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Understanding GMOs Through the Debate Method: What Do Students Think?

Münazara Yöntemiyle GDO'yu Anlamak: Öğrenciler Ne Düşünüyor?

Meryem KONU KADİRHANOĞULLARI[1]
Esra ÖZAY KÖSE[2]

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Abstract: The aim of this research is to examine university students' views on Genetically Modified Organisms (GMOs) when the topic is explored through the debate method. The research used the case study method, which is one of the qualitative research designs. The participants consisted of 23 volunteer students studying at a state university in the 2024-2025 academic year. The non-probability sampling method was used in the sample selection. Eight of these students were assigned to active debate groups, while the others were assigned to jury and listener roles. Data were collected through a semi-structured interview form consisting of 6 open-ended questions developed by the researchers and shaped by expert opinions. The interviews were conducted online after the debate activity was completed, and the obtained data were evaluated using descriptive analysis and content analysis methods. The research showed that the debate method developed critical thinking, empathy, multi-dimensional thinking and communication skills in students; and increased interest and participation in the subject. However, some difficulties such as time management, imbalance of participation and social interaction were observed. As a result, it shows the debate method makes significant contributions to learning, but difficulties may arise during application.

Key Words: Debate method, GMOs, undergraduate students

Özet: Bu araştırmanın amacı, Genetiği Değiştirilmiş Organizmalar (GDO) konusunun münazara yöntemi kullanılarak ele alındığı durumlarda üniversite öğrencilerinin konuya ilişkin görüşlerini incelemektir. Araştırmada nitel araştırma desenlerinden biri olan durum çalışması yöntemi kullanılmıştır. Katılımcılar, 2024-2025 eğitim öğretim yılında bir devlet üniversitesinde öğrenim gören 23 gönüllü öğrenciden oluşmuştur. Örneklem seçiminde olasılık dışı örnekleme yöntemi kullanılmıştır. Bu öğrencilerden 8'i aktif münazara gruplarına atanırken, diğerleri jüri ve dinleyici rollerine atanmıştır. Veriler, araştırmacılar tarafından geliştirilen ve uzman görüşleriyle şekillendirilen 6 açık uçlu sorudan oluşan yarı yapılandırılmış görüşme formu aracılığıyla toplanmıştır. Görüşmeler, münazara etkinliği tamamlandıktan sonra çevrimiçi olarak gerçekleştirilmiş ve elde edilen veriler betimsel analiz ve içerik analizi yöntemleri kullanılarak değerlendirilmiştir. Araştırma, münazara yönteminin öğrencilerde eleştirel düşünme, empati, çok boyutlu düşünme ve iletişim becerilerini geliştirdiğini; konuya olan ilgi ve katılımı artırdığını göstermiştir. Ancak zaman yönetimi, katılım dengesizliği ve sosyal etkileşim gibi bazı zorluklar gözlemlenmiştir. Sonuç olarak münazara yönteminin öğrenmeye önemli katkılar sağladığı, ancak uygulamada zorluklarla karşılaşılabileceği görülmektedir.

Anahtar Kelimeler: Münazara yöntemi, GDO, lisans öğrencileri

[1] Assist. Prof. Dr., Kafkas University, Türkiye, meryem_6647@hotmail.com, https://orcid.org/0000-0001-7359-7061
[2] Prof. Dr., Atatürk University, Türkiye, esraozay@atauni.edu.tr, https://orcid.org/0000-0001-9085-7478

Introduction

In recent years, the use of biotechnology and genetically modified organisms (GMOs) obtained through biotechnological methods has become one of the most debated scientific issues worldwide (Kaynar, 2009). The rapid increase in the world population, the increasing demand for food in parallel with this increase, and the variability of climate conditions have necessitated the development of technologies such as genetic engineering. Developed in 1973, this technology involves making changes to the genetic material of organisms in order to obtain food products resistant to pests, weeds, and environmental factors (Folkerth, 2015). Indeed, thanks to genetic modification, food processing has been facilitated. For example, the "Flavr Savr" tomatoes developed by the California-based company Calgene in 1992 were engineered to have a longer shelf life and to be resistant to spoilage, and gene editing has been used to enhance the color and appearance of potatoes (Castro, 2022).

GMOs are artificial biological products obtained by transferring a gene or regulatory element from one organism into the genetic structure of another. These organisms are designed to develop resistance to drought, frost, pests, soil salinity, acidic conditions, and other harsh environmental factors, while also reducing labor and chemical use by increasing production efficiency (Nunez et al., 2016; Gerçek, 2020). However, it has been reported that although their production is not directly dangerous, GMOs may lead to the formation of harmful compounds under certain conditions. Therefore, increasing individuals' knowledge and awareness about GMOs is of great importance (Gerçek, 2020; McFadden & Lusk, 2015).

