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The Effects of Argumentation-Based Teaching Approach on Students' Critical Thinking Disposition and Argumentation Skills: "Population in Our Country Unit"

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ABSTRACT

As there are limited studies examining relationships between argumentation-based teaching approach and critical thinking and argumentation skills in social studies, the aim of this study was to examine the effects of argumentation-based teaching approach on students' critical thinking disposition and argumentation skills, and the relationship between students' argumentation skills and critical thinking disposition. We used a quasi-experimental design with pretest-posttest equivalent control groups. The participants of this study were 94 seventh grade students from three different classrooms in a middle school in Erzurum district of Turkey. We utilized University of Florida Engagement, Maturity and Innovativeness Critical Thinking Disposition Instrument (UF/EMICTDI) to identify students' critical thinking disposition and argumentation activities to document students' argumentation skills. We used one-way ANOVA and multiple comparisons Tukey tests to analyze the data obtained via the UF/EMICTDI, correlation and regression analysis to investigate the relationships between students' argumentation skills and critical thinking disposition. Argumentation Evaluation Rubric was used in order to evaluate the arguments that the students formed. Results showed that there was no statistically significant difference between students' pre-test critical thinking disposition scores in the experimental and control groups but there was a statistically significant difference between students' post-test critical thinking disposition scores. Additionally, we observed that students' argumentation skills enhanced throughout the study, there was a statistically significant positive relationship between students' argumentation skills and critical thinking disposition, and argumentation skills variable was the predictor of critical thinking disposition. We recommend future research studies to examine the effects of the argumentation-based science learning approach on different higher-order thinking skills. Additionally, in social studies classes, similar activities employed in this study on "Population in Our Country" unit can be used in teaching different topics/units in order to improve students' argumentation skills.

Keywords:
Argumentation, argumentation-based teaching approach, argumentation skill, critical thinking disposition, social studies

1. Introduction

Argumentation, derived from the Latin word of "argumentum," is a verbal, social, and rational activity to demonstrate the acceptability of one or more proposed arguments by using evidence to prove or refute the arguments (Rigotti & Morasso, 2009; van Eemeren, Grootendorst & Henkemans, 2002). While the argument

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is the reasons for supporting a claim (Walton, 2006), argumentation is a process of discussion between individuals with different perspectives (Osborne, Erduran & Simon, 2004a; Sampson & Clark, 2008). In such an argumentation process, individuals need to have high-level thinking skills in order to develop high-level thinking on a particular topic. One of these skills is critical thinking skill that enables individuals to think at high levels. Critical thinking is a complex form of high-level thinking that involves the use of different thinking skills and attitudes (Doğanay, 2013). Critical thinking consists of two interrelated dimensions, "skill" and "disposition." Critical thinking skill is the ability of a person to think through a mental effort for a problem, whereas the disposition is an individual's willingness to think critically (Zhang, 2003). Facione (1990), who stated that critical thinking, contains a number of skills and disposition, classified critical thinking disposition as analyticity, self-confidence, curiosity, cognitive maturity, open-mindedness, systematic, and seeking truth. He also classified the skills and sub-skills of critical thinking as follows:

Table 1. Critical thinking skills

Skills	***Sub-Skills***
Interpretation	Categorization Decoding significance Clarifying meaning
Analysis	Examining ideas Identifying arguments Analyzing arguments
Evaluation	Assessing claims Assessing arguments
Inference	Querying evidence Conjecturing alternatives Drawing conclusions
Explanation	Stating results Justifying procedures Presenting arguments
Self-regulation	Self-examination Self-correction

Even if individuals acquire these skills, they may not be able to use them effectively under necessary conditions. Individuals with these skills should have the prerequisite disposition for critical thinking to be able to use their critical thinking skills effectively (Ertaş, 2012; Facione, 1990; Seferoğlu & Akbıyık, 2006). Developing prerequisite disposition for critical thinking can be achieved by employing learning approaches that enable the creation of appropriate learning environments to support this disposition. Recently, one of the learning environments allowing students to develop critical thinking skills by using their critical thinking disposition effectively is the learning environments where researchers used argumentation-based teaching (ABT) approach, which has been widely utilized in science education (Antiliou, 2012; Chin & Osborne, 2008; Driver, Newton & Osborne, 2000; Lai, 2011; Nussbaum, 2008). The ABT approach is an instructional approach whereby questions are asked, ideas are put forward, criticized, evaluated, claims are compared and arguments are formed using evidence to support the claims in order to obtain more detailed information about a subject (Akkuş, Günel & Hand, 2007). This approach provides students with an appropriate learning environment for meaningful learning and argument generation through inquiry. Research studies in argumentation frequently emphasized that argumentation requiring individuals to use high-level thinking skills is an effective approach in teaching high-level thinking skills such as critical thinking, problem-solving, decision making, and scientific thinking (Antiliou, 2012; Çakan-Akkaş, 2017; Demiral & Çepni, 2018; Hsieh, 2005; Kana, 2013; Nussbaum & Sinatra, 2003; Nussbaum, Winsor, Aqui & Polyquin, 2007; Sevgi & Şahin, 2017; Şahin, 2016; Torun, 2015; van Aufschnaiter, Erduran, Osborne & Simon, 2008).

Nussbaum (2002), who stated that the use of the argumentation in lessons is effective in developing students' high-level thinking skills, stressed that the development of students' argumentation skills is an important element in increasing their ability to use these skills and their capacity of high-level thinking for understanding social issues. Additionally, researchers found that presenting "language of thinking" in the classroom is critical in order to give students mental and intellectual habits related to thinking, and

continuous exposure to the language of argumentation through terms such as justification, cause, inference, evidence, theory, and hypothesis, leads students to the responsibilities and values of critical analysis (Tishman & Perkins, 1997; Nussbaum, 2002). Lai (2011) examined the impact of critical thinking on argumentation process and indicated that critical thinking contains analyzing arguments, making deductions by using deductive and inductive methods, judging or evaluating, decision making, and problem-solving skills. Some researchers underlined the significance of argumentation skills and suggested that individuals with argumentation skills should have critical thinking skills (Mirza & Perret-Clermont, 2009).

Students' critical thinking skills, which are effective in the development of argumentation skills, enable students to evaluate the validity and strength of each argument component in the argumentation process. Researchers indicated that individuals having critical thinking skills use information better and defend their information more effectively against others in the process of argumentation (Chowning, Griswold, Kovarik & Collins, 2012; Freeley & Steinberg, 2013; Torun, 2015).

Research on the use of ABT approach in learning environments indicated that students' levels of utilization in the argumentation process is limited, students' argument production skills are not at the desired level, and efforts in the development of students' argumentation skills are limited (Crowell & Kuhn, 2012; Newton, Driver & Osborne, 1999; Weinstock, Neuman & Glassner, 2006). In this sense, scholars considered that use of the ABT approach requiring use of evidence could be useful in social studies, especially in topics where students have dilemmas. One of the main objectives of the social studies course is to cultivate active citizens who are in harmony with the social and natural environment they live in and take responsibility from the local to the global scale for solutions. For this purpose "teaching based on social issues can be achieved by proposing different views, presenting opposing views for different interpretations of the same data by different people, and enabling students to mobilize their views on dilemma or actions to solve problems" (Yapıcıoğlu & Kaptan, 2018, p. 41). In this context, initiating in-class discussions and debates can improve students' assumptions, arguments, and ideas for contradictory situations about the related topics presented to them (Newton, Driver & Osborne, 1999), let them realize discrepancies in their ideas, help them use the scientific language, and enhance their conceptual understanding levels. As a matter of fact, 2005 Turkish social studies curriculum included learning outcomes for students to acquire high-level thinking skills (e.g., critical thinking, creative thinking, problem-solving, decision making, and making inferences). The importance of using current and controversial subjects in the classroom environment by using different methods of discussion is often emphasized in the teaching of these skills (Ministry of National Education [MoNE], 2005). Additionally, the 2018 social studies teaching program included "use of evidence" skills in addition to the high-level thinking skills and indicated these skills as required in the program (MoNE, 2018). In this context, researchers noted that the use of the ABT approach in social studies course could be useful for students to learn the targeted knowledge with cause-effect relationships in solving different problems and use their high-level thinking skills effectively. In addition, it can be said that the ABT approach, which enables students to formulate their ideas and arguments by questioning many issues/ideas that require decision-making and critical thinking, provides a learning environment appropriate to the nature of social studies. In recent years, science has been seen as a social process in forming information structures that include assumptions. Observations and experimental results are not sufficient to prove the claims. The claims are based on an argumentation process that makes it possible to make connections between the assumptions and the evidence of scientists (Newton, Driver & Osborne, 1999).

