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Letter from the Chief Editor/Baş Editörden Mektup

Dear Readers,

The Middle East... A geography where civilizations have intersected throughout history, where cultures have blended, and where the shared heritage of humanity has been preserved. Yet, regrettably, this ancient region has long been associated with conflicts, wars, and forced migrations. The protracted civil war in Syria, in particular, has profoundly affected the lives of millions, disrupting the social, economic, and humanitarian balances of the entire region. Displaced populations, fragmented families, and lost lives stand among the most visible and devastating consequences of this conflict.

In recent times, tensions in the region appear to have evolved into more complex dimensions. In particular, the reciprocal attacks between Iran and Israel, along with the increasing military mobilization, have rendered the already fragile balances even more precarious. The growing unrest, uncertainty, and security concerns directly affect everyday life in the region, casting a shadow over hopes for the future.

This picture demonstrates that the developments in the Middle East cannot be reduced to momentary events; rather, they reflect deep, multilayered, and interconnected processes. In this period, during which the region has, in many respects, turned into a landscape of ongoing turmoil, efforts to sustain the continuity of life have also brought forth a search for solidarity and coexistence. Therefore, assessments of the region require a broader perspective that places the integrity of human beings, society, and life at its center.

In the first issue of 2026, marking the 10th anniversary of TAY Journal, articles are included on Türkiye's educational policies toward Syrian students, sustainability literacy, the cognitive coaching approach in the development of instructional skills, the ethics of artificial intelligence in education, and understandings of the concept of logarithmic functions.

We would like to express our sincere gratitude to the authors who submitted their original works to our journal; to the reviewers for their meticulous evaluations and reports; to the academics serving on our editorial and advisory boards, who have generously contributed at every stage of the publication process; and to Res. Asst. Eylem Çoban (Copy Editing Editor) and Res. Asst. Esra Nihlenur Şen (Copy Editing Editor) for their careful preparation of the manuscripts for publication. We hope that our journal will contribute to the body of scientific knowledge and welcome your feedback and suggestions.

Letter from the Chief Editor/Baş Editörden Mektup

Değerli Okuyucularımız,

Orta Doğu... Tarih boyunca medeniyetlerin kesiştiği, kültürlerin birbirine karıştığı, insanlığın ortak mirasını içinde barındıran bir coğrafya. Ancak ne yazık ki bu kadim coğrafya, uzun süredir çatışmalar, savaşlar ve zorunlu göçlerle anılmaktadır. Özellikle Suriye’de yıllardır devam eden iç savaş, milyonlarca insanın yaşamını derinden etkilemiş, tüm bölgenin sosyal, ekonomik ve insani dengelerini sarsmıştır. Yerinden edilen insanlar, parçalanmış aileler ve kaybolan yaşamlar, savaşın en görünür ve en ağır sonuçları arasında yer almaktadır.

Son dönemde bölgedeki gerilimlerin farklı boyutlara taşındığı görülmektedir. Özellikle İran ile İsrail arasında yaşanan karşılıklı saldırılar ve artan askeri hareketlilik, zaten hassas olan dengeleri daha da kırılgan hâle getirmektedir. Artan huzursuzluk, belirsizlik ve güvenlik kaygıları bölgede gündelik yaşamı doğrudan etkilemekte, geleceğe dair umutları gölgeleyebilmektedir.

Bu tablo, Orta Doğu’da yaşananların yalnızca anlık gelişmelerden ibaret olmadığını; derin, çok katmanlı ve birbirine bağlı süreçlerin bir yansıması olduğunu göstermektedir. Orta Doğu’nun adeta bir yangın yerine dönüştüğü bu süreçte yaşamın sürekliliğini koruma çabası, dayanışma ve birlikte var olma arayışını da beraberinde getirmektedir. Bu nedenle bölgeye dair değerlendirmelerde, insanın, toplumun ve yaşamın bütünlüğünü merkeze alan daha geniş bir bakış açısına ihtiyaç duyulmaktadır.

10. yılına ulaşan TAY Journal’ın 2026 yılının birinci sayısında; Türkiye’nin Suriyeli öğrencilere yönelik eğitim politikaları, sürdürülebilirlik okuryazarlığı, eğitsel becerilerin gelişiminde bilişsel koçluk yaklaşımı, eğitimde yapay zeka etiği ve logaritmik fonksiyon kavramına ilişkin anlayışlar konularını içeren makaleler yer almaktadır.

Özgün eserlerini dergimize gönderen yazarlarımıza, detaylı incelemeleri ve raporları için hakemlerimize, editör ve yayın danışma kurullarımızda yer alan ve makalelerin her bir adımında yardımlarını esirgemeyen akademisyenlere, makaleleri titizlikle yayıma hazırlayan Araş. Gör. Eylem Çoban’a (Dizgi ve Mizanpaj Editörü) ve Araş. Gör. Esra Nihlenur Şen’e (Dizgi ve Mizanpaj Editörü) teşekkür ederiz. Dergimizin bilimsel birikime katkı sağlamasını diler, görüş ve önerilerinizi bekleriz.

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Türkiye's Education Policies Towards Syrian Students During the Syria Civil War*

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*The related study was derived from the non-thesis master's graduation project prepared by Nazmiye Atasever within the Graduate Education Institute of İstanbul Nişantaşı University.

Abstract

Türkiye, while experiencing migration from neighboring Syria, is aware that meeting only the basic needs of children will be insufficient for refugee children to look to the future with hope without lost generations. Education is an important issue that needs to be emphasized in order to protect refugee children's right to education and to ensure that they can continue their lives as skilled individuals in the future without moving away from the origin of the society. In doing so, efforts to school refugee children are supported and the impact of civil society organizations on the process is observed. This study deals with the educational policies implemented for Syrian students who came to Türkiye as a result of the civil war and the cooperation with international institutions and organizations. This study, which employs a review design, reveals Türkiye's educational policies toward Syrian students during the Syrian civil war and draws attention to the importance of education in the integration of refugees into Türkiye. It has been concluded that there is a lack of integration between Türkiye's migration and education policies, that projects introduced as temporary solutions face significant challenges in becoming permanent, and that non-governmental organizations [NGOs] need to assume a more active role within these processes. Implementing these recommendations would contribute to a more inclusive, equitable, and sustainable education system capable of addressing the long-term needs of Syrian refugee students and promoting social cohesion within Turkish society.

Keywords: Education policy, migration, international education, public policy.

Introduction

Migration can be defined as a movement that involves individuals or communities relocating from their place of residence to another location, either temporarily or permanently, which in turn affects societies and the political policies of states (Tunç, 2015). Migrations occurring either between countries or within national borders due to social, economic, and political reasons have led to the comparison and coexistence of diverse cultures, often giving rise to various issues. Throughout history, societies have repeatedly been compelled to change their living environments for a variety of reasons. These movements have emerged either as a result of necessity or voluntary choice. In relation to population and migratory movements, different terms and concepts are used, particularly when compulsory or coercive factors are involved. Such terms often lead to confusion in everyday discourse and create challenges in understanding the phenomenon.

In this context, one of the most significant reference sources is the Glossary on Migration published by the International Organization for Migration [IOM]. Although the terminology may cause confusion in daily use, migration or population movement may be internal or cross-border, voluntary or forced, legal or illegal, and temporary or permanent - all of which entail different definitions and frameworks. Migration carried out through legal channels and under legal regulations is considered "regular migration" (IOM, 2009). One of the main reasons it is classified as regular is that it is conducted in accordance with a defined standard and under specified conditions.

In contrast, the term "irregular migrant" refers to individuals who enter a country without authorization or who remain in a country after the expiration of their legal stay. The concept of irregularity is particularly used for those who remain in or enter a country without planning or legal control. One of the most frequently confused terms is that of irregular

migrants and individuals under temporary protection. Especially in cases of mass migration, the condition of temporary protection may be perceived as irregular due to its rapid socio-economic impacts on the host country (IOM, 2009).

Migration is often encountered among segments of society that are, for various reasons, in a minority position. Minorities are defined as social groups that are numerically inferior, lack dominant status, and possess distinct ethnic, cultural, religious, or linguistic characteristics compared to the majority population. Although the minority concept is usually based on social divisions, it also applies to individuals who are politically marginalized and seek to migrate in search of better living conditions due to perceived discrimination. This situation particularly gives rise to what is known as “brain drain,” which refers to the migration of skilled individuals who, due to lack of equal opportunities or limited means for self-fulfillment, choose to migrate to another country to work in qualified professions (IOM, 2009).

In this context, the concept of labour migration also emerges, referring to the movement of individuals who seek to maintain their livelihoods through employment opportunities abroad. Although the terms “refugee” and “asylum seeker” are related to the aforementioned concepts, they often carry negative connotations. However, at their core, they refer to individuals who, due to their identity or the prevailing social conditions in their home country, do not feel safe and seek to live in another country (IOM, 2009).

Throughout history, the geography of Anatolia has become a central hub for numerous population movements, whether by necessity or choice. This region, frequently traversed by individuals and groups, has hosted a wide range of cultures, functioning as a space where various cultural identities meet, interact, and often blend. While such interactions may give rise to the emergence of new or hybrid cultures, they can also generate cultural tensions and competition between communities. One of the most significant manifestations of these tensions is the issue of integration. While host communities often strive to accelerate and deepen the integration of newcomers, migrant groups may resist such processes out of concern that integration could lead to assimilation, seeking instead to preserve their cultural identity and traditions. At this juncture, education emerges as one of the most crucial tools.

In 2011, due to the outbreak of civil war in Syria, over 3.5 million Syrian asylum seekers arrived in Türkiye (Anadolu Agency [AA], 2022). Initially, a temporary crisis management strategy was implemented to meet their basic needs. However, as the conflict persisted with no clear end in sight, efforts began to transform temporary measures into more permanent solutions, with the goal of promoting social cohesion. In addition to socio-cultural integration initiatives, efforts within the field of education have played a significant role in facilitating this process. A large proportion of Syrian refugees in Türkiye are children. In order to prevent the formation of a “lost generation” and to instil a sense of hope for the future, considerable emphasis has been placed on encouraging education and ensuring integration through schooling.

Türkiye has endeavoured to meet the essential needs of Syrian refugees. Yet, once it became apparent that their presence would be long-term, initiatives were launched to integrate them into Turkish society. Among these initiatives were efforts to enable Syrian students to

continue their education in public schools and to learn the Turkish language. Until 2016, Syrian students had the option of attending either Temporary Education Centers [TECs] or public schools. However, after 2016, policies were introduced requiring students to enroll in public schools, eliminating the choice between different educational institutions (Emin, 2016).

Türkiye has implemented a range of educational policies and programs aimed at supporting refugee students. While some of these efforts have achieved their intended outcomes, others have fallen short. Identifying the challenges encountered during the integration of Syrian children into the Turkish education system can help assess the effectiveness of existing programs, highlight areas of weakness, and contribute to the acceleration of the overall process of social integration.

Accordingly, the primary aim of this study is to examine the educational policies implemented for Syrian students who have migrated to Türkiye, as well as the collaborations established with international institutions and organizations. It seeks to emphasize the significance of institutional support throughout the policy implementation process.

The United Nations High Commissioner for Refugees [UNHCR] identifies the primary funding areas for refugees and asylum seekers as protection, food, education, health, basic needs, shelter, sanitation, livelihoods, and social cohesion (UNHCR, 2016; 2018; 2020). At the onset of the humanitarian crisis, host countries primarily focused on addressing refugees' basic living needs through context-specific strategies (Özdemir & Aypay, 2022).

In Türkiye, the policy of providing educational services to refugees in state schools and TECs has been implemented through coordinated efforts among the Ministry of National Education [MoNE], United Nations International Children's Emergency Fund [UNICEF], UNHCR, donors, and non-governmental organizations (Özdemir & Aypay, 2022). Statistical evidence suggests that Türkiye's educational intervention is distinctive in two respects. First, the number of children under temporary protection requiring school enrolment is exceptionally high. Second, although the integration of Syrian children into state schools began relatively late, the number of enrolments increased rapidly following the implementation of the integration project (Arık Akyüz et al., 2018; UNICEF, 2019).

By the start of the 2020-2021 academic year, more than 768,000 Syrian children in Türkiye were enrolled in compulsory formal education (K12), and over 37,000 students had entered higher education (6.67%; global refugee average= 3%). Enrolment rates among Syrian children tend to decline with increasing age (primary school= 79.5%; middle school= 78.9%; high school= 39.7%). Socioeconomic factors, the transition to distance learning, language barriers, and challenges related to social integration have been reported to influence enrollment, attendance, and school participation among school-aged Syrian children, approximately 35% of whom are out-of-school (UNHCR, 2020; Organisation for Economic Co-operation and Development [OECD], 2020).

Historically, for asylum seekers and refugees who are not culturally Turkish, permanent solutions in Türkiye have consisted of either resettlement to a third country or voluntary repatriation. For the Syrian refugee crisis, local integration emerged as a third permanent solution due to the impracticality of the first two options (Dereli, 2018). Following this policy

shift, several measures were implemented to integrate Syrian children into the formal education system. These included the creation of new learning environments, financial support for the operational costs of TECs, coverage of security and maintenance expenses for state schools with high numbers of Syrian students, distribution of educational materials, allocation of personnel, incentive payments for Syrian volunteer educators, teacher training and qualification certification programs, conditional cash transfers for families of enrolled children, and the implementation of remedial and Accelerated Education Programs for out-of-school children (UNICEF, 2019).

By mid-2019, the program, which facilitated school enrolment for approximately 500.000 refugee children, had a positive impact on enrolment and attendance rates, particularly in rural areas (OECD, 2020). Evaluations of the Promoting Inclusive Education for Kids [PIKTES] project indicate that interventions such as language instruction, supplemental education, and remedial training for school leaders positively influenced Syrian students' academic performance, absenteeism, grade repetition, and sense of belonging. Nevertheless, in subsequent years, significant challenges remain, including enrolling a greater number of school-aged refugee children and reaching approximately 400,000 children, most of whom are currently out-of-school at the secondary level (Özdemir & Aypay, 2022).

What distinguishes this study from others is its focus on identifying the educational policies adopted by Türkiye for Syrian students during the Syrian civil war, thereby demonstrating the crucial role of education in the integration of refugees into Turkish society. The study highlights the effectiveness of these educational policies in supporting the integration process and contributes to the broader literature by addressing a timely and increasingly important issue. As the integration of Syrian students into the Turkish education system continues to be a dynamic and evolving subject, examining it from multiple perspectives will help generate practical recommendations and guide future research.

Method

This study examines Türkiye's educational policies toward Syrian students during the Syrian civil war and employs a review-based research design. Review articles synthesize and critically examine studies conducted within a specific field or on a particular topic, organizing them according to the author's analytical perspective. The primary objective of such studies is to compile, analyze, and systematically present the existing body of knowledge on a given subject (Rowley & Slack, 2004).

The decision to adopt a review design is grounded in the nature of the research aim, which necessitates the compilation and analysis of data derived from public institutions' practices, official policy documents, academic studies, and statements issued by authorized officials concerning Türkiye's educational policies for Syrian students. Review studies should extend beyond the mere aggregation of information and instead be structured around fundamental concepts and overarching ideas. Accordingly, rather than addressing each source individually in detail, identifying and presenting the shared themes that connect these sources offers a more effective and coherent analytical framework (Karasar, 2009; Uman, 2011). The study examines the literature on the integration of Syrian students into the Turkish education

system, focusing on both its similarities and differences. Within this framework, the review article is organized into the following sections:

1. The Syrian Migration Crisis and Its Socio-Political Impacts on Türkiye,
2. Educational Barriers Faced by Syrian Refugee Children: A Conceptual Overview, and
3. Türkiye's Educational Policy Response to Syrian Refugee Students.

Ethical Permits of Research:

In this study, all the rules specified to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with. None of the actions specified under the heading "Actions Contrary to Scientific Research and Publication Ethics", which is the second part of the directive, have been taken.

Ethics Committee Permission Information:

Since the research was conducted with publicly available documents, it does not require ethics committee approval.

Findings

The Syrian Migration Crisis and Its Socio-Political Impacts on Türkiye

The Syrian civil war has emerged as a major humanitarian crisis in the Middle East, where many people have been injured, lost their lives, or were forced to flee their homeland. Located within the Fertile Crescent, Syria has historically hosted a variety of civilizations. Its strategic location with access to warm seas has offered significant advantages in trade throughout history. Over time, Syria has come under various forms of governance and is home to a rich tapestry of cultures. In the 20th century, as political borders began to be reshaped, Syria's modern history included a departure from Ottoman rule, governance under the French Mandate, the era of the Syrian Republic, the brief union with Egypt under the United Arab Republic, and the rise of Ba'athist rule. Syria's complex political history has been heavily influenced by its diverse ethnic and religious composition.