Today, scientific and technological developments do not only lead to technical advances, they also lead to social, ethical and political effects. Issues such as GMO foods, nuclear power plants and artificial intelligence are examples of scientific developments that directly affect human life and affect social decision-making processes (Zeidler & Nichols, 2009). Such issues are defined as social-dimensional scientific issues that have not yet been agreed upon by society at large and that need to be shaped by the active participation of the public. In fact, individuals' attitudes towards these issues are generally shaped based on their emotional, personal and economic preferences (Temelli & Kurt, 2011).

In this context, it is very important for students to be exposed to current, controversial issues such as GMOs from an early age and to be informed about these issues in terms of developing scientific literacy. However, when the literature is examined, it is seen that studies on GMOs largely focus on student opinions and students are not encouraged to think deeply about this issue (Ebuehi & Ailohi, 2012; Folkerth, 2015; İşcen & Çankaya, 2024; Özel & Gökmen, 2020; Maeas et al., 2016; Uzoğlu & Bahadır, 2024; Yıkmı et al., 2017). At this point, one of the effective methods that can be used in the teaching process is debate. Debate is defined as a method that is based on the mutual discussion of two groups with different opinions by defending their own ideas and especially develops classroom democracy (Freeley & Steinberg, 2013; Kuzgun, 2000). Classroom debate practices contribute to the development of critical thinking, self-expression and discussion skills by ensuring active participation of students in the lesson (Kennedy, 2009; Sofu & Demirkol, 2024). Studies show that this method provides positive contributions to academic and social development, especially for older students (Bell, 1996; Benzer & Peker, 2022; Çabuk & Yeni, 2016; Linn et al., 1998).

The university period is a period when individuals reach maturity to express their own ideas emotionally and cognitively. During this process, creating environments where students can discuss different opinions and express themselves is very important for both their psychological and social development (Kerse & Oktaysoy, 2024). The main purpose of the debate is to ensure that students acquire a culture of discussion by developing their multi-faceted thinking skills, especially on current issues (Oğuzkan, 1970).

In this context, addressing a current and multidimensional issue such as genetically modified organisms with university students using the debate method is of great importance in terms of supporting their critical thinking, questioning, scientific reasoning and idea generation skills. In particular, methods that ensure active participation of students are needed so that controversial scientific issues can be evaluated not only at the level of gaining information but also in social and ethical contexts (Taşpınar, 2004). In this context, the debate method stands out as an effective teaching technique in terms of making students think about the issue under consideration, allowing them to gather information, encouraging them to share ideas and solution proposals and evaluating the issue from different perspectives

(Küçükahmet, 2005). Therefore, it is wondered to what extent students interact with such methods during the education process and how this interaction is reflected in their intellectual development. Based on this, this study aims to determine the opinions of students when the issue of genetically modified organisms is addressed with university students using the debate method. Therefore, the study is important in that it examines how the debate method functions as a teaching tool on a controversial scientific issue such as GMOs.

To this end, the following sub-problem was sought:

- What are university students' opinions about genetically modified organisms (GMOs) when the topic is discussed through the debate method?

Method

Research Model

In this study, the case study method, one of the qualitative research designs, was used. A case study is a research approach in which the researcher examines one or more specific cases in depth over time using multiple data sources (such as observations, interviews, audiovisual materials, documents and reports) and qualitatively defines the themes and phenomena related to these cases (Creswell, 2007). This study adopted a case study approach to examine in depth university students' views on the use of the debate method in teaching the topic of genetically modified organisms (GMOs) by posing more focused

Participants

The research was conducted with 23 students studying at a state university in the 2024-2025 academic year. Purposive sampling method was chosen in the study because the research process was planned and managed by the researcher conducting the course in a natural classroom environment. Eight students were selected on a voluntary basis, and these students were divided into two debate groups, each consisting of four people, based on their voluntary participation. Other students who did not directly participate in the debate process were assigned to two different roles in order to ensure a multi-faceted evaluation of the process. Some of these students served as juries; they evaluated the debate performances in line with pre-determined criteria such as mastery of the subject, speaking skills, persuasiveness of the defense, success in refuting the opposing side's views, use of gestures and facial expressions, and effective use of time, and provided feedback. Other students, on the other hand, carefully monitored the process as spectators (listeners), developed awareness of the subject, and achieved learning outcomes. These roles were structured to increase interaction and enrich the learning process by ensuring that students participated in the debate activity at different levels of responsibility.

