

Small group, problem-based learning in primary school social studies: A mixed methods study in Turkey

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Controversial issues require students to analyse information critically, discuss different perspectives, and develop views on important questions. The problem-based learning model (PBL) allows learners to gain insights from various perspectives and apply the knowledge acquired to different situations. This mixed-method study aims to examine the effect of problem scenarios and argumentation activities on students' academic achievement and argumentation quality by addressing a controversial issue in the context of PBL in the fourth-grade social studies course in primary school. The cultural dimension of globalisation was chosen as the controversial issue. The findings revealed that problem scenarios and argumentation activities with the controversial issue in the context of PBL positively affected students' academic achievement and improved their argumentation quality.

Introduction

Our Social Studies course presents the social sciences, which examine human interaction with society in a way appropriate for primary and secondary school students. The course aims to develop citizens with problem-solving, research, collaboration, and entrepreneurship skills (Barr et al., 1998, p.16). The development of social studies is parallel to the constructivist theory, which focuses on self-directed learning with the student at the centre. This theory aims to teach students theoretical and practical knowledge that they can use in their daily lives, through experience. One of the approaches developed based on constructivist theory to ensure permanent learning is problem-based learning (PBL) (Kek & Huijser, 2017, p. 15; Hmelo-Silver, 2004).

Controversial issues are related to democracy education in social studies courses. These topics are also effective in teaching the concept of democracy within the citizenship education program (Kerr & Huddleston, 2021; Pace, 2021). Democracy education helps students and future citizens develop democratic values such as open-mindedness, respect for opposing views, participation awareness, skepticism, embracing diversity, critical thinking, and interpersonal communication skills (Misco, 2020; Foster, 2014; National Council for the Social Studies, NCSS, 2017).

Discussing controversial issues is the most commonly employed method in social studies education. Participants have indicated that this approach was their preferred teaching strategy for social studies, more so than for other subject areas. Despite these trends, the variety of instructional strategies tends to be less diverse across different subjects than the diversity found within the strategies themselves (Turner et al., 2024). When the research on teaching controversial issues in social studies courses is examined, it is seen that there

should be space for studies aimed at developing student's argumentation skills and situations where controversial issues are integrated into the social studies course, by associating them with an outcome. There are different studies on this issue in the literature (Bellows & Bodle, 2016; Buchanan & Hilburn, 2016; Hess, 2004; Tschida & Buchanan, 2015). Shear (2018) also emphasised the lack of practice and scientific studies and stated that this encourages the handling of controversial issues in social studies courses and at the primary school level. McAvoy and Ho (2020) also conducted a study on approaching the teaching of controversial issues from a scientific perspective. Their research aimed to emphasise the scientific evidence on climate change, which has a clear link to science, and to show that all controversial issues contain foundational evidence.

Problem-based learning aims to bring students face to face with real-life problems and direct them to research, questioning, and argumentation activities. In this respect, the gains achieved with controversial issues are similar to PBL (Yücel & Köçer, 2018). Hmelo-Silver (2004) stated that a good problem should also encourage conjecture and argumentation by providing feedback that allows students to evaluate the effectiveness of their knowledge, reasoning, and learning strategies. Demirel (2014) also examined the changes in student's science process skills with PBL and argumentation-based teaching methods. Argumentation is used in all fields, such as mathematics, biology, history, and social studies, especially in science (Kolstø & Ratcliffe, 2008; Erduran, 2018). Hmelo-Silver (2004) stated that a good problem should also encourage conjecture and argumentation by providing feedback that allows students to evaluate the effectiveness of their knowledge, reasoning, and learning strategies.

In the literature, some studies have examined the nature of science, scientific process, and scientific inquiry skills with PBL (Cofré et al., 2019; Rubini et al., 2019; Lawless et al., 2018). Some have questioned the effect of PBL on students' academic achievement and communication skills in social studies courses (Bayram & Deveci, 2022; Tanrikulu & Baysal, 2023; Wynn & Okie, 2017; Melovitz-Vasan et al., 2018).

Our study proposes problem-based learning as an alternative model for teachers to use argumentation activities in elementary school social studies courses that teach controversial issues from a scientific perspective. Engaging students with PBL can foster the development of critical thinking skills and enhance their problem-solving abilities. The problem-solving process in learning necessitates skills such as thinking, analysing, evaluating, and generating ideas (Gholami et al., 2016; Hallinger & Bridges, 2017; Hung et al., 2019; Saputra et al., 2018; Sari et al., 2021). In this context, it is thought that teaching controversial issues with PBL which allows students to conduct research will be effective in helping students question the accuracy of information, make scientific evaluations, and gain awareness of being a citizen. While students use the research steps in the PBL model, they solve by evaluating the controversial issue scientifically through argumentation practices.