The majority of Syria's population consists of Arabs, with the remaining population comprising ethnic minorities such as Kurds, Armenians, and Turkmen. In terms of religion, more than half of the population is Muslim, with significant Sunni representation, while the remainder includes Christians, Druze, and a small number of Jews (Dağ, 2013).

The outbreak of internal unrest in Syria eventually escalated into full-scale war, prompting mass displacement as citizens found themselves unable to meet even their most basic needs. This mass migration involved large groups of Syrians fleeing to neighbouring countries and beyond. Among the countries most affected by this influx is Türkiye, due to its geographic proximity and shared border with Syria. The forced movement of people away from their homeland under such circumstances is referred to as mass migration.

The Arab Spring, which reshaped political dynamics across the Middle East, led to regime changes in several countries. However, in Syria, the uprisings that began in 2011 escalated into a protracted civil war. Syrian opposition groups initially demanded reforms,

including the end of income inequality, expansion of individual rights, and the lifting of martial law. The Ba'ath regime rejected these reform demands and responded to mass protests with violent suppression. The subsequent militarization of opposition groups and their clashes with Assad's security forces triggered a civil war that soon drew global attention.

Türkiye, as a direct neighbour to Syria, became heavily affected by the civil war. The conflict brought internal and border security challenges for Türkiye, exposing the country to multiple regional threats due to its strategic position. As the war continued, Syrians began to flee in large numbers, seeking refuge primarily in neighbouring countries, including Türkiye (Kömürcü, 2024).

Türkiye has since experienced a significant influx of Syrian refugees. As of 2018, nearly 4 million Syrians were residing in Türkiye (UNHCR, 2018). This migration has had profound effects on Türkiye's social, cultural, and demographic structure. While efforts have been made to promote social integration and cultural coexistence, Türkiye has faced challenges related to disproportionate population growth in urban centers, and in key sectors such as healthcare, education, housing, and food security.

Moreover, this refugee crisis has had ramifications for Türkiye's foreign relations. The scale of the humanitarian burden has led Türkiye to engage in diplomatic dialogues and cooperative efforts with other countries in the areas of humanitarian aid, foreign policy, and international partnerships. However, the crisis has also had adverse impacts on Türkiye's economy, society, and national security. Initially perceived as temporary guests, the prolonged stay of Syrian refugees and the emergence of social tensions with host communities have been widely reported in the media. Communication problems between Turkish citizens and Syrian asylum seekers have surfaced, highlighting the need for policies aimed at reducing local hostility and preventing future social unrest – including the potential for the formation of refugee-based criminal groups.

Forced displacement, whether voluntary or involuntary, inevitably brings socio-cultural challenges. Despite Türkiye's historical experience with migration, the sudden and massive influx of Syrian refugees placed immense pressure on state institutions and social systems. The ambiguity surrounding the duration of their stay, combined with the complexities of integration, has created a host of challenges. Efforts to build a participatory culture of social cohesion have been undermined in some cases by the emergence of marginalized or violence-prone groups, which has had repercussions for social harmony and institutional stability in Türkiye.

Educational Obstacles Encountered by Syrian Refugee Children: A Predictive Overview

A significant proportion of the Syrian population that has migrated to Türkiye consists of children. The rapid and uneven increase in the student population, brought about by migration, has created serious challenges within the Turkish education system. These include a shortage of teachers, instructional materials, and classroom space, as well as behavioural issues and, most importantly, language barriers among students. According to the UNICEF, as of August 2018, approximately 1,7 million of the 4 million refugees in Türkiye were children.

Additionally, around 360,000 refugees from Afghanistan, Iran, and Iraq were also residing in the country (UNICEF, 2018).

Language plays a critical role in the integration of refugee students into the Turkish education system. The rapid and effective acquisition of the Turkish language by Syrian students not only improves their academic performance but also facilitates communication with teachers and peers. It contributes to reducing behavioural issues in schools and enhances students' sense of psychological comfort and belonging, which, in turn, supports broader social cohesion beyond the classroom.

From a developmental perspective, adolescents appear to be the group most negatively affected by the migration experience. These students often find themselves torn between their own cultural identity and the dominant culture they are exposed to. Successful integration of adolescent refugees into society requires addressing their linguistic, cultural, and psychological needs. Exposure to war has left many Syrian students with deep psychological scars, often manifesting as introversion, aggression, sudden mood swings, and emotional outbursts. These traumas have contributed to anxiety and depression among refugee children, significantly impairing their learning processes. Economic hardships also hinder access to education for Syrian students. Due to low household incomes and economic insecurity, many children are compelled to enter the workforce at an early age to contribute to their family's livelihood. In the Syrian education system, compulsory education traditionally covered preschool, primary, and lower secondary levels, whereas upper secondary (high school) was not mandatory. Consequently, even though high school education is compulsory in Türkiye, the enrolment rate of Syrian students at the secondary level remains relatively low. Another challenge concerns early marriages, particularly among girls. In some cases, families continue the practice of child marriage even after relocating to Türkiye, which disrupts girls' education. Moreover, the Syrian education system does not follow a co-educational model, whereas Turkish schools are coeducational. This difference may cause resistance among some refugee families, thereby limiting school attendance, especially for girls.

Türkiye's Educational Policy Response to Syrian Refugee Students

Since 2013, the Türkiye Diyanet Foundation has begun integrating Syrian students into education by utilizing the physical facilities of its Quran courses. Initially, the Türkiye Diyanet Foundation employed nearly 100 Syrian teachers on a salaried basis, which laid the groundwork for the establishment of TECs. The primary barrier preventing Syrian students from being directly incorporated into the Turkish education system was the language problem. TECs were initially implemented as a temporary solution to educational challenges and rapidly expanded due to the disproportionate increase in the child population caused by mass migration. Although TECs made significant contributions to education, the indefinite duration of the conflict in Syria and the uncertainty regarding when the displaced population would return to their home country signalled the need to transform these temporary practices into permanent solutions. Additionally, issues such as the qualifications of educators at TECs, allocated budgets, and salaries posed disadvantages for the sustainability and longevity of the process (Özer et al., 2016).

While TECs continued the education of refugee students with support from civil society organizations and the Türkiye Diyanet Foundation, their supervision was gradually transferred under the MoNE, and the centers were progressively closed, with efforts focused on integrating Syrian students into the regular education system. Educators working in TECs were selected under the PICTES Project in 2016 through oral interviews based on Public Personnel Selection Examination [KPSS] scores, from among graduates of university programs such as Turkish Language and Literature Teaching, Guidance and Turkish Teaching, and Classroom Teaching. Selected educators participated in a 128-hour language instruction program at Turkish and Foreign Language Application and Research Center [TÖMER] and obtained language teaching proficiency certificates upon completion. Since 2016, a total of 2,600 teachers have assumed duties (MoNE, 2019). The management of the PICTES project is carried out by coordinators appointed by the Ministry. Supplementary materials for classes at TECs were derived from books used by the Yunus Emre Institute for teaching Turkish to foreigners. Despite distribution across all educational levels, these materials proved insufficient at the primary school level. The language instruction programs for Syrian students highlighted the inadequacy of resources available for teaching Turkish, underscoring the necessity for further development in this area. This recognition influenced improvements in resources during the transition to the PICTES project.

Ercan Demirci, Deputy Undersecretary of MoNE responsible for Syrian children, stated that: “As of 2015, it became evident that Syrian refugees were settling permanently in the country. Therefore, the education curriculum implemented at TECs was inadequate for meeting their needs, and these centers will be gradually closed. Since the curriculum at TECs was predominantly Arabic-based, it is not possible for refugee children to adapt to the Turkish education system or acquire a profession as they grow up. Efforts to integrate Syrian students into the Turkish education system are increasing” (as cited in Dursun, 2017).

Initial efforts in this area involved the gradual closure of TECs and directing refugee children into the Turkish education system through official letters sent to provincial administrations by the MoNE. Important steps towards the schooling of refugees were taken through the PICTES project.

Initially, temporary solutions were developed in education, based on the assumption that refugees would not stay permanently. However, uncertainty regarding the duration of the war and ambiguity about refugees’ return to their countries prompted the search for permanent solutions in education. Once it was understood that refugees would not return to their home countries, Türkiye undertook efforts to support the education of refugee children, particularly Syrians. Education plays a crucial role in refugee children’s adaptation to social life and in mitigating the effects of war trauma. For refugee children, education holds significant importance in life, enabling them to look to the future with hope, overcome the impact of traumatic experiences, and develop social relationships to create new environments for themselves (Özdemir, 2017). The initial activities included the gradual closure of TECs and systematic redirection of refugee children to public schools by MoNE through official communications with provincial authorities. The PICTES project marked significant progress in the schooling of refugees.

The primary objective of the PICTES Project has been to integrate Syrian refugee children under temporary protection, as well as other foreign nationals' children, into the Turkish education system. In 2016, MoNE launched the project for a two-year period in 29 cities with a high concentration of foreign students (Milliyet, 2021). PICTES is a joint initiative between the MoNE and the European Union [EU], funded by EU financial resources to integrate foreign children into the Turkish education system. Since 2016, the project has been financed through the The Facility for Refugees in Turkey [FRIT] financial aid program, with a total budget of 3 billion euros, contributed by both the EU and its members, and continues to receive funding. During the project's implementation, civil society organizations such as UNICEF, Disaster and Emergency Management Authority [AFAD], and the Turkish Red Crescent have also supported Syrian refugee children's education. Economic hardships have been mitigated by non-governmental organizations [NGO] through the provision of stationery, clothing, and other necessities. Aid has been coordinated by AFAD and distributed to Syrian students (Delegation of the European Union to Türkiye [EEAS], 2020). Furthermore, to promote social integration and help children overcome trauma, NGOs organize trips and workshops bringing Syrian refugee children together with Turkish children (Hayata Destek Association, 2016). By the 2021-2022 academic year, modifications were made in the implementation of the PICTES Project. A new phase known as the "integration class" practice was initiated and continues to be implemented.

Discussion and Conclusion

In the integration of Syrians into the Turkish education system, the perception among Syrian parents that education was not highly prioritized in their home country has influenced their attitudes towards education in Türkiye. Positive approaches by teachers towards Syrian parents and attention to cultural differences remain effective in fostering a harmonious atmosphere. When Syrian parents feel included, they become more supportive of schooling and education. However, coeducation in the Turkish education system poses challenges, particularly in relation to sending female students to school and the early marriage of young girls, which hinder girls' educational participation. Teachers' direct communication with Syrian parents about the integral role of education in life has been effective in alleviating prejudices. Support provided to ensure students' school attendance and meet their needs has contributed to increased enrolment rates.

Including Syrian parents and students in social activities facilitates social integration, although language barriers remain a significant obstacle. To enhance cooperation between parents and teachers, support should be provided to address language challenges, including directing parents to Turkish language courses. Peer support refers to children of the same age group communicating and helping one another. Social learning is accelerated through peer interaction, with play being the most effective means of communication among children. Friendships established among peers are critical for social adaptation and positively influence children's outlook on the future.

The phenomenon of migration should be examined differently for children. Changes in physical and social environments, including relocation from a familiar homeland, disrupt established routines and necessitate relearning. Adolescents and children are among the most

affected during migration due to the psychological and social adjustments they must make. Enrolling children in school and directing them towards education helps mitigate the traumatic effects of war. Peer education can be utilized in integrating Syrian students into the Turkish curriculum. Respecting cultural differences and promoting coexistence within classroom and school settings contribute to this process. Bringing children of different cultures and languages together in the same classes fosters mutual respect and tolerance. Harmonization activities between Syrian and Turkish students should be planned; however, language remains a major barrier. While such activities aim to enhance peer relationships, factors such as culture and ethnicity may complicate integration. Addressing the language barrier is essential to ensuring effective peer relations. Language difficulties have been identified as the most significant obstacle to Syrian students' integration into education.

An amendment was made in 2014 to the Foreigners and International Protection Law, which includes the Temporary Protection Regulation. Refugees were registered through temporary identity documents, enabling Syrian children to attend MoNE-affiliated educational institutions and TECs. Syrian students of university age were allowed to benefit from higher education as special students under the Council of Higher Education [CoHE]. Foreign students gained the right to education in Turkish institutions through temporary population cards and foreign identification numbers. Refugee students face challenges in adapting to education due to language barriers and economic inadequacies. To address language problems, the PICTES project, a partnership between the EU and MoNE, provided Turkish language instruction support. Turkish language teachers working on the project receive salaries funded by the EU. Economic deficiencies have been alleviated with NGO support, providing stationery, clothing, and other necessities. Aid is coordinated by AFAD and distributed to Syrian students.

NGOs across many provinces in Türkiye distribute educational materials, volunteer to teach Turkish, and support children's education through established centers. Furthermore, to promote social integration and help children overcome trauma, NGOs organize excursions and workshops bringing Syrian refugee children together with Turkish children. Education is one of the fundamental rights of children, and all children worldwide should have access to this right. Children who experience forced migration due to war should not be deprived of education but rather integrated into educational systems. This responsibility lies with both states and NGOs. Ensuring that children can exercise their fundamental rights is a collective responsibility of humanity.

This study aims to evaluate the educational policies implemented for Syrian students who migrated to Türkiye following the civil war in Syria in 2011. A literature review was conducted to examine the efforts made for the integration of Syrian students into the Turkish education system. The migration movement from Syria to Türkiye and the resulting challenges experienced within the Turkish education system, as well as the educational policies applied to Syrian students, were addressed. As a result of the examination, the following findings were identified:

-Structural deficiencies in Türkiye's migration policies and educational infrastructure were observed.

-There were shortcomings in the projects aimed at transforming temporary solutions in the field of education and migration into permanent ones.

-Although insufficient attention was given to NGOs, their contributions in managing the migration process became apparent through their activities over time.

Recommendations

Based on the findings of this study, several policy and practice-oriented recommendations are proposed to enhance the educational integration of Syrian students into the Turkish education system.

First, structural deficiencies in migration and education policies should be addressed through the development of long-term, sustainable frameworks rather than temporary or emergency-based solutions. Educational policies targeting refugee students need to be institutionalized and integrated into the national education system, with clear coordination mechanisms among the MoNE, local administrations, and relevant stakeholders.

Second, teacher training programs should be strengthened to improve educators' intercultural competencies. Pre-service and in-service training should include modules on multicultural education, trauma-informed pedagogy, and inclusive classroom practices.

Third, language barriers—identified as the most significant obstacle to educational integration—must be systematically addressed. Expanding Turkish language support programs, such as preparatory language classes and supplementary courses, is critical. In addition, language support should extend to parents through free or accessible Turkish language courses, thereby strengthening parent–school communication and increasing parental involvement in the educational process.

Fourth, parental participation should be actively encouraged and supported. Integration efforts should not focus solely on children but also include families, particularly mothers, whose engagement has a direct impact on students' educational continuity. Schools should implement outreach programs that foster trust and cooperation between teachers and Syrian parents, emphasizing the long-term value of education, especially for girls.

Fifth, gender-sensitive policies are necessary to address barriers to girls' education, including early marriage and low school attendance. Targeted awareness programs, family counseling, and community-based interventions should be developed to promote girls' access to education and prevent early school dropout.

Sixth, peer-based learning and social integration activities should be expanded within schools. Mixed-group classroom activities, play-based learning, and extracurricular programs that bring Syrian and Turkish students together can foster mutual respect, reduce prejudice, and enhance social cohesion. However, such initiatives must be accompanied by language support to ensure effective communication and meaningful interaction.

Seventh, the role of non-governmental organizations should be formally recognized and strengthened through institutional partnerships. NGOs have demonstrated significant capacity in providing material support, psychosocial assistance, and educational services.

Establishing structured collaboration mechanisms between state institutions and NGOs would improve efficiency and sustainability in addressing refugee students' needs.

Finally, given the low likelihood of large-scale return migration, integration policies should be designed within the framework of universal human rights and the best interests of the child. Differentiated integration programs should be developed for children who migrated to Türkiye and those born in the country, taking into account their distinct socialization processes and educational needs.

