Using literary works in character education. *Turkish Studies* - International Periodical for the Languages, Terature and History of Turkish, *6*(1), 1439-1454.

Kaya, O. N. (2005). *The effect of teaching based on argumentation theory on the achievement of the students related to the particulate nature of matter and conception of the nature of science* (Unpublished doctoral dissertation). Gazi University, Ankara.

Kayaalp, F., & Şimşek, U. (2020). (Do) spoken words fly and written words remain (?): an analysis on the impacts of using writing-to-learn activities in the social studies class on cognitive learning, and students' views, *International Journal of Eurasian Education and Culture, 5*(10), 1242-1314. Retrieved from http://www.ijoeec.com/Makaleler/191394387_4.%201242-1314%20fatih%20kayaalp.pdf

Kelly, G., & Takao, A. (2002). Epistemic levels in argument an analysis of university oceanography students' use of evidence in writing. *International Science Education*, 86, 314-342. doi:10.1002/ sce.10024

Küçük, H., & Aycan, H. Ş. (2014). Examining open access studies on argumantation between the years 2007-2012. *MSKU Journal of Education*, *1*(1), doi: 10.21666/mskuefd.05345

Kunsch, D. W., Schnarr, K., & Van Tyle, R. (2014). The use of argument mapping to enhance critical thinking skills in business education. *Journal of Education for Business, 89*(8), 403-410. doi:10.1080/08832323.2014.925416

Lawson, A. E. (2003). The nature and development of hypothetico-predictive argumentation with implications for science teaching. *International Journal of Science Education, 25(11),* 1387-1408. doi: /10.1080/0950069032000052117

McMillan, J. H., & Schumacher, S. (2014). *Research in education: Evidence-based inquiry* (7th ed.). London: Pearson.

Milanovic, V. D., & Trivic, D. D. (2020). Arguments of 14-year-olds in the context of history of the development of organic chemistry. *Science & Education*, *29*(1), 43-74. https://doi.org/ 10.1007/ s11191-019-00092-8

Ministry of National Education (MoNE), (2018). *Sosyal bilgiler öğretim programı (ilkokul, ortaokul 4,5,6,7)*. Retrieved from http://mufred at.meb. gov.tr/ Program Detay .aspx ?PID=354

Najami, N., Hugerat, M., Kabya, F., & Hofstein, A. (2020). The laboratory as a vehicle for enhancing argumentation among pre-service science teachers. *Science & Education*, 29, 377–393. https://doi.org/10.1007/s11191-020-00107-9

Namdar, B., & Tuskan, İ. B. (2018). Science teachers' views of scientific argumentation. Hacettepe University Journal of Education, 33(1), 1-22. doi: 10.16986/HUJE.2017030137

Naylor, D., & Diem, R. (1987). *Elementary and middle school social studies*. New York: Random House.

Nussbaum, E. M., & Edwards, O. V. (2011). Critical questions and argument stratagems: A framework for enhancing and analyzing students' reasoning practices. *Journal of the Learning Sciences, 20*(3), 443-488. doi:10.1080/10508406.2011.564567

Nussbaum, E. M., & Sinatra, G. M. (2003). Argument and conceptual engagement. *Contemporary Educational Psychology*, *28*(3), 384-395. doi: 10.1016/S0361-476X(02)00038-3

Nussbaum, E. M., Winsor, D. L., Aqui, Y. M., & Poliquin, A. M. (2007). Putting the pieces together: Online argumentation Vee diagrams enhance thinking during discussions. *International Journal of Computer Supported Collaborative Learning*, *2*, 479-500. doi: 10.1007/s11412-007-9025-1

Öğreten, B., & Uluçınar Sağır, Ş. (2014). Examining the effectiveness of science teaching based on argumentation. *Journal of Turkish Science Education, 1*(1), 75-100.

Oğuz-Haçat, S., & Demir, F. B. (2016). Evaluatıon by Toulmin argument model of social studıes curriculum and textbooks. *Bolu Abant Izzet Baysal University Journal of Faculty of Education,* 16, 1572-1602.

Organisation for Economic Co-operation and Development (OECD), (2019). *Education at a glance 2019: OECD indicators*. Paris: OECD Publishing. https://doi.org/10.1787/f8d7880d-en

Osborne, J., Erduran, S., & Simon, S. (2004). Enhancing the quality of argumentation in school science. *Journal of Research in Science Teaching, 41*(10), 994-1020. doi 10.1002/tea.20035

Özcan, R. (2016). Determination of applying levels of argumentatıon process and awareness of argumentatıon by science teachers in classes (Unpublished master's thesis). Adnan Menderes University, Aydın.