The subjects discussed in the social studies which also constitute the content of social sciences are more relative, controversial, and open to change than the laws of nature in the positive sciences; therefore, it is suitable for questioning and producing different and high quality arguments (Demir, 2017; Torun & Şahin, 2016). In other words, social studies are a suitable course for the use of argumentation as it helps students questioning, thinking, researching, and directing to make right decisions, suggesting, and suggestive course (Demir, 2017). In a research, Oğuz-Haçat and Demir (2016) showed the relevance of the ABT approach to the teaching of the topics in social studies. Torun (2015) determined that the ABT approach was effective in the students' argumentation and decision-making skills. In this context, we thought that this research contributes to the literature by examining the relationship between students' critical thinking disposition and argumentation skills in seventh grade social studies. In this study, therefore, we aimed to investigate the

relationship between students' critical thinking disposition and argumentation skills by examining the effects of the ABT approach on students' critical thinking disposition and argumentation skills. For this research, we sought the following research questions:

i. Is there any significant effect of ABT approach on students' critical thinking disposition?

ii. Is there any positive effect of ABT approach on students' argumentation skills?

iii. Is there any relationship between students' critical thinking disposition and their level of argumentation skills?

2. Method

2.1. Research Design

In this study, we used a quasi-experimental design with pre-test and post-test equivalent control groups. Experimental designs are a type of research method that attempts to influence a variable and examines cause-effect relationships between variables. The most important feature of the experimental design is the manipulation of the independent variable (Fraenkel, Wallen & Hyun, 2012; McMillan & Schumacher, 2014). The most significant difference between experimental design and quasi-experimental design is that there is no random assignment of groups in the quasi-experimental design (Creswell, 2012).

In this study, we did no random assignment of participants to determine for experimental and control groups since we used available groups for the study. We randomly assigned the available groups to be experimental or control groups. In the determination of the groups, we considered students' pretest of the academic achievement test scores to make sure that experimental and control groups were equivalent. Thus, we designed the study using the quasi-experimental design with pretest-posttest equivalent control groups.

2.2. Participants

We carried out this study with 94 seventh grade students purposefully drawn from three different classrooms of a middle school during 2017 Fall and 2018 Spring semesters in Erzurum, Turkey. That is, we employed such criteria for critical sampling since pre-test scores and class size to assign equivalently control and experimental groups. We designated one of the classes as the experimental group (EG; n = 33) in which we implemented the ABT approach, two other classrooms as control group 1 (CG1; n = 30) and control group 2 (CG2; n = 31) in which students learned the subjects via traditional teaching approaches (in order to increase the reliability of the study, two control groups were used and the teacher of the course participated in the classes as observers in the EG and CG1 during the actual implementation). Table 2 presents the demographic data of the participants in the study.

Table 2. Demographic data of the participants

Groups	Gender	Frequency	Percentage (%)
EG	Male	18	38.3
	Female	15	31.9
CG1	Male	18	38.3
	Female	12	25.5
CG2	Male	11	23.4
	Female	20	42.6
Total		94	100

2.3. Data Collection Tools

We used the University of Florida Engagement, Maturity and Innovativeness Critical Thinking Disposition Instrument (UF/EMICTDI UF/EMICTDI to measure students' critical thinking disposition. Ertaş (2012) conducted a validity and reliability study of this instrument to adapt to Turkish. The instrument consists of 25 items with three factors, including Participation (11 items), Cognitive Maturity (7 items), and Innovation (7 items). The instrument was arranged in 5-point Likert type with Strongly Disagree (1 point), Disagree (2 points), Undecided (3 points), Agree (4 points), Strongly agree (5 points) scales. In the adapted version of the

instrument, the internal consistency coefficient was found .87 for the participation factor, .70 for the cognitive maturity factor, .72 for the innovation factor, and .91 for the overall scale.

In order to determine the applicability, validity, and reliability of the UF/EMICTDI at middle school level, a researcher in this study applied this instrument to a total of 395 students at sixth, seventh, and eighth grades. Then, confirmatory factor analysis (CFA) was performed to examine the construct validity of the instrument. We utilized fit indices to demonstrate the adequacy of the tested model. The fit indices showed that the three-dimensional structure in the original form of the instrument was confirmed in the sample of middle school students. Table 3 shows the results of the CFA.

Table 3. *Results of the CFA*

Statistics/Index	Value
X^2 Compliance Test	686.65(SD= 272, p= 0.00)
X^2/ SD	2.52
RMSEA	.062
St. RMR	0.052
RMR	0.060
PGFI	.73
AGFI	.85
NNFI	.96
NFI	.94
RFI	.93
CFI	.96
IFI	.96
GFI	.88

Figure 1 shows factor loads related to the three-dimensional model obtained from the CFA.

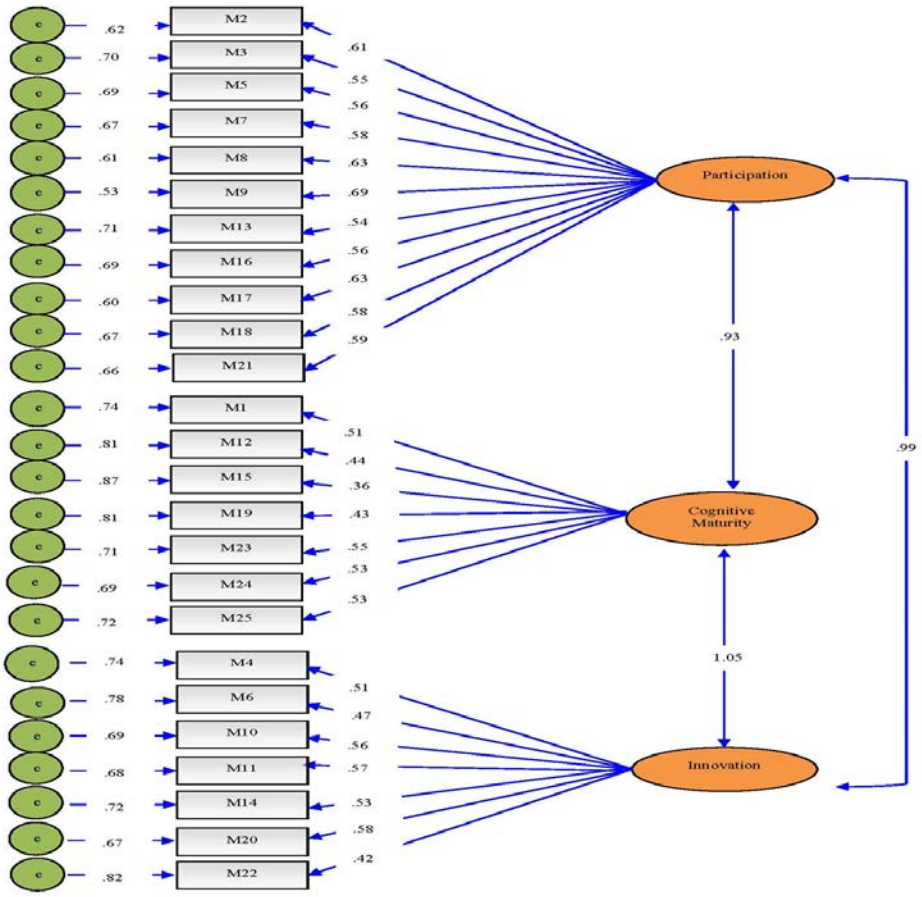

Figure 1. Factor loads from the CFA for the UF/EMICTDI

In the interpretation of the CFA results, as suggested in the related literature we considered that the factor load of the expected size to be included in the scale was over .30 in order to remain on the scale (Büyüköztürk, 2010; Seçer, 2015). As seen in Figure 12, the factor loadings for the Participation factor ranged between .54 and .69, the factor loads for the Cognitive Maturity factor ranged between .36 and .55, and between .42 and .58 for the Innovation factor. The results of the fit indices [932 / SD=2.52, RMSEA = .062, SRMR = .052, NFI = .94, NNFI = .96, CFI = .96, IFI = .96, RFI = .93, GFI = .88, AGFI = .85, PGFI = .73] indicated that 25 items of the original form of the UF/EMICTDI and three-factor structure confirmed. Acceptable fit values for GFI, CFI, NFI, RFI, IFI, AGFI indices are 0.90, and the perfect fit value is 0.95, while the acceptable fit value for RMSEA index is 0.08, the perfect fit value is 0.05. (Bayram, 2011; Brown & Cudeck, 1993; Meydan & Şeşen, 2015; Seçer, 2015; Şimşek, 2007).