Data Collection Tool

In this study, a semi-structured interview form was developed to collect students' opinions on the debate method. The content of the form was prepared by the researchers after a literature review (Benzer & Peker, 2022; Eken & Ünal, 2024; Sofu & Demirkol, 2024) and was presented to two academicians who are experts in the field of biology education for evaluation. In line with the suggestions of the experts, the necessary adjustments were made in terms of clarity and scope in the questions. Then, the form was finalized by conducting a pilot application on three students. The six open-ended questions in the form were selected in accordance with the objectives of the study. During the data collection process, the interview form was presented to the students online via Google Form after the debate activity was completed.

In order to obtain more in-depth opinions about the discussion method applied to the students, the benefits of the discussion method (interest in the lesson, positive skills gained, self-expression, listening to the other person, etc.) and its negatives were asked in the interview questions. The questions in the form are as follows:

1. How did the GMO topic feel to you when it was taught using the debate method? Why?

2. What were the biggest benefits of this method for the course, and what were the biggest challenges you encountered? Explain.
3. How do you evaluate this method in terms of expressing your own opinions and listening to the ideas of others?
4. Which skills do you think you developed the most during the debate process? (Examples: speaking, listening, critical thinking)
5. Did your thoughts about GMOs change at the end of the course?
6. Did the debate increase your interest in the course? Why?

Implementation Process

Before the debate activity, students were provided with basic information about the topic to be discussed and the debate rules were explained in detail. Participants were divided into two groups of four: "GMOs are beneficial" and "GMOs are harmful". They were prepared with arguments, statistics, visuals and current examples to support their views. During the debate process, the groups presented their views one by one, this process was observed and their performances were evaluated. The Debate Evaluation Grid, which is widely used in the literature, was used in the performance evaluation. This grid allows the performance of the speakers to be evaluated according to certain criteria. The jury, consisting of four students, scored each speaker individually according to these criteria. The scale allowed for a total evaluation out of 100 points. The evaluation criteria and score distribution are presented in Table 1. In the average evaluation made according to this table, the "GMOs are harmful" group received 80 points and the "GMOs are beneficial" group received 65 points. Other students, on the other hand, carefully monitored the process as spectators (listeners). The application took 50 minutes in a natural classroom environment.

Table 1. The debate evaluation grid

NAME/SURNAME: …….. 1.Mastery of the subject (20 p) : ……. 2. Speaking skills (stress, intonation, good sentence formation, speaking without looking at the paper) (20 p) : ……. 3. Being convincing in your defense (documents, statistics, pictures, newspaper and magazine news, current events examples) (20 p) : …….. 4. Success in refuting the other party's ideas (15 p) : …… 5. Gestures and facial expressions (15 p) : ……. 6. Use of time (10 p) : …….	Total: **…….**

After the discussion was completed, a semi-structured interview form was applied online via Google Form to further evaluate the students' experiences and opinions. Visuals of the course implementation process are presented in Figure 1.

Figure 1. Images from the Debate Method Implementation

Data Analysis

Qualitative data collected from the semi-structured interview form were examined using descriptive analysis and content analysis methods. Student responses were carefully examined; common codes, categories and themes were created based on the data. A table providing visuals of the theme, codes and categories is given in the findings. This analysis process was carried out independently by both researchers. Later, the researchers compared the analysis results and exchanged views on the codes and themes they obtained. The points of disagreement were discussed and a common decision was reached until a consensus was achieved. The students' views were presented in meaningful groups under these themes, and frequently repeated expressions were supported by direct quotations.

Validity and Reliability

In order to ensure reliability and validity in qualitative research, the concepts of credibility, transferability, consistency and confirmability are accepted as basic criteria (Yıldırım and Şimşek, 2016). In order to ensure the credibility of the research, the data collection tools were revised in line with the opinions of biology education experts. Direct quotes from students' opinions were included to increase transferability. In order to ensure consistency, the data were coded independently and the minimum 70% consistency criterion stated by Miles and Huberman (1994) was taken as basis; in the current study, the consistency between coders was found to be 88%, which shows the reliability of the study. It was noticed that the 12% difference was concentrated in the coding of negative opinions, and by negotiating on these codes, consistency was achieved between the two researchers to reach 100%. Finally, for the purpose of confirmability, all data collected during the research were stored and kept ready for examination when necessary.

Findings and Discussion

In this study, it was aimed to obtain students' opinions on GMOs by using the debate method. The debate sessions provided students with the opportunity to discuss GMOs from different perspectives and develop their thoughts on this subject. The findings are analyzed in Table 2.