In this context, we aimed to determine students' academic achievement and argumentation quality levels using PBL, by addressing a controversial issue in primary social studies courses. Therefore, we sought to answer the following research questions:

1. Is there a significant difference between students' academic achievement pre-test and post-test scores for the content of the controversial issue investigated with problem-based learning?
2. How do student's argumentation quality change during problem-based learning?
3. What is the relationship between students' content knowledge and argumentation quality?

The following sections of our article discuss definitions of controversial issues, theoretical information on PBL and argumentation, findings from previous research and methodological reviews, a detailed description of the data collection and analysis procedures for this review, and present findings, conclusions and recommendations for future research.

Literature review

Controversial issues

Controversial issues arise in both the social sciences (Linowes et al., 2019; Meral et al., 2022) and science (Khishfe, 2012; Krell et al., 2022; Levinson, 2008; Owens et al., 2017). Controversial issues tend to challenge and encourage discussion (McAvoy & Ho, 2020).

There are many definitions of controversial issues in the literature. Bailey (1975) defined controversial issues from a behavioural perspective as issues where many people disagree. Dearden (1981) stated that controversial issues cannot be separated from reason and rationality. Stradling et al. (1984) defined controversial issues as problems and disagreements that divide society and where important groups offer conflicting explanations and solutions based on alternative values. Gardner (1984), on the other hand, stated that the definitions of the term controversial issue were insufficient and argued that it was important for students to realise the meaning of taking a stance on specific issues.

Creating an open classroom climate in schools where controversial issues are addressed increases political efficacy, interest, tolerance, and student engagement (Alarcon & Bellows, 2017). Discussing controversial issues at the primary school level encourages students to think about social issues early (Pace, 2021). Individuals raised in this way can contribute to society as active citizens aware of social and global issues, find compromise solutions, and improve their communication skills (Hess & McAvoy, 2015).

A matter is controversial if contrary views can be held on it without those views being contrary to reason (Dearden, 1981). Hand (2008) stated that for an issue to be considered controversial, it should have at least two rational and competing points of view, and if this is not the case, students should be taught the truth. According to Berg et al. (2003), for an issue to be controversial, it should contain competing values and interests, be politically sensitive, arouse emotions that mobilise individuals, and be general and complex. A controversial issue may have all or some of the characteristics listed above. For example, issues related to gender equality, health, and racism are considered controversial in most of the countries considered to be advanced. In contrast, corruption among public officials

is considered controversial in Albania, the policy for emigrating to Europe is controversial in the United Kingdom, and whether to measure the amount of water use is controversial in the Republic of Ireland (Kerr & Huddleston, 2021; Misco, 2020).

Controversial issues are related to democracy education in social studies courses. These topics are also effective in teaching the concept of democracy within the citizenship education program (Kerr & Huddleston, 2021; Pace, 2021). Democracy education helps students and future citizens develop democratic values such as open-mindedness, respect for opposing views, participation awareness, skepticism, embracing diversity, critical thinking, and interpersonal communication skills (Misco, 2020; Foster, 2014; National Council for the Social Studies, NCSS, 2017).

In our study, we addressed the effects of globalisation on cultures as a controversial issue. The effects of globalisation on cultures are expressed in three different paradigms. The first is defined as polarisation. Nationalism is more prominent here than the states' interaction with each other. The other paradigm is homogenisation. The basic idea here is that the world is becoming increasingly culturally homogeneous; states are shaped within the framework of a common culture. The last paradigm is hybridisation. Just as a new gene emerges when the genes of two biologically different people combine, tertiary cultures can be formed when two different cultures interact (Vallejo-Marín & Hiscock, 2016, p. 1171). These paradigms contained within the cultural dimension of globalisation fit into the framework defined by McAvoy and Ho (2020), Hand (2008), and Berg et al. (2003) on controversial issues. Hess (2009) also studied globalisation as a controversial issue.