Implementing these recommendations would contribute to a more inclusive, equitable, and sustainable education system capable of addressing the long-term needs of Syrian refugee students and promoting social cohesion within Turkish society. As a limitation of the study, it should be noted that it does not address all socio-economic challenges faced by Syrian asylum seekers; rather, the scope has been restricted to issues specifically related to the field of education.

According to official statistics, approximately 4 million Syrian refugees reside in Türkiye, with a significant portion being children. Additionally, children born during this period have now reached school age, resulting in societal integration challenges. At this point, it is more appropriate to implement different integration and adaptation programs for those who migrated and those born in Türkiye.

Due to social structures and cultural habits, integrating only the children into the education system is insufficient; the involvement and integration of families, especially mothers, into the process are essential.

Despite ongoing debates about children who came to Türkiye and those born there, considering their return to Syria is unlikely, integration programs should be implemented within the framework of universal human rights.

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Conflict Statement

There is no conflict of interest among the individuals involved in the research.

Notice of Use of Artificial Intelligence

The authors did not utilise any artificial intelligence tools for the research, authorship and publication of this article.

Suriye İç Savaşı Esnasında Türkiye'nin Suriyeli Öğrencilere Yönelik Eğitim Politikaları



Özet

Türkiye, komşusu Suriye'den yaşanan göç sürecini yaşarken, sadece çocukların temel ihtiyaçlarının karşılanmasının, mülteci çocukların kayıp nesiller olarak yaşamadan geleceğe umutla bakabilmeleri için yeterli olmayacağını farkındadır. Mülteci çocukların eğitim hakkını korumak ve onların gelecekte toplumun kökeninden uzaklaşmadan becerikli bireyler olarak yaşamlarına devam edebilmelerini sağlamak için eğitimin vurgulanması gereken önemli bir konu olduğu görülmektedir. Bu bağlamda, mülteci çocukların okullaşma çabaları desteklenmekte ve sürece sivil toplum kuruluşlarının etkisi gözlemlenmektedir. Bu çalışma, Suriye iç savaşı sonucunda Türkiye'ye gelen Suriyeli öğrencilere yönelik uygulanan eğitim politikaları ile uluslararası kurum ve kuruluşlarla yürütülen iş birliklerini ele almaktadır. Derleme tasarımına sahip olan bu çalışma, Suriye iç savaşı sırasında Türkiye'nin Suriyeli öğrencilere yönelik eğitim politikalarını ortaya koyarak mültecilerin Türkiye'ye entegrasyonunda eğitimin önemine dikkat çekmektedir. Araştırma sonucunda, Türkiye'nin göç ve eğitim politikaları arasında entegrasyon eksikliği olduğu, geçici çözümler olarak sunulan projelerin kalıcı hâle gelmesinin önemli zorluklarla karşılaştığı ve sivil toplum kuruluşlarının [STK] bu süreçlerde daha aktif bir rol üstlenmesi gerektiği sonucuna ulaşılmıştır. Bu önerilerin uygulanması, Suriyeli mülteci öğrencilerin uzun vadeli ihtiyaçlarını karşılayabilecek ve Türk toplumunda sosyal uyumu destekleyecek, daha kapsayıcı, adil ve sürdürülebilir bir eğitim sistemine katkı sağlayacaktır.

Anahtar Kelimeler: Eğitim politikası, göç, uluslararası eğitim, kamu politikası.

Giriş

Türkiye'ye 2011 yılında Suriye'de yaşanan iç savaştan dolayı gelen yaklaşık olarak 3,5 milyondan fazla Suriyeli sığınmacının (Anadolu Ajansı [AA], 2022) hayati gereksinimlerini karşılayarak geçici süreli bir kriz yönetimi yapılmıştır. Savaşın süresinin belirsizliği ile sığınmacılar için geçici çözüm yollarını kalıcı hale getirmek ve toplumsal uyumu ağırlamak için çalışmalar başlamıştır. Farklı kültürlerin bir arada yaşaması için sosyokültürel uyum çalışmalarının yanında eğitim alanında yapılan çalışmalarla desteklemek uyum süresini kolaylaştırmaktadır. Türkiye'ye sığınan mültecilerin büyük bir kısmını çocuk sığınmacılar oluşturmaktadır. Suriyeli çocukların kayıp nesiller olmasının önüne geçmek ve geleceğe umutla bakmaları açısından eğitime teşvik ve entegrasyon çalışmalarına önem verilmiştir. Göçle beraber gelen Suriyelilerin hayati ihtiyaçlarını Türkiye karşılamaya çalışmıştır. Fakat Suriyelilerin kalıcı oldukları anlaşılınca onları toplumsal hayata entegre etme yönünde girişimlerde bulunulmuştur (Emin, 2016). Suriyeli öğrencilerin eğitimlerine devlet okullarında devam etmeleri ve Türk dilini öğrenmeleri yönünde çalışmalar yapılmıştır. 2016 yılına kadar Suriyeli öğrenciler geçici eğitim merkezi ve devlet okullarından eğitim alacakları yerleri kendi istekleri yönünde seçerken 2016'dan itibaren seçim olmadan devlet okullarına devam etmeleri için uygulamalar yapılmıştır (Emin, 2016). Mülteci öğrenciler için Türkiye birçok alanda çalışmalarla beraber politikalar yürütmektedir. Sığınmacı öğrencilerin okul hayatının devamı ve eğitiminin vazgeçilmez olmasına rağmen bazı çalışmalar hedefine ulaşırken bazıları bu

konuda yetersiz kalmıştır. Suriyeli çocukların eğitim sürecine entegrasyon sürecinde ortaya çıkabilecek sorunların belirlenmesinde çalışmaların hedeflerine ulaşmasında, çalışmalardaki eksikliklerin belirlenmesinde ve toplumsal uyum sürecinin hızlı bir şekilde gerçekleşmesinde tespitler yapmak etkili olacaktır.

Bu doğrultuda çalışmanın amacı, Türkiye'ye göç eden Suriyeli öğrencilere yönelik uygulanan eğitim politikaları ile uluslararası kurum ve kuruluşlarla yapılan iş birliklerini tespit edip, eğitim politikalarının uygulama süreci boyunca süreçte kurum ve kuruluşların desteklerinin önemine vurgu yapmaktır.

Yöntem

Suriye iç savaşı esnasında Türkiye'nin Suriyeli öğrencilere yönelik uyguladığı eğitim politikalarına odaklanan bu çalışma, bir derleme tasarımıdır. Derleme makaleleri, belli bir konu ya da alanda yürütülen çalışmaları, yazarın kendi araştırma perspektifi doğrultusunda düzenleyip ele alan çalışmalardır. Bu tür makalelerin temel amacı, belirli bir konuda mevcut bilgileri derlemek, analiz etmek ve sunmaktır (Rowley & Slack, 2004). Araştırmanın derleme tasarımı ile yürütülmesinin nedeni Türkiye'nin Suriyeli öğrencilere yönelik eğitim politikalarının incelenmesi amacıyla kamu kurumlarının yapmış olduğu uygulamalar, resmî politika evrakları, literatürdeki çalışmalar ve ilgili hususta yetkililerin yapmış oldukları açıklamalardaki bilgilerin derlenmiş, analiz edilmiş ve sunulmuş olmasıdır. Derleme türündeki çalışmalar, tüm bilgileri topluca sunmanın ötesine geçerek temel kavramlar ve fikirler doğrultusunda organize edilmelidir. Bu nedenle kaynakların ayrıntılı biçimde tek tek ele alınması yerine, onları birleştiren ortak temaların ortaya konması daha etkili bir yaklaşım sağlar (Karasar, 2009; Uman, 2011). Araştırmada Suriyeli öğrencilerin Türk eğitim sistemine entegrasyonu sürecine ilişkin literatür benzer ve farklı yönleri açısından ele alınmıştır. Bu doğrultuda, derleme niteliğindeki makale şu bölümlerde sunulmaktadır:

1. Suriye Göç Krizi ve Türkiye Üzerindeki Sosyo-Politik Etkileri,
2. Suriyeli Mülteci Çocukların Karşılaştığı Eğitim Engelleri: Öngörülen Bir Genel Bakış,
3. Suriyeli Mülteci Öğrencilere Yönelik Türkiye'nin Eğitim Politikası Tepkisi

Araştırmanın Etik İzinleri:

Bu çalışmada "Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi" kapsamında uyulması gerektiği belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan "Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler" başlığı altında belirtilen eylemlerin hiçbiri gerçekleştirilmemiştir.

Etik Kurul İzin Bilgileri:

Araştırma, kamuya açık dokümanlarla gerçekleştirildiği için etik kurul onayı gerektirmemektedir.

Bulgular

İstemli veya istemsiz olsun, zorunlu yer değiştirme kaçınılmaz olarak sosyokültürel zorlukları beraberinde getirir. Türkiye'nin göçle ilgili tarihsel deneyimine rağmen, Suriyeli mültecilerin ani ve kitlesel akını devlet kurumları ve sosyal sistemler üzerinde büyük bir baskı oluşturmuştur. Kalış sürelerinin belirsizliği, entegrasyonun karmaşıklığıyla birleşince bir dizi zorluk yaratmıştır. Sosyal uyumun katılımcı bir kültürünü oluşturma çabaları, bazı durumlarda marjinalleştirilmiş veya şiddete eğilimli grupların ortaya çıkmasıyla baltalanmış ve bu da Türkiye'de sosyal uyum ve kurumsal istikrar üzerinde sonuçlar doğurmuştur.

Suriye eğitim sisteminde zorunlu eğitim geleneksel olarak okul öncesi, ilkökul ve ortaokul seviyelerini kapsarken, lise (üst ortaöğretim) zorunlu değildi. Sonuç olarak, Türkiye'de lise eğitimi zorunlu olmasına rağmen, Suriyeli öğrencilerin ortaöğretim seviyesindeki kayıt oranı nispeten düşük kalmaktadır. Bir diğer sorun ise, özellikle kız çocukları arasında erken evliliklerdir. Bazı durumlarda, aileler Türkiye'ye taşındıktan sonra bile çocuk evliliği uygulamasına devam ederek kız çocuklarının eğitimini aksatmaktadır. Dahası, Suriye eğitim sistemi karma eğitim modelini izlemezken, Türk okulları karma eğitim vermektedir. Bu farklılık, bazı mülteci aileleri arasında direnişe neden olarak, özellikle kız çocukları için okula devamı sınırlayabilir.

Türk Eğitim Sisteminde Çocuklar İçin Kapsayıcı Eğitimin Desteklenmesi Projesi [PIKTES], yabancı çocukları Türk eğitim sistemine entegre etmek amacıyla AB mali kaynaklarıyla finanse edilen, Millî Eğitim Bakanlığı ve Avrupa Birliği [AB] arasında ortak bir girişimdir. 2016 yılından bu yana hem AB hem de üye ülkeleri tarafından katkıda bulunulan toplam 3 milyar avroluk bütçeyle FRIT mali yardım programı aracılığıyla finanse edilen proje, fon almaya devam etmektedir. Projenin uygulanması sırasında, UNICEF, Afet ve Acil Durum Yönetimi Kurumu [AFAD] ve Türk Kızılayı gibi sivil toplum kuruluşları da Suriyeli mülteci çocukların eğitimini desteklemiştir. Sivil toplum kuruluşları [STK] tarafından kırtasiye, giyim ve diğer temel ihtiyaçların sağlanması yoluyla ekonomik zorluklar hafifletilmiştir. Yardım, AFAD tarafından koordine edilmiş ve Suriyeli öğrencilere dağıtılmıştır (Avrupa Birliği Türkiye Delegasyonu [EEAS], 2020). Ayrıca, sosyal entegrasyonu teşvik etmek ve çocukların travmayı atlatmalarına yardımcı olmak amacıyla, STK'lar Suriyeli mülteci çocukları Türk çocuklarla bir araya getiren geziler ve atölye çalışmaları düzenlemektedir (Hayata Destek Derneği, 2016). 2021-2022 akademik yılına gelindiğinde, PIKTES Projesi'nin uygulanmasında değişiklikler yapılmıştır. "Entegrasyon sınıfı" uygulaması olarak bilinen yeni bir aşama başlatılmış ve uygulanmaya devam etmektedir.

Tartışma ve Sonuç

Suriyelilerin Türk eğitim sistemine entegrasyonunda, Suriyeli ebeveynler arasında, kendi ülkelerinde eğitimin öncelikli bir konu olarak görülmediği algısı, Türkiye'de eğitime yönelik tutumlarını etkilemiştir. Öğretmenlerin Suriyeli ebeveynlere yönelik olumlu yaklaşımları ve kültürel farklılıklara gösterilen özen, uyumlu bir ortamın oluşmasında etkili olmaya devam etmektedir. Suriyeli ebeveynler kendilerini sürece dahil hissedince, okul ve eğitim konusunda daha destekleyici hale gelmektedirler. Ancak, Türk eğitim sisteminde karma eğitimin varlığı, özellikle kız öğrencilerin okula gönderilmesi ve genç kızların erken evlilikleri

gibi konularda zorluklar yaratmakta ve kızların eğitimine katılımını sınırlamaktadır. Öğretmenlerin, eğitimin yaşam içindeki bütünsel rolünü Suriyeli ebeveynlere doğrudan aktarması, ön yargıların giderilmesinde etkili olmuştur. Öğrencilerin okula devam etmelerini sağlamak ve ihtiyaçlarını karşılamak için sunulan destekler, kayıt oranlarının artmasına katkıda bulunmuştur.

Suriyeli ebeveynler ve öğrencilerin sosyal etkinliklere dahil edilmesi, sosyal entegrasyonu kolaylaştırmakta olsa da dil engelleri hâlen önemli bir engel olarak varlığını sürdürmektedir. Ebeveynler ve öğretmenler arasındaki iş birliğini artırmak için, dil sorunlarının giderilmesine yönelik destek sağlanmalı ve ebeveynler Türkçe kurslarına yönlendirilmelidir. Akran desteği, aynı yaş grubundaki çocukların birbirleriyle iletişim kurması ve yardım etmesi anlamına gelmektedir. Sosyal öğrenme, akran etkileşimiyle hızlanmakta ve oyun, çocuklar arasında en etkili iletişim aracı olarak öne çıkmaktadır. Akranlar arasında kurulan arkadaşlıklar, sosyal uyum için kritik olup, çocukların geleceğe bakışını olumlu yönde etkilemektedir.

Göç olgusu, çocuklar açısından farklı bir şekilde ele alınmalıdır. Tanıdık bir vatanın terk edilmesi gibi fiziksel ve sosyal çevredeki değişiklikler, oturmuş rutinleri bozmakta ve yeniden öğrenmeyi gerektirmektedir. Ergenler ve çocuklar, göç sırasında psikolojik ve sosyal uyum süreçleri nedeniyle en fazla etkilenen gruplar arasında yer almaktadır. Çocukların okula kaydedilmesi ve eğitime yönlendirilmesi, savaşın yol açtığı travmatik etkilerin hafifletilmesine yardımcı olmaktadır. Suriyeli öğrencilerin Türk müfredatına entegrasyonunda akran eğitimi kullanılabilir. Kültürel farklılıklara saygı göstermek ve sınıf ile okul ortamlarında birlikte yaşamı teşvik etmek, bu sürece katkı sağlamaktadır. Farklı kültür ve dillerden çocukların aynı sınıflarda bir araya getirilmesi, karşılıklı saygı ve hoşgörüyü geliştirmektedir. Suriyeli ve Türk öğrenciler arasında uyum etkinlikleri planlanmalı, ancak dil hâlen büyük bir engel teşkil etmektedir. Bu tür etkinlikler, akran ilişkilerini güçlendirmeyi hedeflese de kültür ve etnik farklılıklar entegrasyonu zorlaştırabilir. Dil engelini aşılması, etkili akran ilişkilerinin sağlanması açısından hayati öneme sahiptir. Dil sorunları, Suriyeli öğrencilerin eğitim sistemine entegrasyonunda en önemli engel olarak belirlenmiştir.