After obtaining the construct validity of the scale by using the CFA, we calculated Cronbach alpha internal consistency coefficient for the UF/EMICTDI to find the reliability of the measurements obtained for this study. In the related literature, experts recommended having at least .70 value as a criterion for the reliability coefficient (Pallant, 2005; Tezbaşaran, 1997). However, the reliability coefficient above .60 can be sufficient for the reliability of the measurements in the scales with a low number of items (Sipahi, Yurtkoru & Çinko, 2010). This is because the internal consistency coefficient of Cronbach alpha is significantly affected by the number of items in the scale and increases as the number of items grows (Urbina, 2004). In this context, the calculated Cronbach alpha coefficient value of .91 showed that the UF/EMICTDI was a reliable measurement tool in the middle school sample. Table 4 presents the Cronbach alpha coefficients calculated in this study for the UF/EMICTDI.

Table 4. Reliability coefficients of the UF/EMICTDI

Scale/ Factor	Number of Items	Cronbach Alfa
Participation	11	.85
Cognitive maturity	7	.67
Innovation	7	.71
Overall (UF/EMICTDI)	25	.91

2.4. Argumentation Evaluation Rubric

During the research process, we used an argumentation evaluation rubric developed by Erduran, Simon and Osborne (2004) to evaluate students' arguments that students created in the argumentation activities. The developers of the rubric considered the argument evaluation criteria in Toulmin's argument model and graded the levels of arguments as Level 1, Level 2, Level 3, Level 4, and Level 5. Table 5 shows the components and levels of the arguments in detail in the argumentation evaluation rubric developed by Erduran, Simon and Osborne (2004).

Table 5. Argumentation evaluation rubric

Argumentation Level	**Argumentation Content / Component**
Level 1	A simple claim or a simple claim to a counterclaim.
Level 2	A simple claim with another claim, data, warrants, or backings; but does not contain rebuttals.
Level 3	Claim/s and counterclaim/s with data, warrant, backings, and weak rebuttals.
Level 4	Claim/s, data, warrant, backings with a clear rebuttal.
Level 5	Claim/s, data, warrant, backings, more than one rebuttal.

2.5. Design of Material Guideline and Implementation Process

The ADDIE instructional design was used in order to design the material guide and implementation process in a planned way. The ADDIE instructional design model consists of analysis, design, development, implementation, and evaluation steps (Akkoyunlu, Altun & Yılmaz-Soylu, 2008; Ocak, 2011; Şimşek, 2009). The procedures performed based on the ADDIE instructional design model steps are explained below.

Analysis: We conducted a literature review to obtain an understanding of what the ABT approach is and how it is implemented. Then, we determined the study group and the related unit.

Design: We designed activities (i.e., Expressions Table, Competing Theories in Cartoons, Stories, Competing Ideas, Competing Theories, Prediction-Observation-Explaining, News, Concept Maps Consisting of Student Ideas) to be used in the teaching of the related unit (Toulmin, 2003).

Development: We developed the ABT approach activities to enable students to gain different perspectives, create their own ideas, defend their own ideas, produce alternative ideas, use high-level thinking skills, and develop effective discussion skills.

Implementation: We did the implementation step by doing preliminary preparation as a pilot implementation and actual implementation in order to carry out the research without any problem.

Evaluation: During the research process, each step of the analysis, design, development, and implementation steps has been continuously evaluated and asked for expert opinions. Based on the received feedback, we made necessary corrections and moved to the next step.

Figure 2 illustrates the exemplary argumentation activity prepared for the implementation process of the ABT approach.