Teaching controversial issues

Although teaching controversial issues has historically been central to social studies education, it has been conducted through different pedagogical approaches that dominate the field (Ho et al., 2017). For decades, educators have argued that classroom discussion of controversial issues is fundamental to developing the understanding, skills, and habits needed to strengthen and maintain a democratic society. Therefore, most researchers focus on deliberative pedagogies that enable students to explore different points of view through activities such as questioning, critical analysis of sources, formulation of arguments, position-taking, or decision-making (Ho et al., 2017; Pace, 2021).

Since teaching a controversial issue differs from engaging students in an agreed body of knowledge, staying out of it and approaching it from an academic perspective in a different context is impossible. Therefore, the process of teaching and learning controversial issues is always influenced by the attitudes and opinions that teachers and students bring to the classroom; it can never be objective (Stradling et al., 1984). Therefore, guidelines for teaching controversial issues emphasise the need for strategies to help mitigate conflicts in the classroom and prevent discussions from becoming too intense and spilling out of the classroom (Emerson, 2012).

Problem-based learning

Problem-based learning (PBL) was first introduced at the Medical Faculty of McMaster University in Canada in 1970 (Barrows, 1994). Unlike traditional teaching methods that aim to deliver information or content comprehensively, this model enhances student's critical thinking, problem-solving, and intellectual skills (Argaw et al., 2017; Sari et al., 2021). Walker et al. (2015) defined PBL as a didactic approach that requires research, questioning, putting theoretical knowledge into practice, and using knowledge and skills to find solutions.

In PBL, students work in small collaborative groups and learn what they need to know to solve a problem (Hmelo-Silver, 2004; Sari, et. al., 2021). The teacher is a facilitator, guiding student learning through the learning cycle illustrated in Figure 1.

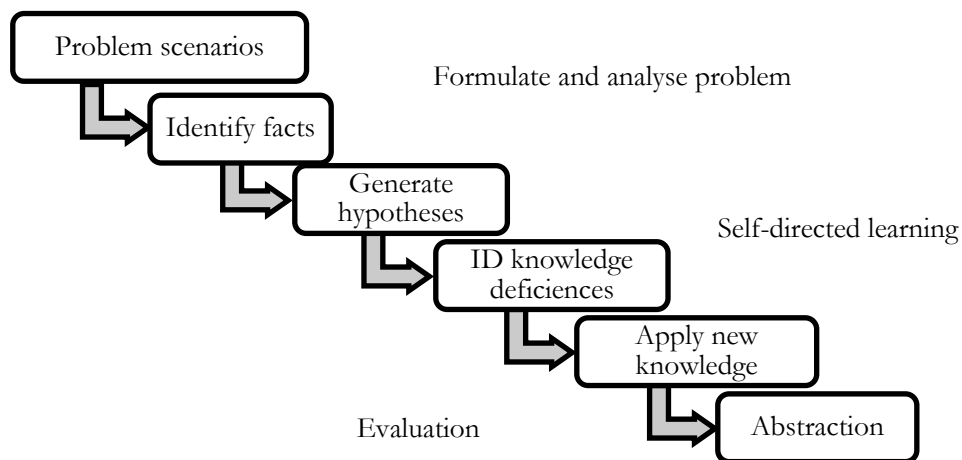


Figure 1: Problem-based learning model (PBL) (after Hmelo-Silver, 2004)

As seen in the cycle in Figure 1, students are first presented with a scenario containing the problem situation. Students formulate and analyse the problem by identifying the facts in the problem scenario. This fact identification step helps students to define the problem. These problem situations are classified by Jonassen and Kwon (2001) as well-structured and ill-structured. PBL consists of ill-structured problems that usually deal with real-life problems, require a connection between concepts and facts, and have multiple and complex solution processes (Lohman & Finkelstein, 2000). Hmelo-Silver (2004) stated that students will also acquire the skills necessary for lifelong learning by managing their learning goals and strategies to solve ill-structured problems that do not have a single correct solution with PBL. These problems are controversial issues used in social studies (Ho et al., 2017; Pace, 2021)

In finding solutions to the problem situations in the given scenarios, students engage in practices such as collecting data, analysing, drawing conclusions, and explaining scientific findings; thus, they gain a scientific perspective (Sugiharto et al., 2019). Accordingly,

students are encouraged to use scientific knowledge combined with their social, political, and economic perspectives (Barrows, 1994; Gallagher, 1997; Hmelo-Silver, 2000).

Method

This study used the embedded design-experimental model, a type of mixed methods (Creswell & Plano Clark, 2011, p. 69). This method can be used when a single data set is insufficient to answer different research questions and to enhance the use of a quantitative or qualitative design to address the study's primary aim (Creswell, 2018, p. 34).