2014 yılında, Geçici Koruma Yönetmeliği'ni içeren Yabancılar ve Uluslararası Koruma Kanunu'nda bir değişiklik yapılmıştır. Mülteciler geçici kimlik belgeleriyle kayıt altına alınmış ve Suriyeli çocukların Millî Eğitim Bakanlığı'na [MEB] bağlı eğitim kurumları ve Temel Eğitim Merkezlerine [TEM] devam etmeleri sağlanmıştır. Üniversite çağındaki Suriyeli öğrenciler, Yükseköğretim Kurulu [YÖK] kapsamında özel öğrenci statüsüyle yükseköğretimden yararlanabilmiştir. Yabancı öğrenciler, geçici nüfus cüzdanları ve yabancı kimlik numaraları aracılığıyla Türk kurumlarında eğitim hakkı kazanmıştır. Mülteci öğrenciler, dil engelleri ve ekonomik yetersizlikler nedeniyle eğitime uyum sağlamakta zorluk yaşamaktadır. Dil sorunlarını çözmek amacıyla Avrupa Birliği [AB] ve MEB iş birliğiyle yürütülen PIKTES projesi, Türkçe dil eğitimi desteği sağlamıştır. Projede görev yapan Türkçe öğretmenlerinin maaşları AB tarafından finanse edilmektedir. Sivil toplum kuruluşlarının [STK] destekleri ile kırtasiye, giysi ve diğer ihtiyaçların karşılanması ekonomik yetersizlikleri hafifletmiştir. Yardımlar AFAD tarafından koordine edilip Suriyeli öğrencilere dağıtılmaktadır.

Türkiye'nin birçok ilinde STK'ler eğitim materyalleri dağıtmakta, Türkçe öğretmek için gönüllü olarak görev almakta ve çocukların eğitimine merkezleri aracılığıyla destek sağlamaktadır. Ayrıca, sosyal entegrasyonu teşvik etmek ve çocukların travmayı atlatmalarına yardımcı olmak amacıyla STK'ler, Suriyeli mülteci çocukları Türk çocuklarıyla bir araya getiren geziler ve atölye çalışmaları düzenlemektedir. Eğitim, çocukların temel haklarından biri olup, dünyadaki tüm çocukların bu haktan yararlanabilmesi gerekmektedir. Savaş nedeniyle zorunlu göç yaşayan çocuklar eğitim hakkından mahrum bırakılmamalı, aksine eğitim sistemlerine entegre edilmelidir. Bu sorumluluk hem devletlere hem de STK'lere düşmektedir. Çocukların temel haklarını kullanabilmelerini sağlamak, insanlığın ortak sorumluluğudur.

Bu çalışma, 2011 yılında Suriye'deki iç savaş sonucunda Türkiye'ye göç eden Suriyeli öğrencilere yönelik uygulanan eğitim politikalarını değerlendirmeyi amaçlamaktadır. Bu amaçla kamu kurumlarının yapmış olduğu uygulamalar, resmî politika evrakları, literatürdeki çalışmalar ve ilgili hususta yetkililerin yapmış oldukları açıklamalardaki bilgiler incelenmiştir. Suriye'den Türkiye'ye göç hareketi ve bunun Türk eğitim sistemi içinde yarattığı zorluklar ile Suriyeli öğrencilere uygulanan eğitim politikaları ele alınmıştır. Yapılan inceleme sonucunda aşağıdaki bulgular tespit edilmiştir:

-Türkiye'nin göç politikaları ve eğitim altyapısında yapısal eksiklikler gözlemlenmiştir.

-Eğitim ve göç alanında geçici çözümleri kalıcı hâle getirmeye yönelik projelerde eksiklikler bulunmaktadır.

-STK'lere yeterince önem verilmemesine rağmen, göç sürecinin yönetimindeki katkıları zaman içinde gerçekleştirdikleri faaliyetlerle belirgin hale gelmiştir.

Öneriler

Resmî istatistiklere göre, Türkiye'de yaklaşık 4 milyon Suriyeli mülteci yaşamaktadır ve bunların önemli bir kısmı çocuklardan oluşmaktadır. Ayrıca, bu dönemde doğan çocuklar artık okul çağına gelmiş olup, toplumsal entegrasyon sorunları ortaya çıkmaktadır. Bu noktada, göç eden çocuklar ile Türkiye'de doğan çocuklar için farklı entegrasyon ve uyum programları uygulamak daha uygun olacaktır.

Sosyal yapı ve kültürel alışkanlıklar nedeniyle yalnızca çocukları eğitim sistemine dahil etmek yetersizdir; ailelerin, özellikle annelerin sürece katılımı ve entegrasyonu gereklidir.


Türkiye'ye gelen çocuklar ve burada doğan çocuklar konusunda devam eden tartışmalara rağmen, Suriye'ye geri dönmelerinin olası olmadığı göz önünde bulundurularak, entegrasyon programları evrensel insan hakları çerçevesinde uygulanmalıdır.



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Literacy of the Future: Determining the Views of Prospective Social Studies Teachers on Sustainability Literacy*

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Abstract

The purpose of the study is to determine the opinions of social studies teacher candidates regarding future literacy and sustainability literacy. A phenomenological design, a qualitative research method, was used in the study. The study was conducted with 25 prospective teachers, 16 women and 9 men, enrolled in the 4th year of the social studies teacher training program at a state university in Türkiye during the 2024-2025 academic year. Maximum variation sampling, a purposive sampling method, was used to determine the study group. Data were obtained through a semi-structured interview form. The research data were evaluated through content analysis using a qualitative data analysis program. The research results showed that prospective social studies teachers expressed the concept of sustainability using the concepts of infinity and continuity, defined sustainability literacy as sustainability knowledge, skills, attitudes and competencies, and respect for the right to life of living beings, and considered sustainability literacy skills important in terms of creating social sustainability awareness and leaving a liveable world for future generations. The study concluded that prospective teachers defined the characteristics of a sustainability literate individual as being aware of sustainability and using limited resources correctly and suggested that activities should be conducted to instill environmentally friendly habits in order to acquire sustainability literacy skills, and that teachers should serve as role models. The research suggests that sustainability literacy skills should be taught to individuals at all levels of education, starting from an early age.

Keywords: Skills, literacy, sustainability literacy, prospective social studies teachers.

Introduction

Humankind has interacted with the environment at every stage of its existence since its existence, benefited from the resources available to it, changed its environment under the influence of developing technology, and lived in harmony with it, yet has never cared about it (Tıraş, 2012). Humans' unconscious use of nature to sustain their lives and meet their needs negatively impacts nature (Ulu Kalın, 2018). Rapid growth in production and consumption, particularly under the influence of industrialization and technological advancements, has led to the pollution of air, water, and soil, the depletion of natural resources, and the reduction of nature's ability to regenerate (Toprak, 2006). The problems the world has faced in the last century appear to stem from many factors, including political, economic, psychological, sociological, and environmental (Kaynak et al., 2023). Therefore, environmental problems have become a vital global issue that requires joint decisions affecting all countries (Atasoy, 2005).

The activities carried out by humans to meet their needs have an impact on nature. Furthermore, as a result of industrialization, economic development, and the consumer society, human needs are diversifying and increasing. This has led to an excessive increase in the impact of human activities on nature, leading to an unsustainable situation. Ensuring sustainability is critical to preventing this unsustainable situation (Özdemir, 2022). The rapid destruction of nature by humans endangers natural resources and ecosystems. As environmental damage increases daily, the need for sustainable solutions is also increasing. Rescuing the environment damaged by humans is only possible through their own efforts. Awareness of human activities is crucial for a sustainable environment (Okayay et al., 2022). Sustainability requires a shift in thinking by improving people's quality of life. These changes aim to foster universal solidarity, social responsibility, and environmental management and

economic solutions, rather than becoming a consumer society (Ozmehmet, 2008). Sustainability is a multifaceted concept that requires considering environmental, economic, and social dimensions together. Sustainability is a concept that is not limited to individual preferences but impacts broader systems (Kazak, 2025).

The concept of sustainability was first used in 1713 by Hans Carl von Carlowitz within the context of forestry circles (Du Pisani, 2006). Sustainability is meeting current needs without endangering the needs of future generations through the interaction between natural and social systems (Ng & Tavitiyaman, 2020). Sustainability is defined as the uninterrupted continuation of a way of life, and this definition also includes many criteria related to ecological, economic, and social issues (World Wide Fund for Nature [WWF], 2012). Sustainability is an approach that considers ecological balance and economic growth together, uses natural resources effectively, meets today's needs without endangering the needs of future generations, and prioritizes the environment (Bayazıt Hayta, 2009). Sustainability is a dynamic process that helps people realize their potential and improve their quality of life by protecting the world's living systems (Forum for the Future, 2025).

To eliminate the unsustainable situation we face today and create a sustainable future, people must be conscious. In this context, sustainability literacy, based on ecological literacy, is a crucial skill. Sustainability literacy is a framework of competencies aimed at promoting a lifestyle that is in harmony with the conditions that include the natural balance of the earth (Özdemir, 2022). This literacy is the skill set necessary for the transition to sustainability (Winter & Cotton, 2012). Sustainable literacy is the organization of individual and social life in solidarity, within the framework of the concept of "global citizenship" (Morin, 2003).

Sustainability literacy is the knowledge and skills that enable individuals to consciously use limited resources and make effective decisions in the process of building a sustainable future (Décamps et al., 2017). This type of literacy is important for improving individuals' decision-making skills (Sterling, 2012). Sustainability literacy is a skill that aims to raise awareness of future professionals about the interconnected environmental, economic, and social impacts of their field (Kinzer, 2021). In line with these definitions, sustainability literacy can be defined as sustainability knowledge, skills, and attitudes, protecting limited resources and natural and cultural heritage, being beneficial to living beings and respecting their right to life, and competencies related to sustainability awareness and a sustainable lifestyle.

A sustainability literate individual is expected to understand, individually and collectively, how to do things sustainably, possess sufficient knowledge and skills to understand and make decisions and take action to support sustainable development, and encourage decisions and actions taken to support sustainable development (Parkin et al., 2004). Individuals with sustainability literate skills are those who foresee the trajectory of society, are aware of unsustainable life, strive to achieve a sustainable world (Stibbe & Luna, 2009), critically evaluate society, better understand unsustainable situations and the social structures that cause them, and are able to build a sustainable future at both the individual and societal levels (Kazak, 2025). A sustainability literate individual "respects other living things; uses knowledge, skills, and competencies to utilize, protect, and pass on cultural, economic, and natural resources to future generations" (Ministry of National Education [MoNE], 2024c).

Sustainability literate individuals are those who possess the necessary knowledge, skills, and attitudes to promote sustainable development and support sustainability-related decisions and behaviors (Dallaire et al., 2018). In this context, it can be said that a sustainability literate individual is someone who is aware of sustainability, uses limited resources effectively for a sustainable life, protects cultural, economic, and natural resources, is environmentally conscious, respects all living things, creates solutions to global problems, makes conscious decisions for sustainability, and takes responsibility for a sustainable future.

For centuries, people have viewed nature as a limitless resource and recklessly exploited it, coupled with the rapid population growth and depletion of natural resources, have led people to find new solutions. This has led to the emergence of a sustainable development approach that ensures the preservation of natural resources to future generations without depletion. Sustainable development centers on people and aims to consciously utilize natural and cultural resources, considering future generations, to meet people's economic and social needs. The limited nature of natural resources and the potential for depletion have made environmental protection and sustainability crucial. The Brundtland report, published in 1987, defines sustainable development as meeting people's needs while considering the needs of future generations (Tıraş, 2012). Sustainable development aims for "economic growth, social development, and ecosystem protection." Sustainable development is a set of objectives that aim to use natural resources effectively and equitably, increase individuals' quality of life and sustainable economic resources, reduce poverty, and provide equal and fair access to quality education (Kaynak et al., 2023). A balance must be established between sustainable development, environmental protection, and economic development (Kaya & Ek, 2021).

The environmental, social, and economic challenges experienced in the 21st century have made it essential for individuals and societies to fully understand sustainable development goals. Therefore, developing sustainability literacy is crucial for the effective implementation of the sustainable development approach in society (Kazak, 2025). Sustainability literacy allows individuals to understand the relationship between the environmental, social, and economic dimensions of sustainable development (Yücel, 2025). Sustainability literate individuals are those who know and understand the principles of sustainable development, support social well-being, contribute to sustainable economies, and make environmentally friendly decisions (Chinedu et al., 2023).

The transition to sustainability depends on the mental transformation of society through education, as well as on ecological, economic, and social sustainability (Sterling, 2004). Sustainability education is important in the transition to a sustainable society (Ozdemir, 2021). However, sustainability education is not limited to formal education (Albinsson et al., 2020). Because education given at a young age in the family and at school is of great importance in raising awareness of sustainability in people (Suna & Çengelci Köse, 2023). The increasing impact of environmental problems on nature and people necessitates the transition to a sustainable lifestyle. The transition to sustainability is possible only if students become sustainability literate. Sustainability education is of critical importance in raising students to be sustainability literate (Ozdemir, 2021). Because sustainability literacy is a key outcome of sustainability education (Sandri, 2014). Furthermore, it is important for

society to be educated about sustainability in order to exhibit sustainability attitudes and behaviors (Gadotti, 2008).

Sustainability literacy enables individuals to understand environmental, social, and economic situations and make informed decisions. Sustainability literacy awareness gained through education is important in developing a sustainable lifestyle (Kazak, 2025). Education is critical for individuals in building a sustainable future. Education is effective in enabling individuals to lead change, collectively build a sustainable future, and cope with the challenges of the 21st century. In this regard, higher education plays a crucial role in educating the leaders of change (Décamps et al., 2017). Sustainability education in higher education is important for developing sustainability literacy and an interdisciplinary approach (Tarrant & Thiele, 2017).

In the Türkiye Century Education Model [TYMM], it is emphasized that “the Virtue-Value-Action Framework, systems literacy, and social-emotional learning skills, created in line with our national and moral values by supporting the multifaceted development of students, are an important part of all courses as cross-program components.” In the process of structuring different literacy skills within the framework of systems literacy in the curriculum, systems thinking was employed and the types of literacy were determined as “information literacy, digital literacy, financial literacy, visual literacy, cultural literacy, civic literacy, data literacy, sustainability literacy, and art literacy.” In this direction, the systems thinking skills developed in students through systems literacy contribute to the holistic achievement of literacy goals (MoNE, 2024a). Sustainability literacy, which is among the literacy skills, includes “knowledge, skills, attitudes and competencies such as protecting limited resources, respecting the right to life of all living things, being beneficial to existence and human civilization, and taking into account equality between generations” (MoNE, 2024c). Furthermore, it is important to integrate process components within the teaching-learning process within the framework of literacy skills. In the TYMM, sustainability literacy encompasses the integrated skills and process components of “understanding sustainability and sustainable development, understanding sustainable and unsustainable systems, analyzing sustainable and unsustainable systems, structuring sustainable and unsustainable systems, discussing problems and issues related to unsustainable systems, creating/selecting/using tools that predict sustainable system behavior, solving problems that affect the sustainability of systems, and translating solutions developed for system sustainability into action” (MoNE, 2024a). Sustainability literacy is one of the crucial skills that students must acquire for their multifaceted development within the context of changing and evolving global conditions.

Literacy skills, which are implicitly addressed in curricula, should be taught holistically and in a spiral manner, with diverse content, across all subjects, starting from preschool (MoNE, 2024a). Social studies is critical in equipping students with sustainability literacy skills, a skill within literacy skills. The 2024 Social Studies Curriculum aims to equip students with “conceptual skills, subject-matter skills, social and emotional learning skills, literacy skills, dispositions, and values.” One of the key literacy skills in the program is sustainability literacy. Two of the program’s specific objectives relate to sustainability literacy. Accordingly, students are expected to “recognize the characteristics of the natural environment in which

they live and our country, analyze the interaction between nature and humans, assume responsibility for protecting natural resources, and question the interaction between humans and the natural and human environment, from the local to the global, for a sustainable life” (MoNE, 2024b). Therefore, social studies teachers have significant responsibilities in instilling sustainability literacy in students from an early age. To foster a social awareness of sustainability and leave a livable world for future generations, it is crucial to cultivate sustainability literate individuals who are aware of sustainability, respect the right to life of living beings, are environmentally conscious, utilize limited resources effectively, protect cultural, economic, and natural resources, and develop solutions to global challenges, possessing the knowledge, skills, attitudes, and competencies necessary for sustainability. Therefore, determining the perspectives of social studies teacher candidates on sustainability literacy is crucial.

The purpose of the study is to determine the views of social studies teacher candidates regarding sustainability literacy, the future literacy. To this end, the sub-problems of the study were identified:

1. What are the views of social studies teacher candidates on the concept of sustainability?
2. What are the views of social studies teacher candidates on sustainability literacy?
3. What are the views of social studies teacher candidates on the importance of sustainability literacy?
4. What are the views of social studies teacher candidates on the characteristics of a sustainability literate individual?
5. What are the views of social studies teacher candidates on how they define themselves as sustainability literate?
6. What are the suggestions of social studies teacher candidates for acquiring sustainability literacy skills?