Table 2. Students' opinions after the debate

What are the positive and negative aspects of teaching the course with this method? Can you explain why?		
Theme	Category	Code
POSITIVE OPINIONS	Deep understanding of the subject	Persistence
		To gain new information
		To learn the benefits and harms of GMOs
		To help learn in detail what GMOs are
		To learn that GMOs are beneficial when used under control
		To have information about unknown or misconceptions
		To be more understandable
	Discussion Skills	Empathy
		Opportunity to evaluate different ideas
		Exchange information
		Opportunity to hear different opinions
	Higher order thinking skills	Problem solving skills
		Critical thinking
		Self-assessment
	Collaboration and teamwork	Realizing the benefits of group work
		Being able to distribute tasks within a group
		Developing a sense of responsibility
	Communication skills	Speaking skills
		Listening skills
		Persuasion skills
		Using gestures and facial expressions
	Increased motivation and participation	Interest in the lesson
		Participation in the lesson
		Enjoyment
	Increasing Awareness of Ethical and Social Issues	Ensuring that they become conscious individuals
		Increasing sensitivity to such issues
		Being aware of social responsibilities
	Increased self-confidence	Participation of people with low self-esteem in class
		Ability to express oneself
NEGATIVE OPINIONS	Time management issues	Lack of time to convey some ideas
		Taking too much time for preparation
	Participation Imbalance	Not giving the right to speak
		Shy students falling behind
	Divergence of the Subject	Deviations from the purpose
	Negative Social Interactions	Inability to control stress
		Noise/interruption
		Offensive expressions
		Raising voice/shouting

The findings of this study show that the debate method enables students to understand the subject of Genetically Modified Organisms (GMOs) in a multidimensional way. “What are the positive and negative aspects of teaching the course with this method? Can you explain the reasons?” The answers given by the students to this question were divided into two themes as positive and negative. Positive opinions were classified into various categories among themselves:

In the Deep Understanding of the Subject, students mentioned the permanence of the information learned, its comprehensibility and detailed learning of the benefits and harms of GMOs. The debate process provides students with the opportunity to learn and compare different perspectives on a subject. This allows students to understand the subject in depth, not superficially. In particular, the topics discussed are usually complex and multifaceted issues that do not have a single correct answer. This helps students examine the subject from different perspectives. One student stated, "*This time we looked not only at the genetic aspect, but also at the impact of corporations and the problem of hunger. I thought more holistically.*" Doody and Condon (2012) emphasized that debate provides conceptual depth instead of superficial learning. The findings also support this view. In addition, students stated that they turned to different sources such as the Internet, journals and scientific articles during the preparation process before the debate. It was emphasized that the research process helped them understand the subject more deeply. Another student stated, "*Just reading a book wasn't enough, I also researched on the Internet. For example, I found a recent news story about GMO corn. We used that in the discussion."* Omelicheva (2007) emphasizes that debate increases students' information literacy and encourages academic research. This finding shows that students tend to access information more consciously. Since students actively discuss the topic, they learn information more effectively than just listening (Omelicheva, 2007).

In gaining discussion skills, students mentioned being able to empathize, having the opportunity to evaluate different ideas, having the opportunity to hear different opinions, and exchanging information. The debate method not only gives students the opportunity to defend their own ideas but also allows them to listen to different ways of thinking. This process encourages students to empathize and understand the perspectives of others. This develops students' tolerance, open-mindedness, and their ability to evaluate different ideas. One student stated, *"I was actually completely against GMOs, but being in the defense group made me think. They were right too."* This situation is consistent with the findings of Bellon (2000) and Zare & Othman (2013) regarding the democratic values and empathy-enhancing effect of debate. Students often have to defend opinions that are contrary to their own. This forces them to understand different thought systems and to empathize (Bellon, 2000). In addition, debate teaches them to express disagreements in a respectful manner. This contributes to the development of democratic culture (Zare & Othman, 2013).

In the Development of Higher-Order Thinking Skills, students mentioned problem-solving skills, critical thinking skills, and self-assessment. The debate method requires students to understand and defend opposing views on a particular topic. This process encourages students not only to express their own views, but also to carefully analyze the arguments of others and to think critically in a logical manner. Students learn to think deeply about a topic and gain the ability to evaluate different perspectives. One student stated, "*I used to think that GMOs were only harmful, but when I learned about their beneficial aspects, I got confused and rethought."* This finding is consistent with the findings of Kennedy (2007), who revealed that debate encourages critical thinking. Debate allows students to think deeply about a topic, analyze and evaluate opposing views. This process significantly increases their critical thinking skills (Kennedy, 2007). In addition, during debate, students often have the opportunity to review their own thoughts and arguments. This allows students to evaluate themselves and realize their shortcomings. It also enables them to make a constant effort to learn from the ideas of others and express themselves better (Doody & Condon, 2012).