We planned to examine the effect of PBL on student's academic achievement through the quantitative dimension of the study and the quality of student's argumentation through the qualitative dimension. We collected quantitative data through an academic achievement test at the beginning of the process, conducted social studies courses with PBL, and collected qualitative data through argumentation scenarios, activity sheets, classroom observation forms, and audio and video recordings.

Participants

We conducted this study with 22 fourth-grade students (12 girls and 10 boys) aged 9-10 studying in a rural public school in Central Anatolia, Turkey. These students had not been given argumentation or small group, scenario-based activities during their previous primary school experiences.

Data collection tools

Scenarios

We prepared five scenarios (Table 1) related to the cultural dimension of globalisation to determine the argumentation quality. Dolan et al. (2020) and Şaşmaz Ören et al. (2023) also used scenarios in their research. Parker et al. (2013) also designed a complex scenario test that emphasised students' ability to analyse different aspects of a controversial issue. However, the explicit design focus of their study was not teaching controversial issues.

While writing the scenarios, we evaluated the learning outcomes covering the Global Connections learning area in the social studies curriculum (MEB, 2018) by dividing them into five themes. We also identified the topic headings corresponding to this concept by scanning the literature relating to the cultural dimension of globalisation. We wrote the scenarios to address these topics.

As seen in Table 1, while preparing the scenarios, we were inspired by newspaper reports, videos, academic research, and real-world case studies related to globalisation. Building on the scenario, we prepared three questions for each scenario in which students would express their arguments about the problem situation in the scenario. When formulating our questions, we benefited from the research of Dolan et al. (2020) and Şaşmaz Ören et al. (2023). Although Atabey et al. (2018) stated that there is no specific method for writing scenarios, they did identify some common points based on the scenarios in the literature.

Accordingly, scenarios should include preliminary information about the controversial issue to enable discussion and allow the participants to generate ideas. Parker et al. (2013) also designed a complex scenario test that emphasised student's ability to analyse different aspects of a controversial issue.

Table 1: The contents of the scenarios

Scenario title	Content
1. Culture rainbow	We prepared this scenario to discuss culture and its characteristics. By emphasising multiculturalism and monoculturalism, we intended for students to form their thoughts on these two concepts and answer the questions prepared.
2. Living in another country	We prepared this scenario for students to produce arguments for another country using the concepts of "refugee" and "discrimination." We wanted them to question how living together with a different culture in another country would be regarded by the individuals who go to that country and the citizens of that country.
3. Become the same	In this scenario, we intended to draw attention to the loss of some cultural characteristics, one of globalisation's negative effects. Based on the concept of "the same", we discussed how having similar tastes and styles can help overcome cultural differences.
4. Where should we live?	We prepared this scenario to increase student's awareness of different countries and their cultural characteristics. We wanted to draw attention to the fact that countries do not develop at the same rate as globalisation and to the cultural dimension and consequences of this fact.
5. Should we globalise?	We prepared this scenario to learn the student's general thoughts about the cultural dimension of globalisation. We intended for them to make a general assessment and asked them to structure their thoughts by considering the characteristics of globalisation.

We reorganised the scenarios we prepared to determine the student's argumentation quality levels after presenting them to experts in Social Studies, Turkish, and argumentation. We made the pilot implementation scenarios, revised them according to the student's feedback, and finalised them.

Academic achievement test

We developed an academic achievement test to assess student's content knowledge on the controversial cultural dimension of globalisation. The test covers three learning outcomes in the Global Connections learning domain (Table 2) of the Social Studies Curriculum (MEB, 2018).

The first thing we did when developing the achievement test was prepare a specification table to ensure content validity by classifying the three objectives in line with Bloom's taxonomy (Anderson & Krathwohl, 2001) (see Table 2). We created a total of 34 draft questions based on the table. We presented the questions and the specification table to the field experts for their opinions. We conducted the validity and reliability study of the academic achievement test in three schools in different educational regions. As a result of our analysis, the Cronbach's alpha (α) value of the academic achievement test was 0.71;

the item difficulty levels (P_j) of the academic achievement test ranged between 0.27 and 0.91. We calculated the test's average difficulty (P_j) as 0.67 and the discrimination index (r_{jx}) as 0.44. Accordingly, we can say that the academic achievement test is of average difficulty and discriminative, and the difficulty levels of the items are acceptable.