Method

Research Design

This study employed a phenomenological design, a qualitative research method. A phenomenological design investigates people’s reactions and perceptions to a phenomenon or event, attempting to identify common characteristics of these reactions and perceptions. This study aims to discover the essence of people’s experiences and to identify and understand the common characteristics of similar experiences (Fraenkel et al., 2012).

Study Group

Maximum variation sampling, a purposive sampling method, was used to determine the study group. In maximum variation sampling, the sample is selected to maximize diversity within the sample regarding the problem under investigation (Mertens, 2019). Accordingly, individuals who maximally reflected the characteristics of interest related to the problem under investigation were selected within the sample. The study was conducted with 25 prospective

teachers, 16 women and 9 men, enrolled in the 4th year of the social studies teacher training program at a state university in Türkiye during the 2024-2025 academic year.

Data Collection Tool and Process

Data for the study were obtained through a semi-structured interview form. Semi-structured interviews are interviews in which the researcher prepares interview questions about the research topic in advance and can rearrange them during the interview process (Ekiz, 2020), the researcher obtains in-depth information about the topic under investigation from the interviewee (Güler et al., 2015). A draft of the semi-structured interview form, consisting of six questions, was developed based on a review of the literature in line with the purpose of the study. This form was submitted to three field experts for review, and the questions were revised based on their feedback. Furthermore, a pilot study was conducted with five prospective teachers before the interview form was finalized.

Participants were informed about the research during the interview process, and the interviews were conducted face-to-face by the researcher. Interviews were conducted in spaces where participants felt comfortable and safe, with participants participating voluntarily. Participant consent was obtained from all participants. The interviews continued until no original ideas emerged and were terminated when data saturation was reached. The interview data were used in the analysis.

Data Analysis

The research data were evaluated through content analysis using a qualitative data analysis program. Content analysis is an analysis technique that aims to uncover concepts and relationships that explain the data obtained during the research process (Altunışık et al., 2023). Qualitative research data were analyzed by following the steps of “coding the data, identifying themes, organizing the codes and themes, and defining and interpreting the findings” (Yıldırım & Şimşek, 2021). The research data were transferred to a computer and prepared for analysis. The data were first divided into meaningful data units in line with the research purpose and theoretical framework. A code list was then created by assigning short codes that describe these data units. The themes were determined by relating the relationships between the prepared codes to categories. The identified themes were organized and described, the themes and upload counts were visualized in tables, the findings were exemplified with participant opinions, and the findings were interpreted. To ensure validity and reliability in qualitative research, credibility, transferability, consistency, and confirmability strategies were used (Erlandson et al., 1993; Lincoln & Guba, 1985). In this regard, expert review and participant confirmation were used for credibility, detailed description and purposeful sampling for transferability, consistency review for consistency, and confirmation review for confirmability.

Ethical Permits of Research:

In this study, all the rules specified to be followed within the scope of “Higher Education Institutions Scientific Research and Publication Ethics Directive” were complied with. None of the actions specified under the heading “Actions Contrary to Scientific Research and Publication Ethics”, which is the second part of the directive, have been taken.

Ethics Committee Permission Information:

Name of the committee that made the ethical evaluation = Firat University Social and Human Sciences Research Ethics Committee

Date of ethical review decision = 10 April 2025

Ethics assessment document issue number = 2025/07

Findings

Themes related to the concept of sustainability are presented in Table 1.

Table 1.

Sustainability Concept

Theme	Sub-themes	Participants	<i>f</i>
Sustainability concept	Eternity	P1, P5, P10, P12, P16, P19, P21, P22, P24	9
	Continuity	P2, P3, P8, P13, P15, P20, P25	7
	Transferring to future generations	P6, P7, P11, P14, P17, P23	6
	Life	P4, P9, P18	3

When Table 1 was evaluated, it was determined that the participants expressed the concept of sustainability with the highest loading as “eternity.” In other themes, social studies teacher candidates expressed the concept of sustainability as “continuity,” “transferring to future generations,” and “life.” It was determined that 9 out of 25 participants expressed the concept of sustainability as infinity. Participant P1 expressed his opinion as “*Sustainability equals infinity.*” while another participant, P5, stated, “*I can express sustainability as infinity.*” Participant P10 explained his opinion on the theme with the sentence, “*I think the concept of sustainability means being infinite.*” while another participant, P24, associated the concept of sustainability with infinity with the sentence, “*The concept of sustainability means infinity.*”

It was determined that 7 of the 25 participants who participated in the study expressed the concept of sustainability as continuity. Participant P3, who explained this theme, explained her thought with the statement, “*I can express sustainability with the concept of continuity.*” while another participant, P13, explained her thought with the statement, “*I think sustainability means continuity.*” One participant, P15, expressed the view, “*I think I can express the concept of sustainability with the concept of continuity.*” while another participant, P20, expressed the view, “*Sustainability means being continuous...*” thus emphasizing the concept of sustainability through continuity. It was determined that participants expressed the concept of sustainability as “passing it on to future generations.” Participant P7 explained his thoughts on this theme with the sentence, “*When I think of sustainability, I think of leaving everything in the world to future generations.*” Another participant, P11, explained his thoughts with the sentence, “*Sustainability and passing it on to future generations.*” Furthermore, another participant, P17, who emphasized the theme of passing on to future generations, expressed his thoughts with the sentence, “*I think the concept of sustainability means leaving a livable world for future generations.*” Another participant, P23, explained his thoughts with the sentence, “*I can explain the concept of sustainability as passing on to future generations.*” Participant P4, who explained the concept of sustainability through the theme of life, expressed his opinion with the sentence, “*Sustainability and life...*”, while another participant P9 explained his opinion with the sentence, “*I can explain*

sustainability through life itself.” One of the participants, P18, expressed his opinion on the theme of life as follows *“When sustainability is mentioned, the first thing that comes to my mind is life.”*

Findings Regarding Sustainability Literacy

Themes related to sustainability literacy skills are presented in Table 2.

Table 2.

Sustainability Literacy

Theme	Sub-themes	Participants	<i>f</i>
Sustainability literacy	Sustainability knowledge, skills, attitudes, and competencies	P1, P4, P7, P12, P13, P16, P20, P21, P24	9
	Respecting the right to life of living beings	P3, P6, P8, P11, P14, P19, P23	7
	Protecting limited resources and natural and cultural heritage	P5, P7, P10, P17, P22, P24	6
	Equality between generations	P1, P9, P12, P20, P25	5
	Understanding sustainability and sustainable development	P2, P9, P15, P18	4
	Being beneficial to living beings	P7, P18	2

An examination of Table 2 reveals that participants most frequently defined sustainability literacy skills as “sustainability knowledge, skills, attitudes, and competencies.” Other themes identified for defining sustainability literacy were “respecting the right to life of living beings,” “protecting limited resources and natural and cultural heritage,” “equality between generations,” “understanding sustainability and sustainable development,” and “being beneficial to living beings,” respectively. It was determined that 9 out of 25 participants defined sustainability literacy as the knowledge, skills, attitudes, and competencies we possess regarding sustainability. Participant P13 expressed his opinion with the statement, *“I can define sustainability literacy as the knowledge, skills, and competencies we possess about sustainability.”* Another participant, P21, explained his definition of sustainability literacy by saying, *“I can define sustainability literacy, which is definitely an important literacy for future generations, as people being conscious and knowledgeable about sustainability for the future of future generations and adopting sustainable attitudes and behaviors.”*

It was observed that 7 of the 25 participants in the study expressed sustainability literacy as respecting the right to life of living beings. Participant P23, who expressed this subtheme, stated, *“I can describe sustainability literacy as people being conscious and sensitive towards the environment in which they live and respecting the right to life of all living beings.”* Explaining the theme of protecting limited resources, natural and cultural heritage, participant P5 defined sustainability literacy with the sentence, *“This literacy does not only mean knowledge, but also protecting the unlimited resources of our world by using them correctly and preserving cultural heritage in order to make the world more livable.”* Five participants identified sustainability literacy as intergenerational equality. One participant, P25, expressed his view with the sentence, *“I believe sustainability literacy is ensuring equality between generations by using natural resources for the benefit of future generations.”* Some participants in the study defined sustainability literacy by associating it with more than one theme. Participant P24 expressed his view with the following sentence *“I think sustainability literacy can be defined as protecting limited natural resources, which is*

one of the world's biggest problems today, and possessing the necessary knowledge, skills, and behaviors for sustainability." Another participant, P1, defined sustainability literacy with the following sentence "I believe that while meeting today's needs, we must consider the rights and needs of future generations. Therefore, I believe that individuals striving to ensure equality between generations and possessing the competencies, skills, and knowledge related to sustainability are sustainability literacy." While one of the participants explained his thoughts on sustainability literacy with the sentence P12, "I think this literacy means using the world's limited resources in the right way, paying attention to intergenerational equality, and acting in accordance with the skills, knowledge, and attitudes related to sustainability." Another participant P7 explained with the sentence, "I can define sustainability literacy as being able to protect the world's scarce resources and natural and cultural heritage by using them in the right way, being able to act beneficially towards all living things, and having the knowledge, attitude, skills, and competencies related to sustainability."

Findings Regarding the Importance of Sustainability Literacy

Themes related to the importance of sustainability literacy are presented in Table 3.

Table 3.

The Importance of Sustainability Literacy

Theme	Sub-themes	Participants	<i>f</i>
The importance of sustainability literacy	Raising social sustainability awareness	P4, P5, P8, P9, P12, P14, P16, P19, P23, P25	10
	Leaving a livable world for future generations	P1, P3, P6, P13, P17, P18, P19, P22	8
	Using natural resources efficiently	P2, P4, P10, P15, P21, P25	6
	Producing solutions to environmental problems	P3, P5, P7, P11, P24	5
	Ensuring intergenerational equality	P9, P20, P21, P24	4
	Improving individuals' quality of life	P1, P11	2
	Increasing social welfare	P6, P15	2

Table 3 shows that participants viewed sustainability literacy as most important for "raising social sustainability awareness." Participants also viewed sustainability literacy as important for "leaving a livable world for future generations," "using natural resources efficiently," "producing solutions to environmental problems," "ensuring intergenerational equality," "improving individuals' quality of life," and "increasing social welfare." Ten participants identified the importance of sustainability literacy as fostering social sustainability awareness. Participant P14 stated, "Sustainability literacy is important for raising public awareness and a greater sense of social sustainability." Participants expressed the importance of sustainability literacy as enabling the efficient use of natural resources and fostering social sustainability awareness. Participant P25 explained his thoughts on these themes with the statement, "Sustainability literacy is a crucial skill for people to use limited natural resources efficiently and for sustainability awareness to be fostered throughout society."

It was determined that 8 out of 25 participants expressed the importance of sustainability literacy as leaving a livable world for future generations. One participant, P13, expressed his opinion on this theme with the statement, "In fact, problems such as

environmental pollution, climate change, famine, and overuse of natural resources reveal why raising sustainability literate individuals and sustainability literacy are crucial for leaving a livable world for future generations.” Another participant, P17, expressed it with the statement, “Sustainability literacy is necessary for a livable world for future generations.” Participant P2 emphasized the importance of sustainability literacy in using natural resources efficiently, stating, “Sustainability literacy is an important skill for a sustainable future. I think it is extremely important to use natural resources efficiently for sustainability, considering the future.” Another participant, P10, explained his opinion with the following statement “I see sustainability literacy as important for using limited natural resources efficiently to meet people’s current and future needs.” Participant P7, who explained the importance of sustainability literacy with the theme of finding solutions to environmental problems, expressed her opinion with the following sentence “I think that raising sustainable literate individuals, which is important for a sustainable future, is of critical importance. Because when I consider the damage we humans inflict on the world, I think this literacy is important for finding solutions to environmental problems.” Participant P20 stated that sustainability literacy is important in terms of ensuring equality between generations and expressed her opinion with the sentence, “Just as sustainability literacy is important for a sustainable future by ensuring equality between generations, providing this literacy education is also important.”

Findings Regarding the Characteristics of a Sustainability Literate Individual

Themes related to the characteristics of a sustainability literate individual are presented in Table 4.

Table 4.

Characteristics of a Sustainability Literate Individual

Theme	Sub-themes	Participants	f
Characteristics of a sustainability literate individual	Having sustainability awareness	P4, P9, P12, P13, P15, P18, P21, P23	8
	Using limited resources correctly	P2, P7, P14, P15, P22, P25	6
	Protecting cultural, economic and natural resources	P5, P10, P17, P20, P23	5
	Treating all living things with respect	P2, P3, P4, P8, P19	5
	Being sensitive to the environment	P1, P2, P6, P11	4
	Producing solutions to global problems	P1, P9, P16, P24	4
	Taking an active role for a sustainable future	P5, P10, P25	3
	Making conscious decisions for sustainability	P5, P14, P19	3
	Being aware of the importance of sustainability for life and the environment	P3, P6	2

When Table 4 is examined, it is determined that the highest loading regarding the characteristics of the sustainability literate individual is made on the theme of “having sustainability awareness”, while other themes are “using limited resources correctly”, “protecting cultural, economic and natural resources”, “treating all living things with respect”, “being sensitive to the environment”, “producing solutions to global problems”, “taking an active role for a sustainable future”, “making conscious decisions for sustainability” and “being aware of the importance of sustainability for life and the environment”. Eight participants

identified the characteristics of a sustainability literate individual as having sustainability awareness. Regarding this theme, participant P18 stated, *“I believe there are individuals who are sustainability conscious and adopt a stance accordingly.”* Another participant, P21, stated, *“Individuals with this literacy are sustainability literate individuals who consider not only the present but also the future and take conscious steps toward sustainability.”* One participant, P23, stated, *“Individuals with sustainability literacy skills are individuals who protect the world’s limited natural resources and cultural heritage, possess sustainability awareness and competencies,”* emphasizing that a sustainability literate individual should protect cultural, economic, and natural resources and possess sustainability awareness. Participant P4 stated that sustainability literate individuals should be individuals who treat all living things with respect and have sustainability awareness, and explained her opinion with the sentence, *“Sustainability literate individuals are individuals who respect all living things and have sustainability knowledge and awareness.”*

It was observed that 4 out of 25 participants described the characteristics of a sustainability literate individual as being environmentally conscious. One participant, P11, explained his thoughts on this theme with the statement, *“I see sustainability literate individuals as environmentally sensitive individuals who are mindful of their consumption habits.”* Furthermore, one participant stated that sustainability literate individuals should use limited resources effectively, be environmentally conscious, and respectful of all living things. Participant P2 explained his thoughts on the themes with the statement, *“I consider myself sustainable literate. I believe I possess the characteristics of a sustainable literate person who uses natural resources effectively, is environmentally sensitive, harmonious, and respectful of other living things.”* Participant P16, who explained the characteristics of a sustainability literate individual with the theme of producing solutions to global problems, explained his opinion with the sentence, *“A sustainable literate person plays a critical role in the process of producing solutions to environmental problems for a sustainable future.”* While another participant expressed his opinion on the themes with the sentence, P24, *“Sustainability literate people are conscious individuals who try to find various solutions to environmental problems related to rapid population growth, environmental pollution, global warming, and climate change for a livable world.”* One of the participants, P25, expressed his opinion on the characteristics of a sustainability literate individual with the sentence, *“Sustainability literate individuals use natural resources consciously and actively participate in environmental projects and recycling campaigns.”* He emphasized that sustainability literate individuals are individuals who use limited resources correctly and take an active role for a sustainable future. Participant P14 expressed her thoughts on the themes of using limited resources correctly and making conscious decisions for sustainability with the sentence, *“I think these individuals are individuals who consume limited resources in the right and sufficient amounts and make conscious decisions to meet their needs without endangering the needs of future generations.”*

Findings Regarding Self-Description as Sustainability Literacy

The themes related to how social studies teacher candidates self-describe as sustainability literate, based on the characteristics of a sustainability literate individual, are presented in Table 5.