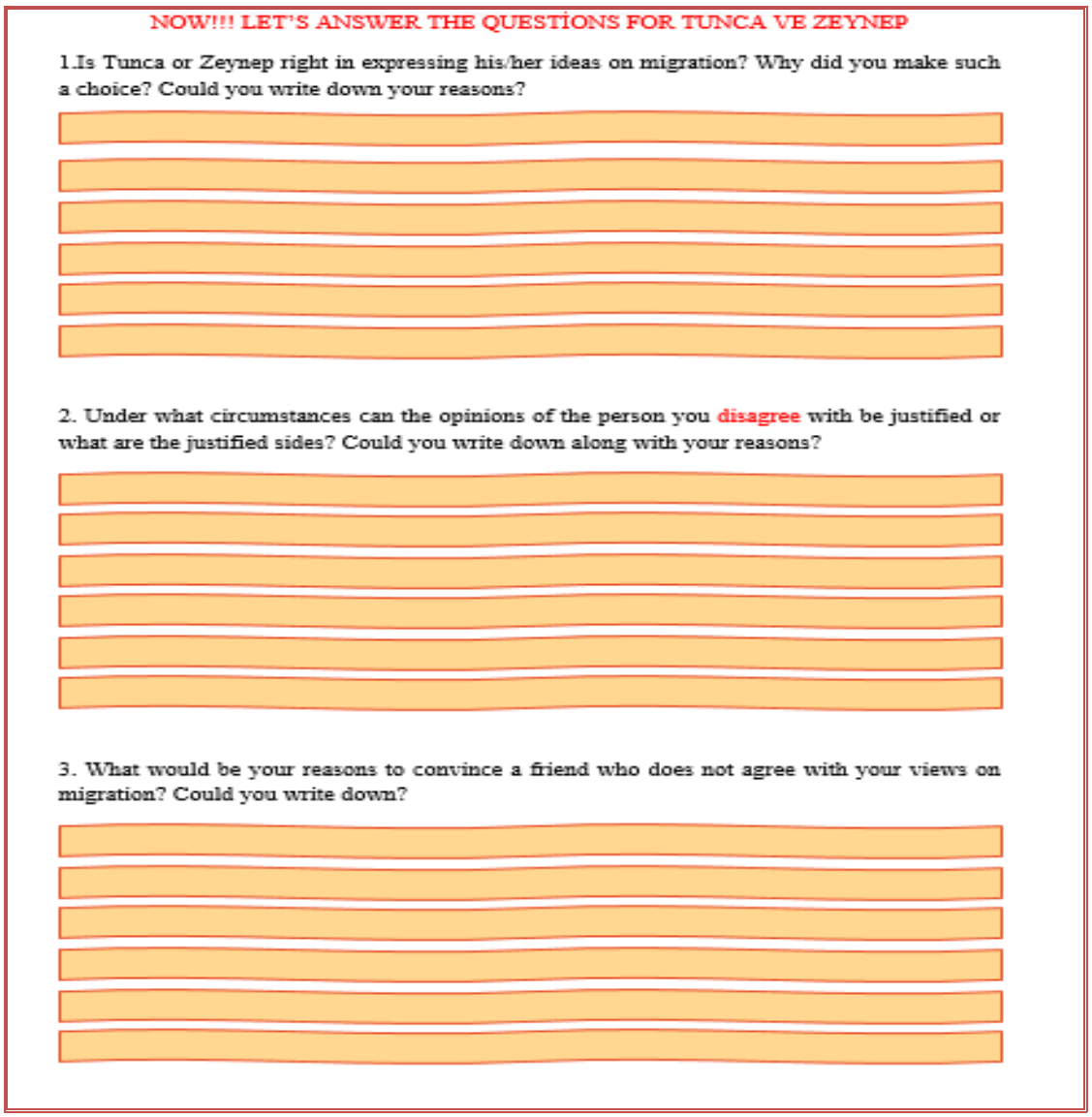

Figure 2. Exemplary argumentation activity

2.6. Implementation Process

2.6. 1. Pilot Implementation

We carried out a pilot implementation study with 60 students studying in two different classrooms of a middle school in the spring semester of 2017 in Yakutiye-Erzurum district of Turkey. First, we instructed the social studies teacher of two classrooms about the ABT approach and provided a teacher guideline explaining how to implement the ABT approach in the course. Afterward, we carried out the exemplary argumentation activities with students in the first week (3 lesson hours) in order to familiarize the students with the ABT approach. As of the second week, pilot implementation of the activities was initiated. The pilot implementation process took eight weeks (24 lessons). All activities prepared for the actual implementation were piloted. As a result of the pilot implementation, we determined deficiencies in the implementation process and prepared activities, identified unclear questions, made necessary corrections before the actual implementation, and got the activities ready for actual implementation. Figure 3 shows some pictures from the pilot implementation process.

Figure 3. Pictures from the pilot implementation process

2.6.2. Actual Implementation

We conducted the actual implementation of the study with 94 students studying in three different classrooms of a middle school located in Yakutiye-Erzurum district of Turkey in the fall semester of 2017. The actual implementation process took 3 hours per week and lasted in 8 weeks in the experimental group (EG) and control groups (CG1 and CG2). In the EG, the subjects were taught with the ABT approach. In the CG1 and CG2, the subjects were taught without the ABT approach. A researcher of this study taught the EG and CG1 and the social studies teacher taught the KG2. Figure 4 shows the actual implementation process.

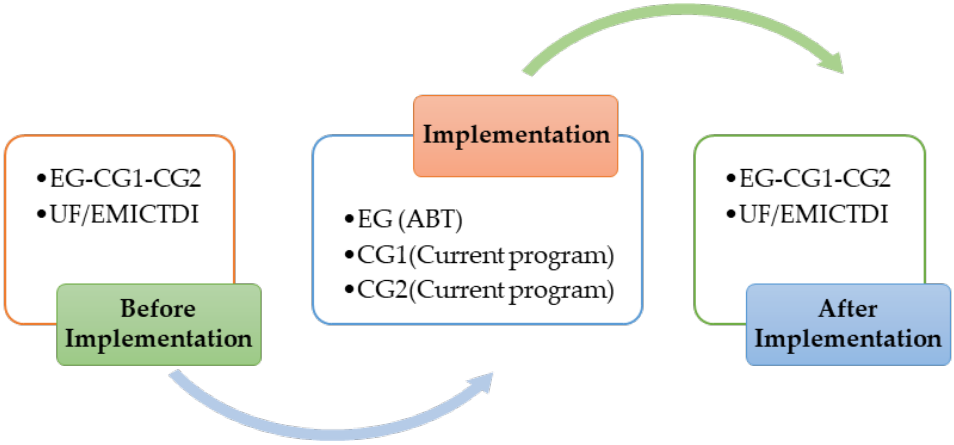

Figure 4. The actual implementation processes

Experimental group course process

The teaching of the targeted unit was carried out in the EG by using the ABT approach. In order for the implementation process to be carried out regularly, we prepared a weekly lesson plan that contained the subjects of the targeted unit and activities used in the teaching of these subjects. A researcher in this study implemented the activities prepared in accordance with the objectives of the "Population in Our Country" unit in the EG for 3 lessons per week in 8 weeks, as planned in the Teacher Material Guideline. The teacher material guideline consisted of two parts. In the first part of the guideline, the ABT approach is explained in general, and, the activities of ABT approach and the actions to be performed in order to effectively teach the unit with ABT approach are explained in details in the second part of the guideline. We designated the first and last week of the implementation process for pre- and post-tests, and 6 weeks for the teaching of the targeted unit. A copy of the weekly lesson plan is outlined in Table 6.

Table 6. Weekly lesson plan

Week	Subject	Activity
1	Informing students about purpose of the research.	Pre-test
2	***Places We Live in*** Population Distribution of population Factors affecting the distribution of population	Concept cartoon (ABT) Interpretation of maps Concept map (ABT)
3	***Characteristics of Our Population*** Census Population growth	Concept cartoon (ABT) Table & chart interpretation
4	Distribution of population by age groups Distribution of population by gender Ratio of working population, Literacy rate Rural-urban population	Competing theories (ABT) Predict-observe-explain (ABT) Expressions table (ABT)
5	***Migration in our Country*** Migration and causes of migration	Concept cartoon (ABT) A migration story
6	Results of migration Types of migration	Competing ideas (ABT) Concept cartoon (ABT)
7	***Our Rights and Freedom*** Freedom of settlement and travel Employment and education rights	Concept cartoon (ABT) News (ABT) Crossword
8	Overall evaluation	Post-test

In the EG, the course process was organized based on the steps of the 5E model (i.e., Engage, Explore, Explain, Elaborate, and Evaluate) in order to be able to implement the ABT approach in an effective and planned manner. Before starting eight weeks long actual implementation of the unit in the EG, sample argumentation activities were carried out with students for 3 weeks (9 lesson hours) to familiarize students with the ABT approach course process and let students see the issues to be considered in creating arguments. Then, we divided students into small groups with five students in each group and provided a student material guideline that contained activities prepared for students to use during the implementation process. After teaching how to create arguments and making necessary preparations, we started teaching the subjects of the targeted unit by using the ABT approach. Before starting the teaching, first of all, an activity called "*Mysterious Event*" was held to attract students' attention and motivate them in argumentation. Afterward, the teaching of subjects was started by following the teacher material guideline that was prepared based on the steps of the 5E model. In the EG, a sample lesson process prepared using ABT approach in teaching related subjects is given in Appendix 1.

While argumentation activities were carried out in teaching subjects, we ensured that the students first formed and wrote down their arguments. Then, we asked each student to share her/his arguments with other group members, defend her/his arguments using argument components, and persuade other group members who raised different claim/s. Once each group finished creating their arguments, we asked each group to select a group reporter and share their agreed arguments to other groups in the classroom. Finally, small group discussions were held to let students defend and discuss their different claims of the groups in the classroom. Figure 5 shows some pictures from the actual implementation.

Figure 5. Pictures from the actual implementation.

Control group course process

In the control groups, the teaching of the targeted unit was done without using a different teaching approach by following the current social studies program. A researcher in this study taught in the CG1 and the social studies teacher taught in the CG2. After completing instructions of the subjects, teachers asked questions to students in control groups whether they understood the subjects and had questions about any part about the subjects and did necessary explanations when needed. Then, questions related to the subjects were solved together with the students and the teaching of the subjects was completed. Teachers asked students to get prepared for the next topic. The teaching of targeted subjects was done in the same way every week and the teaching of the "Population in Our Country" unit was completed.

2.7. Data Analysis

2.7. 1. Analysis of data collected with the UF/EMICTDI

We used SPSS 24.0 package program to analyze the data obtained with the UF/EMICTDI as pre- and post-tests to determine and compare students' critical thinking disposition in the EG, CG1, and CG2. The highest score that can be obtained from the UF/EMICTDI is 125 and the lowest score is 25. As the data of UF/EMICTDI showed a normal distribution, we used descriptive statistics and one-way ANOVA test (as parametric tests) to identify whether there was any statistically significant difference between the groups. When the result of the one-way ANOVA analysis revealed a significant difference between the groups, we used Tukey test as one of multiple comparison post-hoc tests since the variances of the groups were equal and the number of students in each group was close. We also calculated the effect size value (η^2) to determine the effect of the ABT approach implementation. The effect size (η^2) shows the amount of total variance in a dependent variable by evaluating the reliability of the relationship between an independent variable and dependent variable. Literature on effect size indicated that the eta square value ranges between 0.00 and 1.00, and the effect size between 0.01 and 0.06 is small, between 0.06 and 0.14 is medium, 0.14 and above is large effect size (Can, 2017; Green & Salkind, 2005; Pallant, 2005).