Table 2: Topics and outcomes for the academic achievement test

Topics	Outcomes
Let's get to know countries	Introduces various countries in the world.
Different cultures	Compares the cultural elements of different countries with the cultural elements of our country.
The world is beautiful with differences	Respect different cultures.

Data collection process

In the first stage of our research, we conducted a five-week pilot program for the academic achievement tests, PBL activities, and argumentation quality scenarios. In the second stage, we carried out the validity and reliability study of the academic achievement tests that we revised and reorganised after the pilot program.

In the third stage of our research, the program lasted seven weeks, two hours a week in the research group in social studies courses. For this, we used the data collection tools we had finalised using the data we obtained from the first and second stages. Table 3 shows the activities carried out in the research group during the PBL intervention. We prepared the dilemma and situation cards, role-playing, and other activities we used in the PBL implementation (Evagorou, 2011; Gormley et al., 2019; Kelly, 2014).

Table 3: Activities conducted during the PBL process

Week	Name of activity	Subject	Explanation
Week-1	Pre-test		
Week-2	Country cards	The concept of culture and globalisation	Students form groups of three students each. Each group is given a country card and asked to write the cultural characteristics of that country in the boxes on the cards. The groups fill in the boxes by finding the country's cultural characteristics written on the card from the magazines in the library or on the Internet. At the end of the activity, each group presents the cultural characteristics of their chosen country to their friends.
Week-3	Who should I be? What should I do?	Living with different cultures and globalisation	In the activity taken from the "Bleakville" discussion activity developed by McSharry and Jones (2000), students are given a problem related to living with people from different cultures. They are asked to interpret this situation by taking on the roles of different people and coming up with solutions. The situations are re-enacted by changing roles within the group.

Week-4	Past/ present	Loss of cultures and globalisa- tion	Each group is given an activity card and asked to write down past and present traditions. The groups presented what they had written to the class.
Week-5	Opening a Factory	Different countries and global- isation	Students form groups of three students each. The groups are given the situation of opening a mobile phone factory. Students are asked to decide in which country they will open the factory, considering the labour force, technology possibilities, quality, and after-sales features.
Week-6	Globalisat- ion in a full circle	Globalis- ation	Students form five groups. Each group is given a separate question, which they must answer at a specific time. When the time is up, each group moves to the following table and tries to answer the question on that table differently from the previous group's answer.
Week 7	Post-test		

Data analysis

We used the argumentation quality rubric that Sadler and Fowler (2006) developed to assess the argumentation quality. The lowest level of the rubric for evaluating the quality of argumentation in Table 4 (Level 0) shows the cases where the individual does not justify his/her claim (Sadler & Fowler, 2006). Level 1 shows the cases where the individual justifies his/her claim but does not state the reason. Level 2 of the rubric for argumentation quality is for cases where the individual provides a simple reason for justification that everyone accepts. The reasons used in this sense include details about the justification or possible types of support. Sadler and Fowler (2006) combined the concepts defined as data, justification, and reasons and support in Toulmin's (1958) argumentation rubric. Levels 3 and 4 of argumentation quality include detailed explained reasons and opposing views. The distinction between these two levels depends on how strong the justifications are.

Table 4: Argumentation quality rubric

Level	Definition
0	No justification.
1	Justification but no reason given
2	The rationale is explained with a simple reason.
3	The rationale is explained with a detailed reason.
4	The rationale is explained with a detailed reason, and opposing views are included

For the analysis of student's argumentation quality levels, we sought the opinion of a primary school teacher. We calculated the weighted kappa coefficient ($\kappa=0.921$) over the researcher and teacher evaluations to provide evidence of inter-rater reliability. According to Viera and Garret (2005), this result shows high inter-rater reliability.

Findings

To provide a definitive answer to the first research question, we analysed the pre-test and post-test scores of the student's academic achievement test and the normality distributions of the data. Since the number of students was less than 50, we considered the results of the Shapiro-Wilk (S-W) Test in the normality distribution. According to the most commonly accepted practices, Taşpınar (2017) also stated that using the S-W test when $n < 50$ would be more appropriate. We conducted a dependent sample t-test (paired sample t-test) to determine whether there was a significant difference between the pre-test and post-test scores of the students.

A significant difference ($p < 0.005$) exists between the pre-test and post-test scores of the student's academic achievement test before and after the PBL (Table 5). Accordingly, it indicates that PBL increased the academic achievement of the students in a statistically significant way.