Table 5.*Self-Description as Sustainability Literacy*

Theme	Sub-themes	Participants	f
Self-description as sustainability literacy	Yes	P1, P2, P3, P4, P5, P6, P9, P11, P14, P15, P17, P19, P21, P23, P25	15
	Partially yes	P7, P10, P12, P16, P20, P22, P24	7
	No	P8, P13, P18	3

When the participants' opinions on whether they consider themselves sustainability literate are examined in Table 5, it is determined that some participants consider themselves sustainability literate "yes", some see themselves as "partially yes" or partially sustainability literate, and some do not see themselves as sustainability literate "no". It was determined that 15 of the 25 participants (P1, P2, P3, P4, P5, P6, P9, P11, P14, P15, P17, P19, P21, P23, and P25) considered themselves sustainability literate. One participant, P1, expressed her opinion with the statement, *"I consider myself a sustainability literate individual. Because I have the knowledge, skills, and awareness of sustainability, I act sensitively towards nature, and I try to find solutions to environmental problems..."* Another participant, P5, explained her opinion with the statement, *"Because I am someone with sustainability awareness, I can describe myself as a sustainability literate individual."* Another participant, P11, expressed her opinion on the theme with the statement, *"I am also an environmentally conscious, sustainable literate individual who pays attention to my consumption habits."*

Regarding participants' characterization of sustainability literacy, it was determined that 7 out of 25 participants considered themselves partially sustainability literate. Participant P10 explained, *"I think sustainably literate people are those who use and protect natural resources effectively and always actively participate in activities for a sustainable world. But I think I possess these characteristics to a greater or lesser extent."* Another participant, P12, stated, *"...I don't think I'm a fully sustainability literate individual, because I partially possess the sustainability literacy skills of protecting natural resources and respecting the environment and living things."* One participant, P16, stated that she considered herself partially sustainability literate with the statement, *"As I mentioned in the characteristics of a sustainable literate, I believe I'm a conscious individual who strives to find solutions to environmental problems."* The study determined that 3 of the 25 participants did not consider themselves sustainability literate. Participant P8 stated, *"Sustainability literate individuals are individuals who respect living things and are environmentally conscious. Unfortunately, I don't think I have the characteristics of a sustainability literate individual,"* while participant P13 stated, *"No, I wouldn't describe myself as sustainability literate."* Participant P18 explained her thoughts on the theme with the following statement *"I think sustainability literate individuals are sustainability conscious. But I don't think I am that kind of person."*

Findings Regarding Suggestions for Providing Sustainability Literacy Skills

The themes related to suggestions for acquiring sustainability literacy skills are presented in Table 6.

Table 6.*Suggestions for Providing Sustainability Literacy Skills*

Theme	Sub-themes	Participants	f
Suggestions for providing sustainability literacy skills	Activities should be conducted to foster environmentally friendly habits	P1, P3, P6, P10, P11, P15, P18, P20, P23	9
	Teachers should be role models	P4, P7, P9, P13, P14, P17, P22	7
	Schools should be taught at all levels of education, starting from preschool	P5, P8, P12, P19, P24, P25	6
	Different teaching methods and techniques should be used	P2, P3, P7, P16, P21	5
	Various experiences related to real life should be offered	P9, P16, P19, P20, P21	5
	Families should be role models	P2, P4, P22, P25	4
	Scientific events such as seminars, conferences, and congresses should be organized	P1, P12, P17, P25	4
	Theoretical knowledge should be put into practice and become a way of life	P8, P14	2
	Responsibility should be taken for a livable world	P11, P18	2

An evaluation of Table 6 reveals that the highest loading on suggestions for acquiring sustainability literacy skills was placed on the theme “Activities should be conducted to foster environmentally friendly habits”. Regarding other identified themes, participants suggested the following, in order: “Teachers should be role models,” “Schools should be taught at all levels of education, starting from preschool,” “Different teaching methods and techniques should be used,” “Various experiences related to real life should be offered,” “Families should be role models,” “Scientific events such as seminars, conferences, and congresses should be organized,” “Theoretical knowledge should be put into practice and become a way of life,” and “Responsibility should be taken for a livable world.” Nine of the 25 participants suggested that activities should be conducted to foster environmentally friendly habits regarding the development of sustainability literacy skills. Participant P6 explained, *“To raise social sustainability awareness, practices and activities should be implemented to instill environmentally friendly habits in students, such as recycling, energy conservation, and avoiding wasting water, and to leave a livable world for future generations.”* Another participant, P11, stated his opinion as follows *“It is important for a livable world and a sustainable future for individuals to take responsibility in environmental and social projects regarding the acquisition of sustainability literacy skills, and it is also important for sustainability to organize various activities to teach individuals environmentally friendly habits.”* It was determined that he suggested that individuals take responsibility for a livable world and organize activities to teach them environmentally friendly habits in order to acquire sustainability literacy skills.

Participant P13, who suggested that teachers should be role models for acquiring sustainability literacy skills, explained her view with the following sentence *“I think teachers should be role models for students in acquiring sustainability literacy skills. Teachers should be sustainability literate individuals who are conscious of their environment, protect limited resources, and respect the right to life of living things.”* Participant P22 expressed his opinion on the theme of families and teachers should be role models with the sentence, *“In order to*

become sustainability literate individuals and raise students in this direction, families and teachers should first be role models and set an example for society.” Another participant P4 expressed his opinion with the sentence, *“I think sustainability awareness can be instilled first in families and then in schools. Therefore, in order to raise individuals with sustainability literacy skills, both families and teachers should be role models for children with their behavior.”* Participant P17, who suggested that teachers should be role models and scientific events such as seminars, conferences and congresses should be organized to help them gain sustainability literacy skills, expressed her opinion with the sentence, *“I think that in order to develop sustainability literacy and ensure that individuals act consciously and responsibly in this direction, first of all, teachers should be role models for students and events such as conferences and seminars should be organized.”* One of the participants, P5, stated the following *“Students need to be educated from an early age to gain sustainability awareness. This education should begin in pre-school and be provided at all levels of education, including university.”* He also suggested that sustainability literacy skills should be taught at all levels of education, starting from pre-school.

Discussion and Conclusion

The study found that social studies teacher candidates expressed the concept of sustainability through the concepts of eternity, continuity, transfer to future generations, and life. Similarly, Özdemir (2022) defines the concept of sustainability as the use of natural resources without harming nature while protecting the right to life of future generations. Ng and Tavitiyaman (2020) defines it as meeting current needs without endangering the needs of future generations through the interaction between natural and social systems. Bayazıt Hayta (2009) defines it as an approach that considers ecological balance and economic growth together, uses natural resources effectively, and meets today’s needs without endangering the needs of future generations.

It was concluded that social studies teacher candidates defined sustainability literacy as sustainability knowledge, skills, attitudes, and competencies, respecting the right to life of living beings, protecting limited resources and natural and cultural heritage, intergenerational equality, understanding sustainability and sustainable development, and being helpful to living beings. In this context, sustainability literacy can be defined as the totality of sustainability knowledge, skills, attitudes, competencies, and behaviors. Similar definitions of sustainability literacy have been identified in the literature. Décamps et al. (2017) define sustainability literacy as the knowledge and skills that enable individuals to consciously use limited resources and make effective decisions in the process of building a sustainable future, while Winter and Cotton (2012) define sustainability literacy as the skill set required in the transition to sustainability. A review of the literature reveals that there are various studies that have developed different scales for sustainability literacy and determined the level of sustainability literacy (Aginako & Guraya, 2021; Aikowe & Mazancova, 2022; Akeel et al., 2019; Akhgari, 2017; Chen et al., 2022; Erguvan, 2024; Heeren et al., 2016; Kwofie et al., 2024; Leiva Brondo et al., 2022; Mahat et al., 2019; Marcos Merino et al., 2020; Ozdemir, 2021; Ozdemir, 2024; Qureshi, 2020; Saleh et al., 2022; Sekhar & Raina, 2021; Ulbinaité et al., 2023; Wendlandt Amézaga et al., 2022; Winter & Cotton, 2012; Zwickle et al., 2014).

It has been determined that prospective teachers consider sustainability literacy skills important for raising social sustainability awareness, leaving a livable world for future generations, using natural resources efficiently, finding solutions to environmental problems, ensuring intergenerational equality, and improving individuals' quality of life and social well-being. Therefore, it can be said that sustainability literacy is important in terms of environmental, social, and economic dimensions. Similar to this result, Kazak (2025) stated that sustainability literacy is important for individuals to internalize a sustainable lifestyle and make informed decisions. Sterling (2012) stated that sustainability literacy is important for improving individuals' decision making skills.

The study determined that sustainability literate individuals are those who possess sustainability awareness, utilize limited resources effectively, protect cultural, economic, and natural resources, respect all living things, are environmentally conscious, create solutions to global problems, take an active role in achieving a sustainable future, make informed decisions for sustainability, and are aware of the importance of sustainability for life and the environment. It is crucial for sustainability literate individuals to fulfill their environmental, social, and economic responsibilities and act consciously for a sustainable future. Furthermore, sustainability literacy is a literacy skill that fosters holistic personal and social development. Similar to this result, Kazak (2025) stated that sustainability literate individuals are individuals who can evaluate the society from a critical perspective, better understand the unsustainable situation and the social structures that cause this situation, and build a sustainable future at the individual and societal level, while Stibbe and Luna (2009) stated that individuals with sustainability literacy skills are individuals who foresee the course of society, are aware of unsustainable life, and strive to achieve a sustainable world. It is emphasized that, in the process of students becoming sustainably literate individuals, sustainability knowledge is as important as sustainability awareness being reflected in individuals' sustainability attitudes and behaviors (Qureshi, 2020; Tiron Tudor et al., 2020; Winter & Cotton, 2012).

In terms of social studies teacher candidates' sustainability knowledge, skills, attitudes and behaviors, it has been determined that some of them describe themselves as sustainability literate individuals, some see themselves as partially sustainability literate individuals, and some do not see themselves as sustainability literate.

It was concluded that social studies teacher candidates offered various suggestions for acquiring sustainability literacy skills, including activities aimed at fostering environmentally friendly habits; teachers should be role models; these should be taught at all levels of education, starting from preschool; different teaching methods and techniques should be used; diverse experiences related to real life should be provided; families should be role models; scientific events such as seminars, conferences, and congresses should be organized; theoretical knowledge should be put into practice and become a way of life; and responsibility should be taken for a livable world. These suggestions can empower individuals to make conscious and effective decisions for a livable world, a sustainable future, and a sustainable culture of living prevalent in society. Leiva Brondo et al. (2022) stated that developing critical and reflective thinking skills in students is important for universities to achieve sustainability and sustainable development goals. In the study conducted by Dallaire et al. (2018), it was

determined that student-organized symposia were effective in integrating sustainability awareness outside the classroom and that interdisciplinary research increased. Hungerford (2009) emphasizes that teachers should possess and develop the skills necessary for students to cope with sustainability related issues.

Recommendations

Recommendations are provided based on the research findings.

Sustainability literacy skills can be instilled in individuals at all levels of education, starting from an early age.

Activities can be conducted with students to foster environmentally friendly habits to raise public awareness of sustainability.

Teachers can serve as role models for their students, encouraging them to develop environmental awareness and take an active role in building a sustainable future.

Scientific events such as seminars, conferences, and congresses can be organized to foster sustainability literate individuals who are sustainability conscious, environmentally conscious, respectful of all living things, and protect cultural, economic, and natural resources, and students can be encouraged to participate in these events.

Theoretical knowledge can be put into practice and become a way of life to increase students' sustainability awareness, foster a sense of responsibility, and leave a livable world for future generations.

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There is no conflict of interest that the author will declare in the research.

Notice of Use of Artificial Intelligence

The author did not utilise any artificial intelligence tools for the research, authorship and publication of this article.



Geleceğin Okuryazarlığı: Sürdürülebilirlik Okuryazarlığına Yönelik Sosyal Bilgiler Öğretmen Adaylarının Görüşlerinin Belirlenmesi

Özet

Araştırmanın amacı, geleceğin okuryazarlığı sürdürülebilirlik okuryazarlığına yönelik sosyal bilgiler öğretmen adaylarının görüşlerini belirlemektir. Araştırmada nitel araştırma yöntemlerinden olgubilim deseni kullanılmıştır. Çalışma, 2024-2025 eğitim-öğretim yılında Türkiye’de bir devlet üniversitesinin sosyal bilgiler öğretmenliği programında 4. sınıfta öğrenim gören 16’sı kadın ve 9’u erkek olmak üzere 25 öğretmen adayı ile yürütülmüştür. Çalışma grubunun belirlenmesinde amaçlı örnekleme yöntemlerinden maksimum çeşitlilik örnekleme kullanılmıştır. Araştırmada veriler yarı yapılandırılmış görüşme formuyla elde edilmiştir. Araştırma verileri nitel veri analiz programı kullanılarak içerik analizi ile değerlendirilmiştir. Araştırma sonucunda sosyal bilgiler öğretmen adaylarının sürdürülebilirlik kavramını sonsuzluk ve devamlılık kavramları ile ifade ettikleri, sürdürülebilirlik okuryazarlığını sürdürülebilirlik bilgi, beceri, tutum ve yetkinlikleri ve canlıların yaşam haklarına saygılı olma şeklinde tanımladıkları, sürdürülebilirlik okuryazarlığı becerisini toplumsal sürdürülebilirlik bilincinin oluşturulması ve gelecek nesillere yaşanabilir bir dünya bırakılması açısından önemli gördükleri belirlenmiştir. Öğretmen adaylarının sürdürülebilirlik okuryazarı bireyin özelliklerini sürdürülebilirlik bilincine sahip ve sınırlı kaynakları doğru şekilde kullanan bireyler olarak ifade ettikleri ve sürdürülebilirlik okuryazarlığı becerisinin kazandırılmasına yönelik çevre dostu alışkanlıklar kazandırmaya yönelik etkinlikler yapılmalı ve öğretmenler rol model olmalı önerilerinde buldukları sonucuna ulaşmıştır. Araştırmada sürdürülebilirlik okuryazarlığı becerisinin bireylere erken yaşlardan itibaren tüm eğitim kademelerinde kazandırılması gerektiği önerilmektedir.

Anahtar Kelimeler: Beceri, okuryazarlık, sürdürülebilirlik okuryazarlığı, sosyal bilgiler öğretmen adayları.

Giriş

Sürdürülebilirliğe geçiş toplumun eğitim aracılığıyla zihinsel dönüşümüne bağlı olduğu gibi ekolojik, ekonomik ve sosyal sürdürülebilirliğe de bağlıdır (Sterling, 2004). Sürdürülebilir topluma geçiş sürecinde sürdürülebilirlik eğitimi önemlidir. Yaşanan çevre sorunlarının doğa ve insanlar üzerinde etkisinin artması, sürdürülebilir yaşam biçimine geçilmesini zorunlu hale getirmektedir. Sürdürülebilirliğe geçiş, öğrencilerin sürdürülebilirlik okuryazarı olmaları ile mümkündür. Öğrencilerin sürdürülebilirlik okuryazarı olarak yetiştirilmesinde sürdürülebilirlik eğitimi kritik önem taşımaktadır (Ozdemir, 2021).

Sürdürülebilirlik okuryazarlığı, bireylerin çevresel, sosyal ve ekonomik durumları anlayıp bilinçli kararlar almalarını sağlamaktadır. Eğitim yoluyla kazanılan sürdürülebilirlik okuryazarlığı bilinci sürdürülebilir bir yaşam biçiminin geliştirilmesinde önemlidir (Kazak, 2025). Sürdürülebilirlik okuryazarlığı “sınırlı kaynakları koruma, tüm canlıların yaşam haklarına saygı duyma, var oluşa ve insan uygarlığına yararlı olma, nesiller arası eşitliği dikkate alma gibi bilgi, beceri, tutum ve yetkinlikleri” kapsamaktadır (Millî Eğitim Bakanlığı [MEB], 2024c). Sürdürülebilirlik okuryazarlığı değişen ve gelişen dünya koşulları çerçevesinde öğrencilerin çok yönlü gelişimleri için kazandırılması gereken önemli becerilerden biridir.