In the development of collaboration and teamwork skills, students mentioned the benefits of group work, the ability to distribute tasks within the group, and the development of a sense of responsibility. Debate usually involves group work. This allows students to develop their problem-solving skills by working together. Exchanging ideas, sharing information, and producing solutions together within the group reinforces students' cooperation skills. In addition, such group work also contributes to the development of students' social skills. Moreover, debate allows students to play an active role in their own learning processes. Before participating in the debate, each student must collect information about the subject, prepare arguments, and present these arguments logically. This encourages students to be responsible for their own learning and to take more responsibility in classes. During the debate process, students stated that they worked together by sharing tasks within the group, discussed different ideas, and created a common defense plan. One student expressed this as follows: *"When we worked as a team,*

we completed each other. We decided together who would defend what." This is consistent with Doody and Condon's (2012) finding that debate supports collaborative learning. Group debate preparations improve students' skills in working together, sharing tasks, and exchanging ideas (Doody & Condon, 2012).

In terms of acquiring communication skills, students mentioned speaking, listening skills, persuasion skills and being able to use gestures and facial expressions. Debate provides a great opportunity for students to express themselves, present their arguments properly and persuade logically when faced with opposing ideas. These skills provide significant advantages to students not only at school but also in their future professional lives. Students develop their listening and speaking skills, thus enabling them to communicate more effectively. Students emphasized that during the debate, they listened to ideas opposing their own and tried to give logical responses instead of aggression. One student stated, "*At first, I was angry with what the other party said, but then I saw that they were right in their own way. I tried to be respectful while discussing."* This finding supports the findings of Zare and Othman (2013) that debate develops a social discussion culture in students. Students stated that they made their expression more effective by consciously using their hands, gazes or postures while expressing their ideas. "*When I spoke, I tried to explain not only with words but also with my hands. I emphasized with my hand when I said something especially important."* This statement is consistent with the study of Goodwin (2003), who stated that the use of body language together with verbal expression skills is important for the student's self-confidence and effective communication.

In terms of increasing motivation and participation, students mentioned the interest in the lesson, the fun of the lesson and the increase in participation in the lesson. The debate method encourages students to participate in the lesson more actively. Students enjoy including their own ideas in the discussions and this increases their motivation for the lessons. Increasing their personal interest in the subject leads students to do more research and focus on the subject more deeply. Some students stated that the debate activities were different from the classical lecture and therefore they participated in the lesson more willingly. "*Normally, I was bored in science class, but this time the subject caught my attention. Because we did not just listen, we discussed."* This view supports the findings of Doody & Condon (2012) that students' interest in the lesson and their positive attitudes increased with active learning methods. Some students stated that the competition atmosphere of the debate made them more willing: "*The other group was very ambitious. We worked hard to win. This got me hooked on the lesson."* This finding is consistent with Omelicheva's (2007) view that debates increase students' motivation to learn by creating a natural competitive environment.

In increasing sensitivity to ethical and social issues, debates on complex topics such as GMOs, environmental issues, and social inequality provide students with the opportunity to think about ethical and social responsibilities. Students learn to consider ethical dimensions and social impacts when discussing a topic. Some students stated that they established a connection between their individual consumption preferences and their impacts on society thanks to the debate: *"When I buy a product, I started to think, 'Is this healthy? Does its production harm nature?' It would never have occurred to me before."* This statement is parallel to the findings of Omelicheva (2007), indicating the power of debate to create social awareness along with critical thinking. Students stated that they had the opportunity to discuss not the unlimited applicability of scientific developments but their ethical impacts on society: *"GMOs can be made with technology, but is everything that can be made right? This is the first time I have thought about this question so much."* This view is consistent with the study of Kolstø (2001), which emphasizes that socio-scientific discussions develop students' ability to question the relationship between science and ethics. Some students stated that during the debate process they realized that the GMO issue was not only an individual issue but also an environmental and global issue: *"I realized that changing a seed affects not only the farmer but also nature, biodiversity, and our future. I did not think in such broad terms before."* This statement supports the findings of Zeidler et al. (2005) that structured discussions such as debates develop global responsibility and environmental awareness in students.

In increasing self-confidence, the debate method provides a platform for students to express their opinions freely. Defending their own ideas, voicing them and creating convincing arguments against others increases students' self-confidence. This process allows students to feel more confident and participate more actively in lessons and group work. Communication skills such as speaking, expressing

ideas and persuasion also improved during the debate process. Some students stated that they were shy at first but their self-confidence increased over time. *"At first I was shy to speak but with the support of my friends I expressed myself. Now I speak more comfortably in other lessons."* This situation is parallel to the findings of Goodwin (2003) that debate increases verbal expression skills and self-confidence. Another student stated, *"I normally do not raise my hand in class but I came prepared because I knew I had to speak in the debate. I was excited while speaking but I got used to it later."* This statement is parallel to the study by Kennedy (2007) in which it was stated that debate supports students' verbal expression and self-confidence gains.