2.7.2. Analysis of the ABT approach activities

In the analysis of the ABT approach activities, firstly written students' arguments created through the activities (concept cartoons, competing theories, competing ideas, a migration story, predict-observe-explain, and news activity) enabling students to produce written arguments were evaluated individually by identifying the argument components (i.e., claim, data, warrant, backing, and rebuttal) of the written arguments. (This process was done separately for each student activity in the experimental group and in order to ensure reliability, the activities were re-evaluated by researchers two weeks later). Then, we asked two faculty members, who were researchers in the ABT approach field, to examine students' argumentative statements and indicate which of the argument component each student statement represented. After two faculty member researchers completed their individual examinations, other field experts examined the student statements and final decisions were made for each student statement indicating which argument components were determined in each argumentative statement. Next, we calculated reliability by using Miles and Huberman's formula (Miles & Huberman, 2016) [i.e., (Reliability = consensus number / (total number of consensus + number of disagreements)] for the consensus and disagreements between the faculty member researchers and field experts. According to the related literature (e.g., Miles & Huberman, 2016), 90% agreement level between experts and researchers' examinations is demanded. In this study, we detected 95% agreement between researchers and experts. After determining the quality and number of argument components of the students' statements, we analyzed students' argumentative statements via the argumentation evaluation rubric to identify students' argumentation levels. We scored students' argumentative statements (i.e., level 1 = 1 point, level 2 = 2 points, level 3 = 3 points, level 4 = 4 points, and Level 5 = 5 points) and calculated the total argument score of each student. In order to track the weekly development of each student during the implementation, we assigned a code (e.g., S1, S2, S3…S33) to each student in the EG. We made no changes and/or corrections in the students' argumentative statements and evaluated them as stated by students. In the evaluation of argumentation, we used concept cartoon, prediction-observation-explanation, competing theories, a migration story, competing ideas, and news activities, while we used expression table and concept map activities to enable students to think in the cause-

effect relationship in the ABT environment and familiarize students with argumentation-based environments.

We provided examples below showing students' arguments with their levels from different activities during the implementation.

Example of Level 1 Argument

> *S-18 The population is a collection of people living in a certain area. I think that the population does not occur at a specific time* ***(claim)****.*

The student of S-18 only stated his argument about the concept of population. The student did not use warrant, data, rebuttal, and backing to support his claim. Analysis of the S-18 student's argument is shown in Figure 6.

Figure 6. Analysis of the S-18 student's argument

Example of Level 2 Argument

> *S-17 With the censuses, not only the number of population but also the characteristics of the population are determined* **(claim)** *because with the census the state learns about the status and information of the population characteristics (gender, age, rural-urban) in a residential area. According to the learned results, the state makes planning and takes the necessary steps in necessary subjects* **(warrant)**. *For example, the needs of Istanbul, which is crowded, and the needs of Erzurum are not the same* **(data)**. *The census is also important in determining the needs of the country and planning of the future. In addition, with the census, population growth and population growth rate are also determined* **(backing)**.

The student of S-17 stated his argument about the population concept and supported his claim by using warrant, data, and backing. However, he did not use a weak or clear rebuttal that showed the conditions in which his claim might be invalid. The analysis of the S-17 student's argument is presented in Figure 7.

Figure 7. Analysis of the S-17 student's argument

Example of Level 3 Argument

> *S-3 In my opinion, Boserup, whose views are expressed by Arda, is right* **(claim)** *because technology is constantly developing at an unbelievable pace. With this development, food can be grown in a short period of time and result in more annual yield, and since transportation, education, and health will occur within better circumstances there will be no problems with the increase in the population growth* **(warrant)**. *For example, as one of the most developed countries, the US has a big population and is a well-developed country* **(data)**. *But if the birth rate decreases and the death rate increases, this view can be reversed* **(rebuttal)**. *Population growth means new people; new people means new ideas means new technologies. Therefore, there will be no problem in population growth* **(backing)**.

The student of S-3 stated his claim about population increase. The student supported his claim by using warrant, data, and backing. He indicated the circumstance that his claim might be invalid by using a weak rebuttal. Figure 8 shows the analysis of the S-3 student's argument.

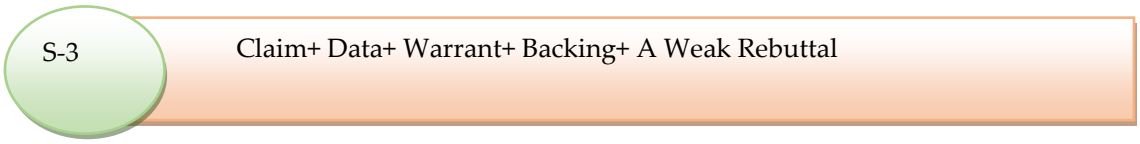

Figure 8. Analysis of the S-3 student's argument

Example of Level 4 Argument

> *S-1 I think Zeynep is right* **(claim)**. *Uncontrolled migrations bring problems like an imbalance in the distribution of population, unemployment, loss of qualified people, etc. because high population decreases the service power in education and health areas. Unemployment occurs due to the decrease in qualified people, which reduces the number of the working population* **(warrant)**. *As a result of uncontrolled migration from villages to cities, agriculture and animal husbandry in the villages are reduced. With this, people cannot meet their nutritional needs, the imports increase, and product prices rise. This adversely affects the economy of the state* **(backing)**. *If the immigration region is travel zone, my decision may change because the negativity of temporary migrations for 3-5 days does not cause permanent problems (unemployment, education, distorted urbanization, etc.)* **(Rebuttal)**.

The student of S-1 indicated her claim and then tried to prove her claim by using a warrant and backing. She then described the circumstance in which her claim might be invalid by using a clear rebuttal. Figure 9 illustrates the analysis of the S-1 student's argument.

Figure 9. Analysis of the S-1 student's argument

Example of Level 5 Argument

> *S-28 I find the practices of Hungary correct* **(claim)** *because as Syrian refugees continue to migrate to countries, the country's problems will continue to increase. Each of the people migrating from outside has needs such as shelter, nutrition, and work. When they cannot achieve these needs, there will be chaos, unrest, and disagreements in the country. Therefore, I find Hungary's practices more appropriate* **(warrant)**. *The number of refugees is increasing day by day in our country. As far as I can see in the news, there are now over 3 million refugees in our country. Turkey spends 5.3 billion liras for refugees* **(data)**. *I think Hungary's decision is more accurate in terms of the security of our country, but no one can be taken away from the freedom of settlement and traveling. In this case, Turkey could be right* **(rebuttal)**. *If we do signed agreements with the refugees coming to our country and allow them to stay in our country based on certain rules, make rearrangements that they should return to their country again when the problems in their country are solved, then I can find Turkey's policy correct* **(rebuttal)**. *If immigration to countries continues to take place without any measures, the problems of the country in economic, health, transportation, and education fields keep increasing. This causes some unrest in the country. The unrest in the country will cause both physical and moral damages. Our country will gradually transform into chaos. This will adversely affect the development plans of the country and reduce the defense power of the country. With the fall of defense power, the safety of citizens will be at risk. Of course, refugees also have some rights, but taking into account the country's future plans, some measures should be taken, and more planned works should be done* **(backing)**.

The student of S-28 explained her claim by using data and warrant and strengthened her claim with backing. She defined the circumstance in which her claim might be invalid by using more than one rebuttal. Figure 10 demonstrates the analysis of the S-28 student's argument.