Öğretim programlarında örtük bir yapıda ele alınan okuryazarlık becerileri, bütüncül olarak sarmal bir yapıda okul öncesinden itibaren farklı içeriklerle bütün derslerde kazandırılması gerekmektedir (MEB, 2024a). Okuryazarlık becerileri içerisinde yer alan sürdürülebilirlik okuryazarlığı becerisinin öğrencilere kazandırılması sürecinde sosyal bilgiler dersi kritik önem taşımaktadır. 2024 Sosyal Bilgiler Dersi Öğretim Programı ile öğrencilere “*kavramsal beceriler, alan becerileri, sosyal ve duygusal öğrenme becerileri, okuryazarlık becerileri, eğilimler ve değerlerin*” kazandırılması amaçlanmaktadır. Programdaki önemli okuryazarlık becerilerinden biri sürdürülebilirlik okuryazarlığıdır. Programın özel amaçlarından iki tanesi sürdürülebilirlik okuryazarlığı ile ilgilidir. Buna göre öğrencilerin: “*yaşadığı çevrenin ve ülkemizin doğal çevre özelliklerini tanımaları, doğa ve insan arasındaki etkileşimi çözümlmeleri ve doğal kaynakları koruma sorumluluğuna sahip olmaları ve sürdürülebilir bir yaşam için yerelden küresele insanın doğal ve beşerî çevre etkileşimini sorgulamaları*” amaçlanmaktadır (MEB, 2024b). Dolayısıyla sürdürülebilirlik okuryazarlığının erken yaşlardan itibaren öğrencilere kazandırılması sürecinde sosyal bilgiler öğretmenlerine önemli sorumluluklar düşmektedir. Çünkü toplumsal sürdürülebilirlik bilincini oluşturmak ve gelecek nesillere yaşanabilir bir dünya bırakmak için sürdürülebilirlik bilincine sahip, canlıların yaşam haklarına saygılı, çevreye duyarlı, sınırlı kaynakları doğru şekilde kullanan, kültürel, ekonomik ve doğal kaynakları koruyan, küresel sorunlara çözüm üreten, sürdürülebilirlik bilgi, beceri, tutum ve yetkinliklere sahip sürdürülebilirlik okuryazarı bireylerin yetiştirilmesi son derece önemlidir. Bu nedenlerle, sosyal bilgiler öğretmen adaylarının sürdürülebilirlik okuryazarlığına yönelik görüşlerinin belirlenmesi önem arz etmektedir.

Araştırmanın amacı, geleceğin okuryazarlığı sürdürülebilirlik okuryazarlığına yönelik sosyal bilgiler öğretmen adaylarının görüşlerini belirlemektir. Bu amaç doğrultusunda araştırmanın alt problemleri belirlenmiştir:

1. Sosyal bilgiler öğretmen adaylarının, sürdürülebilirlik kavramına yönelik görüşleri nasıldır?
2. Sosyal bilgiler öğretmen adaylarının, sürdürülebilirlik okuryazarlığına yönelik görüşleri nasıldır?
3. Sosyal bilgiler öğretmen adaylarının, sürdürülebilirlik okuryazarlığının önemine yönelik görüşleri nasıldır?
4. Sosyal bilgiler öğretmen adaylarının, sürdürülebilirlik okuryazarı bireyin özelliklerine yönelik görüşleri nasıldır?
5. Sosyal bilgiler öğretmen adaylarının, kendilerini sürdürülebilirlik okuryazarı olarak nasıl nitelendirdiklerine yönelik görüşleri nasıldır?
6. Sosyal bilgiler öğretmen adaylarının, sürdürülebilirlik okuryazarlığı becerisinin kazandırılmasına yönelik önerileri nasıldır?

Yöntem

Araştırmanın Deseni

Bu çalışmada nitel araştırma yöntemlerinden olgubilim deseni kullanılmıştır. Olgubilim deseni insanların bir olguya veya olaya verdiği tepkileri ve algıları araştırarak bu tepkilerin ve algıların ortak özelliklerin belirlenmeye çalışıldığı bir desendir. Bu çalışmanın temelinde insanların deneyimlerinin özünü bulmayı, insanların benzer deneyimlerinin ortak özelliklerini tanımlamayı ve anlamayı amaçlamaktadır (Fraenkel vd., 2012).

Çalışma Grubu

Araştırmada çalışma grubunun belirlenmesinde amaçlı örnekleme yöntemlerinden maksimum çeşitlilik örnekleme kullanılmıştır. Maksimum çeşitlilik örneklemede araştırılan probleme yönelik örneklem içerisinde çeşitliliği maksimum seviyede yansıtmak amacıyla örneklem seçilmektedir (Mertens, 2019). Çalışma, 2024-2025 eğitim-öğretim yılında Türkiye’de bir devlet üniversitesinin sosyal bilgiler öğretmenliği programında 4. sınıfta öğrenim gören 16’sı kadın ve 9’u erkek olmak üzere 25 öğretmen adayı ile yürütülmüştür.

Veri Toplama Aracı

Araştırmada veriler yarı yapılandırılmış görüşme formuyla elde edilmiştir. Yarı yapılandırılmış görüşme, araştırmacının araştırma konusu hakkında görüşme sorularını önceden hazırladığı ve görüşme sürecinde hazırladığı soruları tekrar düzenleyebildiği (Ekiz, 2020), araştırmacının görüştüğü kişiden araştırılan konuyla ilgili derinlemesine bilgi elde ettiği (Güler vd., 2015) görüşmelerdir. Yarı yapılandırılmış görüşme formu araştırmanın amacı doğrultusunda alan yazın incelenerek 6 sorudan oluşan taslak form hazırlanmıştır. Bu form üç alan uzmanının görüşüne sunulmuş ve uzmanların görüşleri doğrultusunda formdaki sorular düzenlenmiştir. Ayrıca 5 öğretmen adayı ile pilot uygulama yapılarak görüşme formuna son hali verilmiştir.

Veri Toplama Süreci

Görüşme sürecinde katılımcılara araştırma hakkında bilgi verilerek görüşmeler araştırmacı tarafından katılımcılarla yüz yüze yapılmıştır. Görüşmeler, araştırmaya gönüllü olarak katılan katılımcılarla birlikte kendilerini rahat ve güvende hissedebilecekleri mekânlarda yürütülmüştür. Çalışmaya katılan tüm katılımcılardan katılımcı onayı alınmıştır. Görüşmelere orijinal fikirler gelmeye kadar devam edilerek görüşmeler veri doygunluğuna ulaşıldığında sonlandırılmıştır. Görüşme verileri analizde kullanılmıştır.

Verilerin Analizi

Araştırma verileri nitel veri analiz programı kullanılarak içerik analizi ile değerlendirilmiştir. İçerik analizi, araştırma sürecinde ulaşılan verileri açıklamaya yönelik kavramları ve ilişkileri ortaya çıkmayı amaçlayan analiz tekniğidir (Altunışık vd., 2023). Nitel araştırma verileri “*verilerin kodlanması, temaların bulunması, kodların ve temaların düzenlenmesi ve bulguların tanımlanması ve yorumlanması*” aşamaları takip edilerek analiz edilmiştir (Yıldırım & Şimşek, 2021). Nitel araştırmalarda geçerliği ve güvenilirliği sağlamak için inandırıcılık, aktarılabilirlik, tutarlık ve teyit edilebilirlik stratejileri kullanılmıştır (Erlandson vd., 1993; Lincoln & Guba, 1985). Bu doğrultuda araştırmada inandırıcılık için uzman

incelemesi ve katılımcı teyidi, aktarılabirlik için ayrıntılı betimleme ve amaçlı örnekleme, tutarlılık için tutarlılık incelemesi ve teyit edilebilirlik için teyit incelemesi yapılmıştır.

Araştırmanın Etik İzinleri:

Bu çalışmada “Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi” kapsamında uyulması gerektiği belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan “Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler” başlığı altında belirtilen eylemlerin hiçbiri gerçekleştirilmemiştir.

Etik Kurul İzin Bilgileri:

Etik değerlendirmeyi yapan kurulun adı = Fırat Üniversitesi Sosyal ve Beşerî Bilimler Araştırmaları Etik Kurulu

Etik Kurul Etik inceleme karar tarihi = 10 Nisan 2025

Etik değerlendirme belgesi konu numarası = 2025/07

Bulgular

Sürdürülebilirlik Kavramına İlişkin Bulgular

Sürdürülebilirlik kavramına ilişkin temalara Tablo 1’de yer verilmiştir.

Tablo 1.

Sürdürülebilirlik Kavramı

Tema	Alt tema	Katılımcılar	f
	Sonsuzluk	K1, K5, K10, K12, K16, K19, K21, K22, K24	9
Sürdürülebilirlik kavramı	Devamlılık	K2, K3, K8, K13, K15, K20, K25	7
	Gelecek nesillere aktarma	K6, K7, K11, K14, K17, K23	6
	Yaşam	K4, K9, K18	3

Tablo 1 değerlendirildiğinde katılımcıların sürdürülebilirlik kavramını en fazla yükleme ile “sonsuzluk” şeklinde ifade ettikleri belirlenmiştir. Diğer temalarda ise sosyal bilgiler öğretmen adaylarının sürdürülebilirlik kavramını; “devamlılık”, “gelecek nesillere aktarma” ve “yaşam” şeklinde belirttikleri görülmüştür.

Sürdürülebilirlik Okuryazarlığına İlişkin Bulgular

Sürdürülebilirlik okuryazarlığı becerisine ilişkin temalara Tablo 2’de yer verilmiştir.

Tablo 2.

Sürdürülebilirlik Okuryazarlığı

Tema	Alt tema	Katılımcılar	f
	Sürdürülebilirlik bilgi, beceri, tutum ve yetkinlikleri	K1, K4, K7, K12, K13, K16, K20, K21, K24	9
	Canlıların yaşam haklarına saygılı olma	K3, K6, K8, K11, K14, K19, K23	7
Sürdürülebilirlik okuryazarlığı	Sınırlı kaynakları, doğal ve kültürel mirası koruma	K5, K7, K10, K17, K22, K24	6
	Nesiller arası eşitlik	K1, K9, K12, K20, K25	5
	Sürdürülebilirliği ve sürdürülebilir kalkınmayı anlama	K2, K9, K15, K18	4
	Canlılara yararlı olma	K7, K18	2

Tablo 2 incelendiğinde katılımcıların sürdürülebilirlik okuryazarlığı becerisini en fazla “sürdürülebilirlik bilgi, beceri, tutum ve yetkinlikleri” olarak tanımladıkları görülmektedir. Sürdürülebilirlik okuryazarlığını tanımlamaya ilişkin belirlenen diğer temalar ise sırasıyla; “canlıların yaşam haklarına saygılı olma”, “sınırlı kaynakları, doğal ve kültürel mirası koruma”, “nesiller arası eşitlik”, “sürdürülebilirliği ve sürdürülebilir kalkınmayı anlama” ve “canlılara yararlı olma” olarak belirlenmiştir.

Sürdürülebilirlik Okuryazarlığının Önemine İlişkin Bulgular

Sürdürülebilirlik okuryazarlığının önemine ilişkin temalara Tablo 3’te yer verilmiştir.

Tablo 3.

Sürdürülebilirlik Okuryazarlığının Önemi

Tema	Alt tema	Katılımcılar	f
Sürdürülebilirlik okuryazarlığının önemi	Toplumsal sürdürülebilirlik bilincini oluşturma	K4, K5, K8, K9, K12, K14, K16, K19, K23, K25	10
	Gelecek nesillere yaşanabilir bir dünya bırakma	K1, K3, K6, K13, K17, K18, K19, K22	8
	Doğal kaynakları verimli kullanma	K2, K4, K10, K15, K21, K25	6
	Çevre sorunlarına çözüm üretme	K3, K5, K7, K11, K24	5
	Nesiller arası eşitliği sağlama	K9, K20, K21, K24	4
	Bireylerin yaşam kalitesini artırma	K1, K11	2
	Toplumsal refahı artırma	K6, K15	2

Tablo 3’e bakıldığında katılımcıların sürdürülebilirlik okuryazarlığını en fazla “toplumsal sürdürülebilirlik bilincini oluşturma” açısından önemli gördükleri belirlenmiştir. Ayrıca katılımcıların sürdürülebilirlik okuryazarlığını; “gelecek nesillere yaşanabilir bir dünya bırakma”, “doğal kaynakları verimli kullanma”, “çevre sorunlarına çözüm üretme”, “nesiller arası eşitliği sağlama”, “bireylerin yaşam kalitesini artırma” ve “toplumsal refahı artırma” açılarından önemli gördükleri tespit edilmiştir.

Sürdürülebilirlik Okuryazarı Bireyin Özelliklerine İlişkin Bulgular

Sürdürülebilirlik okuryazarı bireyin özelliklerine ilişkin temalara Tablo 4’te yer verilmiştir.

Tablo 4.

Sürdürülebilirlik Okuryazarı Bireyin Özellikleri

Tema	Alt tema	Katılımcılar	f
Sürdürülebilirlik okuryazarı bireyin özellikleri	Sürdürülebilirlik bilincine sahip olma	K4, K9, K12, K13, K15, K18, K21, K23	8
	Sınırlı kaynakları doğru şekilde kullanma	K2, K7, K14, K15, K22, K25	6
	Kültürel, ekonomik ve doğal kaynakları koruma	K5, K10, K17, K20, K23	5
	Tüm canlılara saygılı davranma	K2, K3, K4, K8, K19	5
	Çevreye duyarlı olma	K1, K2, K6, K11	4
	Küresel sorunlara çözüm üretme	K1, K9, K16, K24	4
	Sürdürülebilir bir gelecek için aktif rol alma	K5, K10, K25	3
	Sürdürülebilirlik için bilinçli kararlar alma	K5, K14, K19	3
	Sürdürülebilirliğin yaşam ve çevre için öneminin farkında	K3, K6	2

Tablo 4 incelendiğinde sürdürülebilirlik okuryazarı bireyin özelliklerine ilişkin en fazla yüklemenin “sürdürülebilirlik bilincine sahip olma” temasına yapıldığı belirlenirken, diğer temaların ise “sınırlı kaynakları doğru şekilde kullanma”, “kültürel, ekonomik ve doğal kaynakları koruma”, “tüm canlılara saygılı davranma”, “çevreye duyarlı olma”, “küresel sorunlara çözüm üretme”, “sürdürülebilir bir gelecek için aktif rol alma”, “sürdürülebilirlik için bilinçli kararlar alma” ve “sürdürülebilirliğin yaşam ve çevre için önemini farkında” şeklinde sıralandığı belirlenmiştir.

Sürdürülebilirlik Okuryazarı Olarak Nitelendirmeye İlişkin Bulgular

Sürdürülebilirlik okuryazarı bireyin özellikleri doğrultusunda sosyal bilgiler öğretmen adaylarının kendilerini sürdürülebilirlik okuryazarı olarak nitelendirmelerine ilişkin temalara Tablo 5’te yer verilmiştir.

Tablo 5.

Sürdürülebilirlik Okuryazarı Olarak Nitelendirme

Tema	Alt tema	Katılımcılar	f
Sürdürülebilirlik okuryazarı olarak nitelendirme	Evet	K1, K2, K3, K4, K5, K6, K9, K11, K14, K15, K17, K19, K21, K23, K25	15
	Kısmen evet	K7, K10, K12, K16, K20, K22, K24	7
	Hayır	K8, K13, K18	3

Tablo 5’teki katılımcıların kendini sürdürülebilirlik okuryazarı olarak nitelendirmelerine ilişkin görüşlerine bakıldığında; bazı katılımcıların kendini “evet” sürdürülebilirlik okuryazarı olarak nitelendirdikleri, bazılarının kendini “kısmen evet” kısmen sürdürülebilirlik okuryazarı olarak gördükleri, bazılarının ise kendini “hayır” sürdürülebilirlik okuryazarı olarak görmedikleri belirlenmiştir.

Sürdürülebilirlik Okuryazarlığı Becerisinin Kazandırılmasına Yönelik Önerilere İlişkin Bulgular

Sürdürülebilirlik okuryazarlığı becerisinin kazandırılmasına yönelik önerilere ilişkin temalara Tablo 6’da yer verilmiştir.

Tablo 6.