Table 5: T-test results of the student's academic achievement test

		N	\bar{x}	SS	sd	t	p
Students	Pre-test	22	66.22	12.01	41	-4.841	.0001
	Post-test		76.95	10.16			

Concerning the second research question, the findings regarding the analysis of argumentation quality levels according to the scenarios are presented in Table 6.

Table 6: Student's argumentation quality levels according to scenarios

Argum. quality level	Week-1	Week-2	Week-3	Week-4	Week-5
	Culture rainbow f (%)	Living in another country f (%)	Becoming the same f (%)	Where to live? f (%)	Should we globalise? f (%)
1	1 (4.5)	0 (0)	0 (0)	0 (0)	0 (0)
2	16 (72.7)	12 (54.5)	9 (40.9)	3 (13.6)	0 (0)
3	5 (22.7)	10 (45.5)	13 (59.1)	15 (68.2)	12 (54.5)
4	0 (0)	0 (0)	0 (0)	4 (18.2)	10 (45.5)
Total	22 (100)	22 (100)	22 (100)	22 (100)	22 (100)

Table 6 reveals that in the first week, 4.5% of the students produced arguments at level 1, 72.7% at level 2, 22.7% at level 3, and no student produced arguments at level 4 in the "Culture rainbow" scenario. In the fifth week, 54.5% of the students produced arguments at level 3, 45.5% at level 4, and no students produced arguments at levels 1 and 2.

When we analysed the student's answers, we observed that students with an argumentation quality level of "1" did not explain their reasons; students with an argumentation quality level of "2" explained their reasons; students with an argumentation quality level of "3" explained their reasons in detail and exemplified their explanations.

Students with an argumentation quality level of "4" explained and exemplified the opposing positions and answered the questions by establishing a relationship with the topics covered since the beginning of the application; some students used examples from previous lessons in their answers and developed their ideas in verbal discussions. Accordingly, it can be stated that student's argumentation quality levels increased as the weeks progressed in the PBL process.

For the last research question, we compared the argumentation quality levels of the students with their pre-test and post-test scores from the academic achievement test (Table 7).

Table 7: Comparison of argumentation quality level and academic achievement test mean scores by weeks

	Rates of students at argumentation quality levels				Academic achievement test mean scores (\bar{x})
	1	2	3	4	
Pre-test					66.22
Week 1	4.5	72.7	22.7	0	
Week 2	0	54.5	45.5	0	
Week 3	0	40.9	59.1	0	
Week 4	0	13.6	68.2	18.2	
Week 5	0	0	54.5	45.5	
Post-test					76.95

Table 7 illustrates the rates of students at argumentation quality levels according to the weeks and the mean scores of the pre-test and post-test of the academic achievement test. As the weeks progressed, the percentage of students with argumentation quality levels 1 and 2 decreased while the proportion of students with argumentation quality levels 3 and 4 increased. At the end of the implementation, student's academic achievement post-test scores were also higher than the pre-test. It can be concluded that student's argumentation quality increased with their content knowledge about the controversial issue.

Figure 2 shows the relationship between student's argumentation quality levels and academic achievement, which helps explain the data more clearly.

When we look at the data on the comparison of student's argumentation quality levels at the end of the PBL according to the scenarios in Figure 2, we see that student's argumentation quality levels were low in the "Culture rainbow" and "Living in another country" scenarios; their argumentation quality levels increased in the "Becoming the same" scenario; and student's argumentation quality levels were distributed in the "3" and "4" level range in the "Where to live?" and "Should we globalise?" scenarios. In light of the data we obtained from the student's statements, we concluded that PBL improved students' argumentation quality.