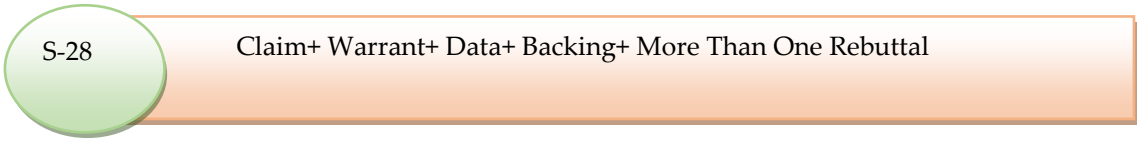

Figure 10. Analysis of the S-28 student's argument

2.7.3. Analysis of the relationship between students' argumentation skills and critical thinking disposition

We used correlation analysis to determine the relationship between the students' argumentation skills and critical thinking disposition. After determination of the relationship between the variables, we run simple linear regression analysis to document whether the argumentation skill was the predictor of critical thinking disposition. In calculating the relationship between the argumentation skills and critical thinking disposition, we utilized the total scores obtained from the UF/EMICTDI and students' total argumentation from the argumentation activities. The correlation coefficient has been interpreted in various ways by different researchers. In this study, we modeled the related literature (Green & Salkind, 2005; Pallant, 2005) in the interpretation of the correlation coefficient (r), and considered the r when it was between .10 and .29 as small, .30 and .49 as moderate, and .50 and 1.0 as large correlation.

3. Findings

3.1. Findings on the Effects of the ABT Approach on Students' Critical Thinking Disposition

In order to investigate the effects of ABT approach on students' critical thinking disposition, we used the UF/EMICTDI as pre- and post-tests in the experimental and control groups.

3.1.1. Findings of the UF/EMICTDI pre-test

We used one-way ANOVA as an appropriate parametric test since the data obtained from the pre-test of the UF/EMICTDI displayed normal distribution overall and each factor of the scale. Table 6 shows descriptive statistics of the UF/EMICTDI pre-test and Table 7 presents the results of the one-way ANOVA test in the pre-test.

Table 7. *Descriptive statistics of the UF/EMICTDI pre-test results*

Groups	**N**	$\overline{X}$	**SD**
EG	33	99.03	19.05
CG1	30	92.90	16.41
CG2	31	91.87	19.39
Total	94	94.71	18.45

As seen in Table 7, the descriptive statistics of the data obtained from the pre-test of the UF/EMICTDI documented that the mean score of the EG was the highest while the mean scores of the CG1 and CG2 groups were close to each other. We utilized one-way ANOVA analysis to uncover whether the differences between the mean scores of the groups were statistically significant. Table 8 shows the results obtained from the one-way ANOVA analysis.

Table 8. The UF/EMICTDI pre-test one-way ANOVA results

Groups	Sum of Squares	df	Mean Square	F	p
Between Groups	964.091	2	482.046		
Within Groups	30715.154	91	337.529	1.428	.24
Total	31679.245	93			

Results of one-way ANOVA analysis indicated that there was no statistically significant difference between the groups in terms of critical thinking disposition based on the data obtained from the UF/EMICTDI applied to students before beginning the implementation [$F_{(2, 91)} = 1.428$, $p = 0.24$ *(p>05)*].

3.1.2. Findings of the UF/EMICTDI post-test

We used one-way ANOVA as an appropriate parametric test since the data obtained from the post-test of the UF/EMICTDI revealed normal distribution in all groups. Table 8 displays descriptive statistics of the UF/EMICTDI post-test and Table 9 depicts the results of the one-way ANOVA test in the post-test.

Table 9. Descriptive statistics of the UF/EMICTDI post-test results

Groups	N	$\overline{X}$	SD
EG	33	107.93	14.97

CG1	30	94.96	19.78
CG2	31	93.12	19.87

As shown in Table 9, the descriptive statistics of the data obtained from the post-test of the UF/EMICTDI elucidated that the mean score of the EG was the highest while the mean scores of the CG1 and CG2 groups were close to each other. We used one-way ANOVA analysis to investigate whether the differences between the mean scores of the groups were statistically significant. Table 10 shows the results obtained from the one-way ANOVA analysis.

Table 10. The UF/EMICTDI post-test one-way ANOVA results

Groups	Sum of Squares	df	Mean Square	F	p
Between Groups	4825.625	2	2412.813	7.313	.00
Within Groups	30024.587	91	329.941		
Total	34850.213	93			

As seen in Table 10, results of the UF/EMICTDI post-test detected that there was a statistically significant difference between post-test scores of the groups, [$F_{(2, 91)} = 7.313$, $p = 0.00$ *(p<.01)]*. We calculated the effect size value (Eta squared) as $\eta^2 = 0.13$ and this value indicated a moderate effect. In order to determine which groups were in favor of this difference, we used the Tukey test for post-hoc tests since the variances were distributed homogeneously and differences between group numbers were not high. Table 11 illustrates the results of multiple comparisons Tukey test.

Table 11. Experimental and control groups multiple comparison Tukey test results

Groups	Compared Groups	Mean Difference	Std. Error	p
EG	CG1	12.97273*	4.58216	.01
	CG2	16.42326*	4.54329	00
CG1	EG	-12.97273*	4.58216	.01
	CG2	3.45054	4.65202	.73
CG2	EG	-16.42326	4.54329	.00
	CG1	-3.45054	4.65202	.73

* p <0.05 level shows the group in favor of the significant difference.

When we reviewed the results of multiple comparison Tukey test between the experimental and control groups, we found that the significant difference between EG and CG1, EG and CG2 in the post-test were in favor of the EG. We found no statistical difference between CG1 and CG2. Figure 11 displays the pre- and post-test mean scores of the groups for critical thinking disposition.

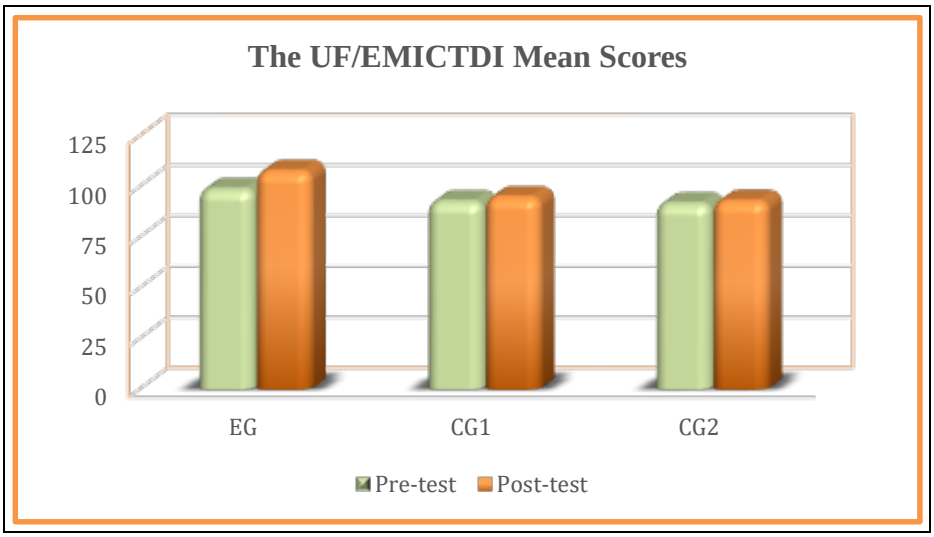

Figure 11. The UF/EMICTDI pre- and post-test mean scores of groups

When we compared the pre-test and post-test average scores of the groups, we observed that the mean scores of the critical thinking disposition of EG, CG1, and CG2 increased.

3.2. Findings on the Effects of the ABT Approach on Students' Argumentation Skills

In order to find out the effects of the ABT approach on students' argumentation skills, we provided argumentation activities for students in the EG. Table 12 and Figure 12 illustrate the number of arguments and level of arguments that students created in the activities during the implementation (6 weeks long).