Öztürk, M. (2013). *The impact of argumentation on students' conceptual understanding, argumentativeness, and self-efficacy beliefs* (Unpublished master's thesis). Pamukkale University, Denizli.

Polat, H. (2014). *The effects of the argumentation method 7th grade elementary school in the structure of atom upon the student success* (Unpublished master's thesis). İnönü University, Malatya.

Power, F. C., Higgins, A., & Kohlberg, L. (1989). *Lawrence Kohlberg's approach to moral education*. New York: Columbia University Press.

Puvirajah, A. (2007). Exploring the quality and credibility of students' argumentation: teacher facilitated technology embedded scientific inquiry (Unpublished doctoral dissertation). Retrieved from https://search .proquest.com/docview/ 304799183?pq-origsite=summon (3289408).

Rapanta, C., & Macagno, F. (2016). Argumentation methods in educational contexts: Introduction to the special issue. *International Journal of Educational Research*, *79*, 142-149. doi: 10.1016/j.ijer.2016.03.006

Rod-Watson, J., Swain, J. R., & McRobbie, C. (2004). Students' discussions in practical scientific inquiries. *International Journal of Science Education*, *26*(1), 25-45. doi:10.1080/0950069032000072764

Sampson, V., & Clark, D.B. (2008). Assessment of the ways students generate arguments in science education: current perspectives and recommendations for future directions. *Science Education,* 92, 447-472. doi: 10.1002/sce.20276

Sampson, V., & Gleim, L. (2009). Argument-driven inquiry to promote the understanding of important concepts & practices in biology. *The American Biology Teacher, 71*(8), 465-472. Retrieved from https://www.researchgate.net/publication/232670338_

Sampson, V., Grooms, J. & Walker, J. P. (2011). Argument-driven inquiry as a way to help students learn how to participate in scientific argumentation and craft written arguments: An exploratory study. *Science Education*, *95*(2), 217-257

Sandoval, W. A. (2003). Conceptual and epistemic aspects of students' scientific explanations. *Journal of the Learning Sciences, 12*(1), 5-51. doi: https://doi.org/10.1207/S15327809JLS1201_2

Sandoval, W. A., & Milwood, K. A. (2005). The quality of students' use of evidence in written scientific explanations. *Cognition and Instruction, 23*(1), 23-55. doi: 10.1207/s1532690xci2301_2

Schwarz, B. B., Neuman, Y., Gil, J., & Ilya, M. (2003). Construction of collective and individual knowledge in argumentative activity. *Journal of the Learning Sciences, 12*(2), 219–256. doi: 10.1207/S15327809JLS1202_3

Shi, Y., Matos, F., & Kuhn, D. (2019). Dialog as a bridge to argumentive writting. *Journal of Writting Research, 11*(1), 107–129. https ://doi.org/10.17239 /jowr-2019.11.01.04.

Short, R.A., Van der Eb, M.Y., & McKay, S. R. (2020). Effect of productive discussion on written argumentation in earth science classrooms, *The Journal of Educational Research, 113*(1), 46-58. doi: 10.1080/00220671.2020.1712314

Simon, S., Erduran, S., & Osborne, J. (2006). Learning to teach argumentation: Research and development in the science classroom. *International Journal of Science Education*, 28, 235-260. doi: 10.1080/09500690500336957

Şimşek, U. (2015). Sosyal bilgiler öğretiminde tarihsel şehitlik, anıt ve mezarlıklarının kullanımı (Ed. A. Şimşek ve S. Kaymakçı). *Okul dışı sosyal bilgiler öğretimi* içinde (1. baskı, s. 225-233). Ankara: Pegem Akademi.

Solak, E. (2016). *Analysis middle school students' conceptual understanding on heat and temperature concepts and argumentation based activity proposal* (Unpublished master's thesis). Balıkesir University, Balıkesir.

Suparka, Douglas P., & Johnson, P. L. (1975). *Values education: Approaches and materials*, (ERIC Document Reproduction Service No: ED103284). https://files.eric.ed.gov/fulltext/ED103284.pdf

Superka, D. P., Ahrens, C., Hedstrom, J. E., Ford, l. J., & Johnson, P. L. (1976). *Values education sourcebook: Conceptual approaches, materials analyses and an annotated bibliography* (ERIC Document Reproduction Service No: ED118465). https://files.eric.ed.gov/fulltext/ED118465.pdf

Titiz, M. T. (2013). *Ezbersiz (sorgulamaya dayalı) eğitim yol haritası.* (4. Baskı). Ankara: Pegem Akademi.