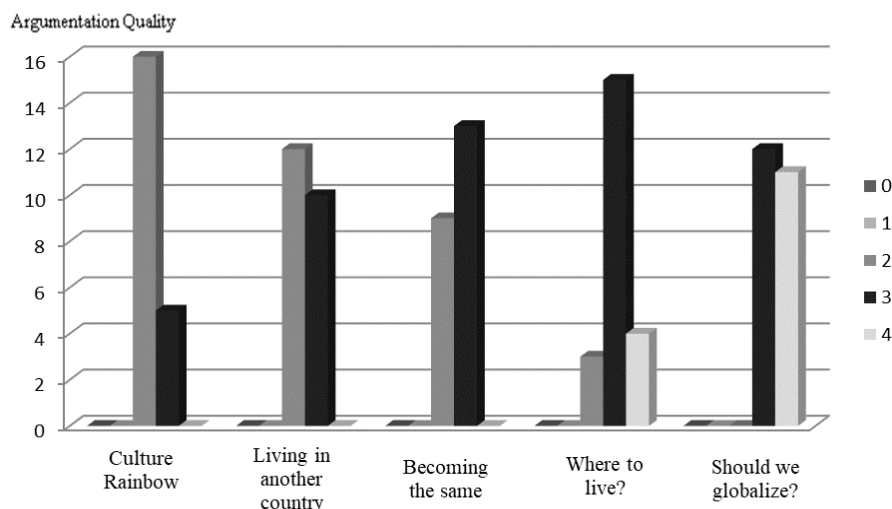


Figure 2: Distribution of argumentation quality level total scores according to scenarios

Discussion and conclusions

Our study aimed to teach a controversial issue in a primary school social studies course with PBL. According to the first research question, the significant difference between the pre-test and post-test in student's academic achievement shows that PBL contributed positively to student's learning the content knowledge of the controversial issue and their academic achievement. Mercer and Dörnyei (2020) and Amerstorfer and von Münster-Kistner (2021) also concluded that PBL increases student learning retention and success. Hursen (2021) stated that the problem-based learning method supported by Web 2.0 tools increased the academic achievement levels of pre-service teachers. Malmia et al. (2019) determined that PBL increased student's learning outcomes in 11th-grade chemistry courses. Similarly, Mulyanto et al. (2018) reported significant differences in mathematics learning outcomes between students who applied the PBL model and students who followed traditional teaching methods. Merritt et al. (2017) suggest that PBL is a practical approach for K-8 students to increase academic achievement in science courses.

When we look at our findings regarding the second research question, it can be said that PBL increased student's argumentation quality levels. While the students produced low-quality arguments in the first weeks of the implementation, their argumentation quality increased as the weeks progressed. In their study, Anagün and Atalay (2016) stated that the participants initially produced basic argumentation about the scenarios, but their argumentation quality increased as the implementation progressed. Karışan et al. (2017) reported a significant improvement in the quality and quantity of argumentation as the participants became more experienced in argumentation. Osborne (2000) stated that students will gain skills in argumentation as they participate in classroom discussions.

When we compared students' academic achievement and argumentation quality for the third research question, we found that students with high academic achievement scores also had high argumentation quality. Students produced similar arguments at Level 1 in the first week scenarios. As the weeks progressed and the content of the controversial topic was covered in the lessons, we observed that the argumentation quality level and the number of arguments increased, the arguments produced differentiated, and the students supported their claims with at least one justification. Learning the content of the debate enabled students to act more consciously while producing claims and justifications. Kızıkan and Bektaş (2021) also concluded that there is a positive correlation between academic achievement, content knowledge, and argumentation. According to the research findings, the argumentation quality of students with low academic achievement was also low. These students may not yet be able to form quality arguments because they lack content knowledge. Yılmaz-Özcan and Tabak (2019) stated that academic achievement increased with activities that enable argument formation in argumentation-based social studies teaching studies. When we analysed the arguments in the student's responses to the scenarios, we found that students with high academic achievement scores supported their claims with content knowledge. Sadler and Zeidler (2023) examined the argumentation quality of two groups with different levels of knowledge, finding that the group with high content knowledge performed better in argumentation quality. Canoz et al. (2022), Chen et al. (2016), Dawson and Carson (2018) also reached similar results in their studies examining argumentation quality and students' academic achievement.

Cultural differences in society can lead to disagreements in solving societal problems. Examining these differences as a controversial issue requires students to analyse their sources critically, discuss different points of view, and develop positions on essential questions. PBL enables students to approach social dilemmas from a scientific perspective and reflect on how they think about the moral principles and virtues surrounding the social world. PBL in elementary social studies classes enables students to learn about controversial issues in a scientific framework through argumentation activities. Teachers can facilitate the discussion of controversial issues in social studies lessons by adequately structuring the classroom environment and making it suitable for PBL. By discussing and reaching a consensus on controversial issues in the classroom environment, students can find the opportunity to develop themselves in different areas and address the moral, political, and environmental aspects of social issues from a scientific perspective. Instead of accepting all the information presented to them as it is, they can approach it skeptically and demand that it be backed up with scientific evidence.

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