Table 12. The number and level of arguments students created during the implementation

Week			Level 1 (f)	Level 2 (f)	Level 3 (f)	Level 4 (f)	Level 5 (f)
Week 1	Activity 1	Concept cartoon	16	11	5	1	0
Week 2	Activity 2	Concept cartoon	13	17	0	3	0
Week 3	Activity 3	Competing theories	9	10	10	3	1
	Activity 4	Predict-observe-explain	8	24	0	0	1
Week 4	Activity 5	Concept cartoon	3	30	0	0	0
	Activity 6	A migration story	0	12	4	12	5
Week 5	Activity 7	Competing ideas	1	13	0	19	0
Week 6	Activity 8	Concept cartoon	7	26	0	0	0
	Activity 9	News	0	7	0	14	12

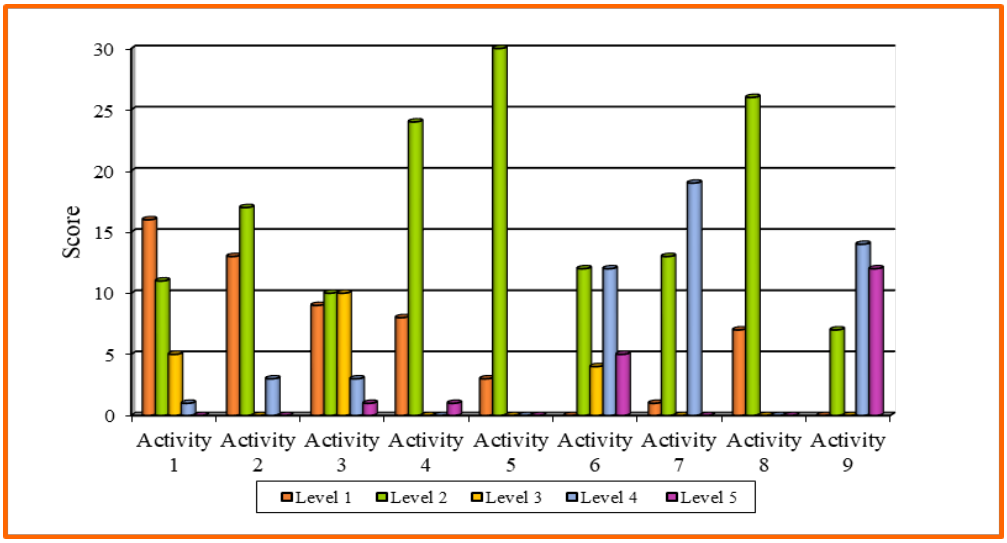

Figure 12. The levels of arguments students created during the implementation

Results indicated that students created more arguments at Level 1 and Level 2 during the first weeks of the implementation process and it is noteworthy that created arguments at these levels were during the "Concept Cartoon" activities. We found that students did not create any Level 3 arguments in 6 activities out of 9 activities, and they created more Level 4 and Level 5 arguments in the last weeks. This can suggest that students were able to create better quality arguments as the activities proceeded.

3.3. Findings on the Relationship Between Students' Argumentation Skills and Critical Thinking Disposition

We calculated the correlation coefficient to determine whether there was a significant relationship between students' argumentation skills and critical thinking disposition. Table 13 shows the relationship between students' argumentation skills and critical thinking disposition.

Table 13. The relationship between argumentation skills and critical thinking disposition

	Critical Thinking Disposition	Argumentation Skills
Critical Thinking Disposition	1	.583**
		.000
	33	33
Argumentation Skills	.583**	1
	.000	
	33	33

** Correlation significance level 0.01

As seen in Table 13, there was a positive significant relationship between students' argumentation skills and critical thinking disposition (r = .583, p <0.01). Figure 13 shows the relationship between students' critical thinking disposition and argumentation skills.

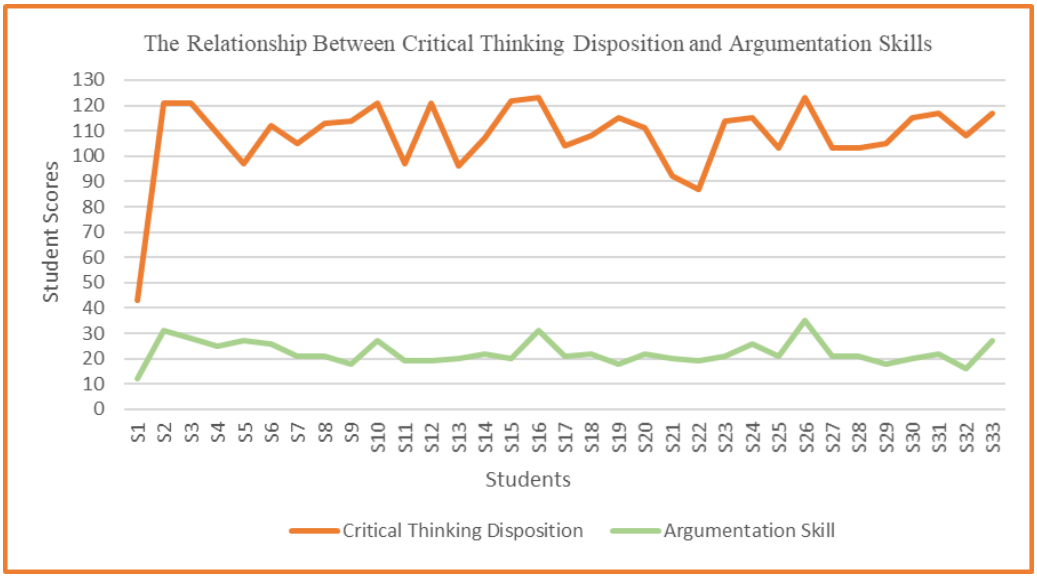

Figure13. The relationship between critical thinking disposition and argumentation skills

When we examined the relationship between students' critical thinking disposition and argumentation skills, we observed that students who had high ability to create arguments also showed a high level of critical thinking disposition (Figure 13).

We used simple linear regression analysis to determine the power of argumentation skills to predict critical thinking disposition. Table 14 shows the result of the simple linear regression analysis.

Table 14. Results of simple linear regression analysis between critical thinking disposition and argumentation skills level

Variable	B	SE_B	β	t	p
Constant	66.623	10.551		6.314	.000
Argumentation skills	1.850	.463	.583	4.000	.000
n= 30, R= .583, R^2= .340, F= 15.999, p< .01					

As seen in Table 14, there was a statistically significant relationship between argument skill and critical thinking disposition *(R= .583, R^2= .340)*, and the argumentation skills variable was found to be the predictor of critical thinking disposition *(F= 15.999, p< .01)*. The argumentation skills explained 34% of the change in the critical thinking disposition. The significant predictor of the main predictor variable *(B = 1.850)* showed that the argumentation skills variable was a significant predictor (p <.01).

4. Discussion, Conclusion and Recommendations

We examined students' critical thinking disposition by applying the UF/EMICTDI scale in this study. Before the implementation, we identified that students' critical thinking disposition scores were close to each other and there was no significant difference between the UF/EMICTDI scores (Table 5, Table 6). After the implementation, however, we documented that the UF/EMICTDI mean scores of the students in the experimental group, in which we used the ABT (Argumentation-Based Teaching) approach, were higher than the mean scores of the students in the control groups and there was a significant difference in favor of the experimental group (Table 7, Table 8). This result is parallel with the results of the previous studies in the related literature (Çakan-Akkaş, 2017; Eyceyurt-Türk, 2017; Hsieh, 2005; Lai, 2011; Kunsch, Schnarr & van Tyle, 2014; Sevgi & Şahin, 2017; Şahin, 2016; Tonus, 2012; Tüzün, 2016). In the previous studies, researchers generally examined the effects of the ABT approach on critical thinking skills rather than the effects of the ABT approach on critical thinking disposition that is a prerequisite for critical thinking. However, there were

also some studies that showed that the effects of the ABT approach on critical thinking disposition were not positive (Koçak, 2014). The positive effects of the ABT approach on students' critical thinking disposition can be explained by providing opportunities such as thinking, reasoning, decision making with interpretation, addressing the information with different aspects, reflecting ideas better, and learning by inquiry in the learning environments prepared in accordance with this approach.