Torun, F. (2015). *The relationship level between argumentation-based teaching and decision-making skills in social studıes course* (Unpublished doctoral dissertation). Gazi University, Ankara.

Torun, F., & Açıkgül-Fırat, E. (2020). Determination of prospective teachers' argument levels and errors in the argumentation process. *Fırat University Journal of Social Sciences, 30*(1), 119-135.

Torun, F., & Şahin, S. (2016). Determination of students' argument levels in argumentation-based social studies course. *Education and Science*, *41*(186), 233-251.

Toulmin, S. E. (2003). *The uses of argument.* Cambridge: Cambridge University Press, New York.

Uluay, G. (2012). *Investigation of the effects of scientific argümantation based teaching on student's success in teaching primary school 7 th grade science and technology course force and motion unit teaching* (Unpublished master's thesis). Kastamonu University, Kastamonu.

Ünlü, İ. (2019). Examining the value orientations of primary school students with moral dilemma stories: The case of value of responsibility. *Atatürk University Journal of Social Sciences Institute, 23*(1), 265-287.

Venville, G. J., & Dawson, V. M. (2010). The impact of a classroom intervention on grade 10 students' argumentation skills, informal reasoning, and conceptual understanding of science. *Journal of Research in Science Teaching. 47*(8), 952- 977.

Von Aufschnaiter, C., Erduran, S., Osborne, J., & Simon, S. (2008). Arguing to learn and learning to argue: Case studies of how students argumentation relates to their scientific knowledge. *Journal of Research in Science Teaching*, *45*(1), 101-131. doi: https:// doi.org/ 10.1002 /tea. 20213

Walton, D. (2009). Argumentation theory: a very short introduction. I. Rahwan & G.R. Simari (Eds.), *Argumentation in artifical intelligence* (*pp.* 1-22). New York: Springer.

Wissinger, D. R. (2012). *Using argumentative discussions to enhance the written arguments of middle school students in social studies classrooms* (Unpublished doctoral dissertation). Retrieved from https://search.proquest.com/docview/1175951070?pq-origsite=summon (3543618).

Xiao, S. (2020). Rhetorical use of inscriptions in students' written arguments about socioscientific issues. *Research in Science Education*, 50, 233–1249. https://doi.org/10.1007/s11165-018-9730-y

Yeşil, R. & Aydın, D. (2007). The method and timing in democratic values education. *Journal of Turkey Social Studies*, *11*(2), 65-84.

Yesildag-Hasancebi, F., & Günel, M. (2013). College students' perceptions toward the multi modal representations and ınstructıon of representations in learning modern physics. *Eurasian Journal of Educational Research*, *53*, 197-214.

Yiğittir, S., & Kaymakcı, S. (2012). Examination of activites in primary school social studies curriculum guides (4th and 7th grades) in terms of value education approaches. *Ahi Evran University Journal of Kırşehir Education Faculty, 13*(2), 49-73.

Yıldırır, H. E. (2020). Secondary school students' initial and changes in cognitive structures of argument and related concepts. *International Journal of Research in Education and Science (IJRES), 6*(2), 231-249.

Yıldırır, H. E., & Nakiboğlu, C. (2014). Examination of chemistry teachers and preservice teachers'argumentation processes used in their courses. *Bolu Abant İzzet Baysal University Journal of Faculty of Educatıon, 14*(2), 124-154. doi: 10.17240/aibuefd.2014.14.2-5000091531

Zambak, V. S., & Magiera, M.T. (2020). Supporting grades 1–8 pre-service teachers' argumentation skills: constructing mathematical arguments in situations that facilitate Analyzing cases. *International Journal of Mathematıcal Education in Science and Technology,* 1-28. https:// doi.org/10.1080/0020739x.2020.1762938

Zhu, M., Lee, H. S., Wang, T., Liu, O. L., Belur, V., & Pallant, A. (2017). Investigating the impact of automated feedback on students' scientific argumentation. *International Journal of Science Education, 39*(12), 1648-1668. doi: 10.1080/09500693.2017.1347303.

Zohar, A., & Nemet, F. (2002). Fostering students' knowledge and argumentation skills through dilemmas in human genetics. *Journal of Research in Science Teaching, 39*(1), 35–62. doi: 10. 1002/ tea.10008

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