In addition to the positive aspects that the debate method provides to students, like every teaching method, debate also has some negative aspects. When these negative aspects are supported by the opinions of the students, it contributes to making more balanced decisions in the teaching process. The negative aspects of using the debate method in classes are discussed below, together with the opinions of the students:

One of the most frequently expressed negatives is time management. If the debate method is not planned well, it can lead to time management problems. It can be time-consuming for all students to have a say during the lesson and for the topic to be discussed. The student statement, "*Debate takes a lot of time. We cannot move on to other topics. A discussion lesson sometimes covers the entire topic."* supports this. Kerse and Oktaysoy (2024) emphasize that good time management is essential for the debate to be effective; otherwise, there may be delays in achieving the teaching goals. In addition, preparation for the debate before the lesson requires extra time and has been evaluated as a negative. When students participate in the discussion unprepared or with incomplete information, incorrect information can circulate in the classroom. Failure to correct this incorrect information can cause students to have misconceptions. Serious preparation is required for an effective debate. If students do not make this preparation, the discussion remains superficial. The teacher should also carefully select the topics and manage the process well, otherwise the educational efficiency will decrease.

One of the negative aspects of debate is the participation imbalance and passive students. Not every student may participate equally in the discussions. Shy students or students with poor communication skills may remain in the background. Dominant students may lead the discussion, which disrupts a democratic environment. Debate usually allows dominant and socially more active students to come to the fore in the classroom. This can cause some students to remain passive. One student stated, *"The talkative students of the class always speak. The quiet ones always remain in the background. Even if I express my ideas, I have difficulty expressing myself."* In a study, it was stated that some students remain in the background in classes conducted with the debate method, and especially introverted individuals have difficulty in active participation (Karatay & Demirel, 2020). In addition, debate can be a serious source of stress for students with a fear of public speaking. This situation can reduce the student's self-confidence. *"Speaking in front of everyone in a debate makes me very nervous. When it is my turn to speak, my heart pounds and my hands and feet shake."* is an example of this situation. In their research, Kerse and Oktaysoy (2024) found that some students participating in the debate process experienced high levels of anxiety and this negatively affected the learning process.

Another negative aspect is that sometimes the transfer of information can remain in the background in a debate, as the subject gets distracted or deviates from the purpose. Discussions can sometimes deviate from the subject. Students can personalize the subject or go into unnecessary details. When the purpose of the debate becomes "winning" rather than learning, pedagogical value can decrease. When students focus only on refuting the other side, deep learning may not occur. Students may focus on defeating the other side instead of discussing the information on the subject in depth, with the ambition to win. There is a statement like "*It is not what the subject is, but who we silence and how it is important. Everyone focuses not on the subject, but on how to refute the other side."* Demirel (2016) states that if the debate method is not carried out carefully, it can deviate from the pedagogical goals and turn into a form where only competition is emphasized.

Another negative aspect has been identified as negative social interactions. During the debate, there may be polarization, personal conflicts, unnecessary noise or hurtful statements. Some students may experience a loss of self-confidence due to being criticized or defeated. There are students who use

expressions such as, "*When we debate, the discussion with our friends is like a fight. Voices are raised, hurtful statements are used and a stressful environment is created."* Excessive competition can lead to personal conflicts and disruption of classroom harmony during the debate. In addition, students may have difficulty distinguishing between an idea and a person. Kerse and Oktaysoy (2024) stated in their research that emotional tension was experienced among some students during the debate process and that harmony within the group could be disrupted.

Conclusion And Recommendations

The research demonstrates that the debate method contributes to students' detailed understanding of the topic of GMOs. Students stated that this method increased the comprehension of the topic, made the information learned more permanent, and gave them a better understanding of the benefits and harms of GMOs. It was noted that sharing tasks within the group contributed to responsibility, collaboration, and teamwork. Additionally, some students reported that this method improved their speaking and listening skills. It was also observed that this method increased their interest in the lesson, encouraged participation, and made the lesson more enjoyable. Students also mentioned disadvantages of the method, such as time constraints, some students remaining passive, or taking less of a voice in discussions. They further stated that negative situations, such as occasionally straying from the topic, the discussion shifting from knowledge sharing to a desire to win, and personal tensions, were experienced. Therefore, when well planned, the debate method can be quite effective; however, being aware of the aforementioned drawbacks and taking precautions will ensure the method achieves its purpose. Some suggestions can be offered for this situation:

1. According to the findings of the first study, students experienced difficulties with time management. For time management, giving each speaker a certain amount of time both prevents unnecessary prolongation and gives students effective expression practice. In addition, by preparing before class, determining the topic of discussion in advance and giving it to the students, the class time is devoted only to practice. Guiding students during the preparation process can also shorten the preparation process.
2. In this study, due to both class size and time constraints, not all students were assigned the same tasks, and therefore, not all students participated equally. To encourage participation and ensure equality, the whole class should be divided into groups and everyone should be given a role, so that even shy students can participate. Quiet students should be included in the discussion by asking direct, constructive questions with guiding questions. Dominant students can be prevented from dominating the discussion by establishing rotational speaking rules or giving them the right to speak in turns.
3. In some cases, straying from the topic occurred, and some suggestions have been made to address this. To prevent straying from the topic, a moderator (student or teacher) should be assigned to manage the process in a way that prevents the discussion from straying from the topic. It can also be effective to set simple rules that will warn you when you stray from the topic (e.g. "back to the topic" cards).
4. Some negative social interactions were encountered during the discussion. In order to reduce negative social interactions, rules of conversation should be determined within a respectful framework and the emphasis should be on refuting ideas rather than criticizing. An environment of emotional trust should be created and students should be reminded frequently that their ideas are valuable. In addition, learning should be emphasized rather than judgment. The idea that debate is not a competition but a learning method should be emphasized, and students should be rewarded for what they learn instead of for winning. Awards such as "The Most Interesting Information," "The Best Defense," or "The Most Improved Group" can be given.

References

Bell, P. (1996). *Debate as an instructional form in science education*. Unpublished Master's Thesis, University of California, Berkeley, Berkeley, CA.

Bellon, J. (2000). A research-based justification for debate across the curriculum. *Argumentation and Advocacy, 36*(3), 161–175. https://doi.org/10.1080/00028533.2000.11951646

Benzer, S., & Peker, M. G. (2022). Argümantasyon tabanlı yaklaşımın fen bilgisi öğretmen adaylarının risk algıları, bilgi ve tutum düzeyleri üzerine etkisi: GDO'lu besinler. *Gaziantep Üniversitesi Eğitim Bilimleri Dergisi, 6*(1), 75-93.

Castro, R. C. (2022). Awareness of grade 9 students in genetically modified organisms (GMO) food products: A survey study. *International Journal of Innovative Science and Research Technology*, *7*(7), 1077-1081.

Creswell, J. W. (2007). *Qualitative inquiry & research design*: Choosing among five approaches (2. Baskı). USA: SAGE Publications.

Çabuk, B., & Yeni, E. (2016). Okul öncesi eğitimde yeni bir yöntem: Münazara. *Kastamonu Education Journal*, *24*(5), 2439.

Demirel, Ö. (2016). *Öğretim ilke ve yöntemleri öğretme sanatı.* Pegem Akademi.

Doody, O., & Condon, M. (2012). Increasing student involvement and learning through using debate as an assessment. *Nurse Education in Practice, 12*(4), 232–237. https://doi.org/10.1016/j.nepr.2012.03.002

Ebuehi, O.M., & Ailohi, O.L. (2012). Genetically modified (gm) foods/organisms: perspectives of undergraduate medical and dental students of the college of medicine, *University of Lagos, Lagos, Nigeria. Food and Public Health, 2*(6), 281-295.

Orbay, E., & Ünal, F. T. (2024). Konuşma becerisinin gelişiminde münazara tekniğinin öğretmen görüşlerine göre incelenmesi. *The Journal of Social Sciences, 61(61), 367-382.*

Folkerth, C. (2015). *Students' knowledge and opinions concerning genetically modified organisms: a survey at university of colorado boulder*. University of Colorado at Boulder.Undergraduate Honors Theses.

Freeley, A., & Steinberg, D. (2013). *Argumentation and debate.* Boston: Cengage Learning.

Gercek, C. (2020). High school students' cognitive structures and views: what is a genetically modified organism? *Journal of Qualitative Research in Education, 8*(1), 96-106. https://doi.org/10.14689/issn.2148-2624.1.8c.1s.5m

Goodwin, J. (2003). Students' perspectives on debate as a learning activity. *Contemporary Argumentation and Debate*, 24, 1–13.

İşçen, C. F., & Çankaya, C. (2024). Fen bilgisi öğretmen adaylarının genetiği değiştirilmiş organizmalara (gdo) dair bilgi düzeylerinin ve görüşlerinin belirlenmesi. *The Journal of Academic Social Science Studies, 2*(32), 537-554.

Karatay, H., & Demirel, A. (2020). *Münazara etkinliklerinin Türkçe öğretmeni adaylarının konuşma kaygısına etkisi.* Türkçe Eğitimine Adanan Bir Ömür Dr. Asiye Duman'a Armağan. Pegem yayınları, Ankara.

Kaynar, P. (2009). Genetik olarak değiştirilmiş organizmalar GDO'ya genel bir bakış. *Türk Hijyen ve Deneysel Biyoloji Dergisi*, *66*(4), 177-185.