We used various activities to determine students' argumentation levels, analyzed students' arguments that they created during the activities, and identified their argumentation levels in this research. When we examined the levels of the arguments throughout the implementation process, we observed that the students' argumentation levels were lower in the first three weeks of the implementation and higher in the following weeks. As a result of the study, we detected that students' argumentation levels showed a positive increase from the first week of the implementation to the last week, and the students' argumentation skills enhanced. At the first weeks of the implementation, the majority of students created simple arguments consisting of simple claims, simple claims with data, warrant, or backing. In the following weeks, the students created better quality arguments consisting of weak, clear, and multiple rebuttals. The reason for the low level of arguments students created in the first weeks could be their limited classroom practice in argumentation and their limited knowledge of this approach. This result is similar with the results of the previous research in the related literature (Anagün & Atalay, 2016; Crowell & Kuhn, 2012; Çetin, Kutluca & Kaya, 2014; Dawson & Venville, 2010; Erduran, Simon & Osborne, 2004; Karışan, 2011; Kuhn & Udell, 2003; Maloney & Simon, 2006; Nussbaum & Edwards, 2011; Öztürk, 2013; Topcu & Atabey, 2017; Torun, 2015; Wissinger, 2012; Zohar & Nemet, 2002). In the study conducted by Torun (2015), it was found that the levels of the arguments formed by students were lower in the first two activities, higher in the last three activities, and it was found that the levels of the students' arguments increased from the first activity to the last activity. Similarly, Wissinger (2012) examined students' arguments on three controversial topics in history in the social studies course by using first source documents, argumentation discussions, and controversial/critical article writing data collection techniques in an experimental study. Wissinger (2012) observed that the experimental group learned argument schemes, asked critical questions during the discussion, and students' levels of the argument increased. Erduran, Simon and Osborne (2004) aimed to increase use of teachers' argumentation and improve students' argumentation skills, and they found that the quality of students' arguments improved as a result of two years teacher development. In their study, Çetin, Kutluca and Kaya (2014) encountered students' argumentation levels with collected data through scenarios. As a result, they noted increases in the level of students' arguments. Nussbaum and Edwards (2011) explored critical questions and complementary, rebuttal argument strategies as an approach to teaching critical thinking. The experimental group, as a whole, successfully created remarkable critical solutions, especially in evaluating values and producing practical and creative solutions. The common emphasis in many studies on this subject is that the argumentation-based courses increase the number, level, and quality of students' arguments and develop their argumentation skills in a positive way (Demir, 2017).

In this study, it was seen that presenting claims and some data to students in the process, making discussions about contradictory situations, and discussing individually created arguments with friends increased students' argumentation levels. Additionally, we thought that the continuation of argumentation-based activities for six weeks and encouraging students to form arguments in the courses during this period contributed positively to the students' ability to form arguments. As stated in the related literature, it is not possible to improve students' argumentation skills in the classroom environments in a short time and that it may be beneficial to repeat these skills at different times in order to acquire and transform them into behavior (Torun, 2017). Additionally, we observed that students' small group discussions had a positive effect on increasing students' levels of argumentation skills. Since students discussed their ideas in the group work, they had opportunities to gain new views and perspectives on their ideas. We thought that peer learning within the scope of social learning theory could also contribute to the increases in argumentation skill levels. For example, in their research study, Cavlazoglu and Stuessy (2018) documented that working in groups and interactions within groups enhanced participants' argumentation skill levels. In this research, we observed that students' argumentation levels were lower in the concept cartoon activity used in the introduction phase of each lesson, and students' argumentation levels were higher in the news, competing ideas, a migration story, competing theories, and prediction-observation-explanation activities respectively when students' argumentation levels evaluated in terms of effectiveness. The reason for this could be the

provided opportunities to create arguments easier, reflect ideas better, and make more comments in the activities.

We found that there was a positive relationship between argumentation skills and critical thinking disposition, and the argumentation skills variable was the predictor of critical thinking disposition in this study. Based on this finding, we can state that students who have high argumentation skills also have high critical thinking disposition and use their critical thinking skills more effectively. In this sense, Andrews (2015) indicated that critical thinking and argumentation were closely related. Karadeniz (2016) stated that the ability to create arguments was a characteristic of the students with high-level thinking skills. Tüzün (2016) showed that students' development of argument creation skills contributed to students' development of critical thinking skills. Demiral and Çepni (2018) suggested that students needed to improve critical thinking skills to increase argumentation skills to higher levels. Nussbaum (2008) revealed that effective argumentation skills were crucial in decisions making and critical thinking at different levels. In the activities of "competing theories" and "news events involving different practices for migrants" used in this research, students were asked to look at the ideas, situations, and opinions presented to them from different perspectives and provide reasons to support the claims they created or defended. Besides, during the activities students were asked questions such as (a) Why do you think this way?, (b) How do you convince a person who doesn't think like you?, and (c) Do your opinions apply in all cases? They were allowed to discuss with their friends about conflicting/uncompromising issues given in the activities. It can be said that these questions and discussions contributed to the students gaining habits of thinking such as approaching, questioning, making their own decisions with a different point of view, and developing critical thinking tendencies. As stated in the related literature, in developing students' critical thinking and problem solving skills, it is important that students (a) support their claims/ideas in different subjects by using claims, data, warrant, backing, and rebuttal components of the argumentation process, and (b) create refutation ideas about situations where their claims are invalid. Additionally, using such activities in all courses is vital in achieving the desired level of these skills (Karamustafaoğlu, 2018).

Based on the results of this study, considering the ABT approach as effective in improving students' critical thinking disposition and accordingly in critical thinking skills, we suggest future researches about the effects of this approach on different higher-order thinking skills (e.g., problem-solving and creative thinking) in social studies. Argumentation can be used to develop critical thinking skills in different areas of social studies (environmental issues, global connections where global problems are examined). In addition, studies that examine the effect of ABT approach on students' academic achievement in social studies education can be carried out with students at different grade levels. In this study, it was seen that the claims given to contradictory arguments and some data were presented to the students and their argumentation skills increased. In this context, it is important to include controversial topics in the course, to encourage students to formulate arguments, data, justifications and rebutters on the subject discussed individually or in groups, and to include activities based on argumentation in learning environments in order to develop the students' argumentation skills. In addition, if students do not have sufficient experience in making arguments, the activities prepared for this purpose may not produce the desired effect. Thus, it is important to give importance to pilot studies in order to determine the experiences of the working group and the difficulties that may be experienced in the implementation of the activities based on argumentation and to take measures to reduce the possible problems in practice. However, some studies can be conducted to reveal the differences between individual and group argumentation.

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Appendix 1. Sample Course Process

UNIT: POPULATION IN OUR COUNTRY

Course Title: Social Studies

Grade: 7

Course Hours: 3

Subject: Migration

Concepts: Migration, settlement, unemployment, urbanization, transportation, tax, environment and environmental pollution, and natural resources

Learning Outcome: Students will discuss the reasons and results of migration through case studies.

- Students are expected to learn by questioning the reasons and results of migration in our country.

Implementation Process

Engage

The 'concept caricature' activity, which is one of the argumentation-based teaching activities that explain the concept of migration, is conducted in order to find out what students know about the concept of migration. The aim of this activity is to enable students to comprehend the concept of migration correctly.

Explore

The 'migration story' activity, which is one of the argumentation-based teaching activities, is conducted so that students can comprehend the reasons and results of migration through discussion.

Explain

Upon asking the students to discuss migration as well as its reasons and types based on their prior knowledge in the introduction and exploration part, the teacher gives detailed explanations about migration, its reasons and types. After explaining what the concept of migration is, the teacher states that migration takes place in different ways according to where and for how long it takes place, and the types of migration are explained in detail. Afterwards, the teacher makes further and detailed explanations by emphasizing that there are various reasons of migration, including economic, social, political and natural reasons. After making sure that the reasons of migration are understood by the students, the teacher makes more detailed explanations about the consequences of migration, emphasizing the fact that internal migration (in places of immigration and emigration) and external migration have different results.

Elaborate

After making sure that students fully understand the concept of migration, its causes and consequences and its types at this stage, the teacher conducts the activity of 'ideas are competing', which is one of the argumentation activities that will enable students to discuss the phenomenon of migration. In this activity, students are asked to state which of the given expressions they agree with and to explain why they think so, and to describe their opinions with their reasons.

Evaluate

A concept map activity, which is one of the argumentation activities, is conducted in order to make a general revision of the subject for students, and to determine the level of their understanding related to the concepts and relationships between concepts. After the students complete the activity, they are asked to discuss their answers with their group mates. Finally, the teacher makes a general assessment to complete the teaching of the subject.