Kennedy, R. (2007). In-class debates: Fertile ground for active learning and the cultivation of critical thinking and oral communication skills. *International Journal of Teaching and Learning in Higher Education, 19*(2), 183–190.

Kennedy, R. (2009). The power of in-class debates. *Active Learning in Higher Education*, *10*(3), 225-236. https://doi.org/10.1177/1469787409343186

Kerse, G., & Oktaysoy, O. (2024). Münazara etkinliğinin birey üzerindeki etkilerinin farklı değişkenlerle değerlendirilmesi. *İnsan ve Toplum Bilimleri Araştırmaları Dergisi, 13*(3), 1503-1536. https://doi.org/10.15869/itobiad.1418572

Kolstø, S. D. (2001). Scientific literacy for citizenship: Tools for dealing with the science dimension of controversial socio-scientific issues. *Science Education, 85*(3), 291–310. https://doi.org/10.1002/sce.1011

Kuzgun, Y. (2000). Eğitimde kendini gerçekleştirme. A. Şimşek (Ed.), *Sınıfta demokrasi* içinde (s. 1-25). Ankara: Eğitim Sen Yayınları

Küçükahmet, L. (2005). *Öğretimde planlama ve değerlendirme*. Nobel Yayın Dağıtım.

Linn, M. C., Bell, P., & Hsi, S. (1998). Using the internet to enhance student understanding of science: The knowledge integration environment. *Interactive Learning Environments, 6*(1-2), 4-38.

Maes, J., Gheysen, G., & Valcke, M. (2016). The role of knowledge in student opinions on genetically modified organisms: an ıntervention study. *PONTE International Scientific Researchs Journal, 72*(7). https://doi.org/10.21506/j.ponte.2016.7.2

McFadden, B. R., & Lusk, J. L. (2015). Cognitive biases in the assimilation of scientific information on global warming and genetically modified food. *Food Policy,* 54, 35-43. https://doi.org/10.1016/j.foodpol.2015.04.010

Miles, M. B., & Huberman, M. (1994). Qualitative data analysis. Thousand Oaks: Sage.

Nunez, G. H., Kovaleski, A. P., Casamali, B., & Darnell, R. L. (2016). Can science and genetics literacy affect student perception of genetically modified organisms. *AgBioForum*, *19*(1), 44-53.

Oğuzkan, T. (1970). *Grup münakaşası el kitabı.* Ankara: Ülkü Yayınları

Omelicheva, M. Y. (2007). Resolved: Academic debate should be a part of political science curriculum. *Journal of Political Science Education, 3*(2), 161–175. https://doi.org/10.1080/15512160701338320

Özel, Ş. A., & Gökmen, A. (2020). University students' views about genetically modified organisms: A case study. *International Journal of Curriculum and Instruction*, *12*(1), 351-369.

Sofu, M. S., & Demirkol, R. (2024). Türkçenin yabancı dil olarak öğretiminde münazara tekniğinin kullanımına yönelik öğrenci görüşleri. *RumeliDE Dil ve Edebiyat Araştırmaları Dergisi*, (40), 1-12.

Taşpınar, M. (2004). *Kuramdan uygulamaya öğretim yöntemleri*. Ankara: Nobel Yayın Dağıtım.

Temelli, A., & Kurt, M. (2011). Üniversite öğrencilerinin transgenik ürünler (gdo) konusundaki bilgi ve görüşlerinin belirlenmesi. *Kuramsal Eğitimbilim, 4*(2), 247- 261.

Uzoğlu, M., & Bahadır, E. (2024). Sınıf öğretmeni adaylarının genetiği değiştirilmiş organizmalar (gdo) hakkındaki görüşlerinin belirlenmesi. *The Journal of Social Sciences, 30*(30), 78-96.

Yıkmı, S., Gülüm, L., Aksu, H., & Alpaslan, M. (2017). Determination of opinions and level of knowledge of culinary program students about genetically modified organisms (GMO's): Istanbul. *International Journal of Agricultural and Life Sciences-IJALS*, *3*(1), 136-146.

Yıldırım, A., & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri*. Ankara: Seçkin Yayıncılık

Zare, P., & Othman, M. (2013). Classroom debate as a systematic teaching/learning approach. *World Applied Sciences Journal, 28*(11), 1506–1513.

Zeidler, D. L., Sadler, T. D., Simmons, M. L., & Howes, E. V. (2005). Beyond STS: A research-based framework for socioscientific issues education. *Science Education, 89*(3), 357–377. https://doi.org/10.1002/sce.20048

Zeidler, D., & Nichols, B. (2009). Socioscientific issues: Theory and practice. *Journal of Elementary Science Education, 21*(2), 49-58. https://doi.org/10.1007/BF03173684