Sürdürülebilirlik Okuryazarlığı Becerisinin Kazandırılmasına Yönelik Öneriler

Tema	Alt tema	Katılımcılar	f
Sürdürülebilirlik okuryazarlığı becerisinin kazandırılmasına yönelik öneriler	Çevre dostu alışkanlıklar kazandırmaya yönelik etkinlikler yapılmalı	K1, K3, K6, K10, K11, K15, K18, K20, K23	9
	Öğretmenler rol model olmalı	K4, K7, K9, K13, K14, K17, K22	7
	Okul öncesinden itibaren tüm eğitim kademelerinde kazandırılmalı	K5, K8, K12, K19, K24, K25	6
	Farklı öğretim yöntem ve teknikleri kullanılmalı	K2, K3, K7, K16, K21	5
	Gerçek yaşamla bağlantılı çeşitli deneyimler sunulmalı	K9, K16, K19, K20, K21	5
	Aileler rol model olmalı	K2, K4, K22, K25	4
	Seminer, konferans ve kongre gibi bilimsel etkinlikler düzenlenmeli	K1, K12, K17, K25	4
	Teorik bilgi pratiğe dönüştürülerek yaşam biçimi haline getirilmeli	K8, K14	2
	Yaşanabilir bir dünya için sorumluluk alınmalı	K11, K18	2

Tablo 6 değerlendirildiğinde sürdürülebilirlik okuryazarlığı becerisinin kazandırılmasına yönelik önerilere ilişkin en fazla yüklemenin “çevre dostu alışkanlıklar kazandırmaya yönelik etkinlikler yapılmalı” temasına yapıldığı belirlenmiştir. Belirlenen diğer temalarda ise katılımcıların sırayla; “öğretmenler rol model olmalı”, “okul öncesinden itibaren tüm eğitim kademelerinde kazandırılmalı”, “farklı öğretim yöntem ve teknikleri kullanılmalı”, “gerçek yaşamla bağlantılı çeşitli deneyimler sunulmalı”, “aileler rol model olmalı”, “seminer, konferans ve kongre gibi bilimsel etkinlikler düzenlenmeli”, “teorik bilgi pratiğe dönüştürülerek yaşam biçimi haline getirilmeli” ve “yaşanabilir bir dünya için sorumluluk alınmalı” önerilerinde buldukları görülmüştür.

Tartışma ve Sonuç

Araştırma sonucunda sosyal bilgiler öğretmen adaylarının sürdürülebilirlik kavramını sonsuzluk, devamlılık, gelecek nesillere aktarma ve yaşam kavramları ile ifade ettikleri belirlenmiştir. Bu sonuca benzer şekilde sürdürülebilirlik kavramını Özdemir (2022) gelecek nesillerin yaşam hakkını koruyarak doğal kaynakların doğaya zarar vermeden kullanılması, Ng ve Tavitiyaman (2020) doğal ve sosyal sistemlerin arasındaki etkileşim doğrultusunda mevcut ihtiyaçların, gelecek kuşakların ihtiyaçlarını tehlikeye sokmadan karşılanması, Bayazıt Hayta (2009) ekolojik denge ile ekonomik büyümenin beraber değerlendirildiği, doğal kaynakların etkin şekilde kullanıldığı, gelecek nesillerin ihtiyaçlarını tehlikeye atmadan bugünün ihtiyaçlarının karşılandığı bir anlayış olarak ifade etmektedir.

Sosyal bilgiler öğretmen adaylarının sürdürülebilirlik okuryazarlığını sürdürülebilirlik bilgi, beceri, tutum ve yetkinlikleri, canlıların yaşam haklarına saygılı olma, sınırlı kaynakları, doğal ve kültürel mirası koruma, nesiller arası eşitlik, sürdürülebilirliği ve sürdürülebilir kalkınmayı anlama ve canlılara yararlı olma olarak tanımladıkları sonucuna ulaşılmıştır. Bu doğrultuda sürdürülebilirlik okuryazarlığı sürdürülebilirlik bilgi, beceri, tutum, yetkinlik ve davranışlarının bütünü olarak ifade edilebilir. Alan yazınında sürdürülebilirlik okuryazarlığının benzer şekillerde tanımlandığı belirlenmiştir. Décamps vd. (2017) sürdürülebilirlik okuryazarlığını bireyin sürdürülebilir bir gelecek inşa etme sürecinde sınırlı kaynakları bilinçli şekilde kullanmasını ve bu doğrultuda etkili kararlar almasını sağlayan bilgi ve beceriler olarak tanımlarken Winter ve Cotton (2012) sürdürülebilirlik okuryazarlığını sürdürülebilirliğe geçiş sürecinde gerekli olan beceri seti olarak tanımlamaktadır.

Öğretmen adaylarının toplumsal sürdürülebilirlik bilincinin oluşturulması, gelecek nesillere yaşanabilir bir dünya bırakılması, doğal kaynakların verimli şekilde kullanılması, çevre sorunlarına çözüm üretilmesi, nesiller arası eşitliğin sağlanması, bireylerin yaşam kalitesinin ve toplumsal refahın artırılması açısından sürdürülebilirlik okuryazarlığı becerisini önemli gördükleri tespit edilmiştir. Dolayısıyla sürdürülebilirlik okuryazarlığının çevresel, sosyal ve ekonomik boyutlar açısından önemli olduğu söylenebilir. Bu sonuca benzer şekilde Kazak (2025) sürdürülebilirlik okuryazarlığının, bireylerin sürdürülebilir yaşam şeklini içselleştirmeleri ve bilinçli kararlar almaları açısından önemli olduğunu belirtmiştir.

Araştırma sonucunda sürdürülebilirlik okuryazarı bireyin sürdürülebilirlik bilincine sahip, sınırlı kaynakları doğru şekilde kullanan, kültürel, ekonomik ve doğal kaynakları koruyan, tüm canlılara saygılı, çevreye duyarlı, küresel sorunlara çözüm üreten, sürdürülebilir

bir gelecek için aktif rol alan, sürdürülebilirlik için bilinçli kararlar alan ve sürdürülebilirliğin yaşam ve çevre için önemini farkında bireyler olduğu belirlenmiştir. Sürdürülebilirlik okuryazarı bireylerin çevresel, sosyal ve ekonomik açıdan sorumluluklarını yerine getirmeleri ve bilinçli davranışları sürdürülebilir bir gelecek için son derece önemlidir. Ayrıca sürdürülebilirlik okuryazarlığı bireyin kişisel ve sosyal açıdan bütüncül gelişimlerini sağlayan bir okuryazarlık becerisidir. Bu sonucuna benzer şekilde Kazak (2025) sürdürülebilirlik okuryazarı bireylerin toplumu eleştirel bir bakış açısıyla değerlendirerek, sürdürülemez durumu ve bu durumun sebebi olan sosyal yapıları daha iyi anlayabilen, bireysel ve toplumsal düzeyde sürdürülebilir bir gelecek inşa edebilen bireyler olduğunu belirtirken, Stibbe ve Luna (2009) sürdürülebilirlik okuryazarlığı becerisine sahip bireylerin, toplumun gidişatını öngören, sürdürülemez yaşamın farkında olan, sürdürülebilir bir dünyaya ulaşılmasında çaba gösteren bireyler olduğunu belirtmektedir.

Sosyal bilgiler öğretmen adaylarının sürdürülebilirlik bilgi, beceri, tutum ve davranışlara sahip olmaları açısından bazılarının kendilerini sürdürülebilirlik okuryazarı bireyler olarak nitelendirdikleri, bazılarının kendini kısmen sürdürülebilirlik okuryazarı bireyler olarak gördükleri, bazılarının ise kendini sürdürülebilirlik okuryazarı olarak görmedikleri belirlenmiştir.

Sosyal bilgiler öğretmen adaylarının sürdürülebilirlik okuryazarlığı becerisinin kazandırılmasına yönelik çevre dostu alışkanlıklar kazandırmaya yönelik etkinlikler yapılmalı, öğretmenler rol model olmalı, okul öncesinden itibaren tüm eğitim kademelerinde kazandırılmalı, farklı öğretim yöntem ve teknikleri kullanılmalı, gerçek yaşamla bağlantılı çeşitli deneyimler sunulmalı, aileler rol model olmalı, seminer, konferans ve kongre gibi bilimsel etkinlikler düzenlenmeli, teorik bilgi pratiğe dönüştürülerek yaşam biçimi haline getirilmeli ve yaşanabilir bir dünya için sorumluluk alınmalı gibi farklı önerilerde buldukları sonucuna ulaşılmıştır. Bu öneriler, yaşanabilir bir dünya, sürdürülebilir bir gelecek ve toplumda sürdürülebilir yaşam kültürünün hâkim olması için bireylerin bilinçli ve etkili kararlar almalarını sağlayabilir.

Öneriler

Araştırma sonuçları doğrultusunda önerilere yer verilmiştir.

Sürdürülebilirlik okuryazarlığı becerisi bireylere erken yaşlardan itibaren tüm eğitim kademelerinde kazandırılabilir.

Toplumsal sürdürülebilirlik bilincinin oluşturulabilmesi için öğrencilerle çevre dostu alışkanlıklar kazandırmaya yönelik etkinlikler yapılabilir.

Öğretmenler öğrencilerine rol model olarak öğrencilerin çevre bilincinin gelişmesi ve sürdürülebilir bir gelecek için aktif rol almaları teşvik edebilir.

Sürdürülebilirlik bilincine sahip, çevreye duyarlı, tüm canlılara saygılı, kültürel, ekonomik ve doğal kaynakları koruyan sürdürülebilirlik okuryazarı bireyler yetiştirilmesi sürecinde seminer, konferans ve kongre gibi bilimsel etkinlikler düzenlenebilir ve öğrencilerin bu etkinliklere katılımı sağlanabilir.

Öğrencilerin sürdürülebilirlik bilincini artırmak, sorumluluk duygusunu geliştirilmek ve gelecek nesillere yaşanabilir bir dünya bırakmak için teorik bilgi pratiğe dönüştürülerek yaşam biçimi haline getirilebilir.



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Cognitive Coaching Approach as a Professional Development Tool: Examining the Development of Instructional Skills of English Language Teachers*

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Abstract

The changing conception of education with the constructivist approach has remarked different roles and domains of responsibility for teachers. In this context, it has become very significant for teachers to be supported with contemporary supervision practices that enable them to improve their professional development and instructional skills in order to adjust to the changes that have emerged in today's education system. This study focuses on the cognitive coaching approach from contemporary supervision practices and aims to discover whether cognitive coaching approach can be used as a functional source in the development of instructional skills of English teachers. Within this scope, a fourteen-week Cognitive Coaching training program was implemented for fifteen English teachers working at different levels in a private school in Çanakkale during the fall semester of the 2022-2023 academic year. This research is a single case study based on a pre/post-test design and an embedded mixed method involving both qualitative and quantitative analysis was used as the research method. The database of the study was structured through the "Self-Assessment Tool for Post-Lesson Reflection" used as a quantitative data collection tool and audio recordings of individual interviews with the coach, video recordings of lessons taken from each teacher and data obtained with the cognitive coaching training evaluation form used as a qualitative data collection tool. The results of the research indicate that cognitive coaching is an effective source in the development of teachers' instructional skills and suggest that cognitive coaching can be used as a powerful supervision tool.

Keywords: Cognitive coaching, instructional skills, professional development, supervision practices.

Introduction

The globalizing and changing world has brought about many changes and transformations in the socio-cultural, economic and technological levels, and the most forceful and significant change in this entire process has been experienced in the education system that integrates individuals into society. In this process, the focus of education has evolved on learning management, and at this point, in order to increase the professional self-efficacy and effectiveness of teachers, the transfer of new teaching methods and techniques to the classroom environment and the acquisition of cognitive skills such as critical thinking, problem solving, planning, evaluation, analysis and control have gained great importance (Ishak & Mansor, 2020). Unlike traditional education models, the changing focus of education on the learning process with the constructivist approach has brought about a change in the roles and behaviors of teachers. At this point, the changing focus of education has defined different roles and responsibilities for teachers and given them an 'educational leader' identity beyond the teaching role (Göker, 2017). Based on the fact that it is not the program but the teacher that makes a difference in education, it is understood that determining effective strategies to support the development of teachers in order to achieve success in education is very important and valuable within the scope of realizing the leadership role of teachers (Pilevne, 2024).

Leadership is based on building relationships and developing collective capacity to achieve desired goals. Therefore, the development of teachers' leadership skills is related to the development of self-confidence, teaching techniques and methods, professional attitudes, knowledge and perspectives. As educational leaders, teachers are expected to focus on continuous development and change in teaching methods and techniques, classroom management, and to structure their perceptions of the profession in a more creative and

innovative way, thus improving their perceptions of competence and effectiveness both individually and professionally (Bloom et al., 2003). In this sense, it can be stated that professional development programs that provide teachers with an effective and productive learning experience are very important for teachers to adapt to the rapid changes and transformations experienced in the education process. Especially, the innovative era defined as Education 4.0 has led to a radical transformation of all existing understandings and structures in the educational environment, creating a profound impact on different qualities such as the development of students' computer, information and communication, collaborative work, and lifelong learning skills. Therefore, various assumptions have been made regarding how teachers will adapt to the changes and innovations brought about by Education 4.0. In the Education 4.0 approach, which aims to meet the needs of an innovative society, the concept of 'learning' is associated with each individual equipping themselves with the best qualities and skills, in other words, creating qualities and skills appropriate to the needs of the age (Katzenmeyer & Moller, 2009).

Abersek (2017) argued that Education 4.0 has created new challenges for both teachers and students in the field of education, and emphasized the importance of developing qualities such as thinking methods, deep analysis skills, and problem-solving techniques, especially for teachers, in order to overcome these challenges. Similarly, Ishak and Mansor, (2020) based on learning trends within Education 4.0, stated that learning management that responds to Education 4.0 aims to prepare individuals to be creative and innovative, and therefore emphasized the importance of teachers acquiring characteristics considered within the scope of 21st-century skills such as leadership, collaboration, creativity, digital literacy, effective communication, emotional intelligence, entrepreneurship, global citizenship, problem-solving, critical thinking, and teamwork. Finally, Tanang and Abu (2014) argued that, as students become more independent in their learning, teachers should assume a new role, which they can define as "facilitators," to guide and direct students in their learning processes. They further argued that the greatest and most genuine contribution of teachers can make to students' learning process is to mediate in helping students acquire responsibility and obligation for their own learning in order to develop and realize themselves.

Based on this, it can be argued that the innovative and leadership-based learning contexts that have emerged with Education 4.0 create new tasks and responsibilities for teachers to embrace and implement change in order to function effectively in both digital and physical classroom environments, and that supporting the professional development of teachers as active agents in this process has become crucial. In short, it can be stated that in the Education 4.0 era, with the evolving focus on learning management in educational contexts, it has become important to activate and disseminate teacher professional development programs that include new techniques and methods within the framework of contemporary educational supervision, in order to more effectively conceptualize this focus in educational contexts. To achieve this, it can be argued that various contemporary supervision practices that allow teachers to develop self-assessment and self-regulation skills in their teaching practices will offer highly effective benefits in supporting the development of teachers' instructional skills (Göker, 2017).

In light of this information, it can be argued that reflective supervision practices, in which roles and relationships are restructured, allow for a reconceptualization of the traditional understanding of supervision, where the teacher is in a passive position and the hierarchical structure is rigidly shaped in the supervision process (Göker, 2017). Reflective supervision approaches, seen as a tool for change in the understanding of supervision, can be applied through different methods and practices in different educational contexts (Hatton & Smith, 1995; Smith, 1997). Knight (2009) emphasized that coaching practices, particularly those focused on professional development in the context of education, are quite important in terms of the guidance and support they provide to teachers in the process of acquiring and applying new educational skills, practices, and methods. Coaching approaches discussed in educational contexts generally focus on the teacher's perspective and attitude towards development, change, learning experiences, and coaching practice, and support the teacher within the scope of these situations (Ürün Göker & Göker, 2021).

Göker (2022) pointed out that coaching approaches applied in educational contexts have many functions, such as observing lessons and providing feedback, shaping effective teaching techniques and methods, offering support and consultancy to teachers to improve their planning and implementation skills, conducting problem-solving discussions, giving seminars to teachers on new techniques and methods, providing leadership, helping teachers improve their classroom management skills, and supporting teachers in designing and determining systematic and organizational changes. Similarly, Borman and Feger (2006) stated that coaching approaches involve an interactive process based on consultation and collaboration built together between the coach and the teacher, and argued that coaching practices have facilitative functions within the scope of aims such as revealing the teacher's potential, aligning behavior and thought patterns, and supporting the teacher in achieving better results. In this context, the effectiveness and importance of coaching practices aimed at improving teachers' professional practices and skills, and thus raising learning outcomes to higher levels, have been demonstrated through various studies (Biancarosa et al., 2010; Kretlow & Bartholomew, 2010; Neuman & Cunningham, 2009; Snyder et al., 2015; Wehby et al., 2012; Winton et al., 2015). While various coaching practices such as peer coaching, educational coaching, and reflective coaching are considered effective practices within the context of reflective supervision approaches, this study focuses on the cognitive coaching approach among reflective supervision practices.

The cognitive coaching approach, as an effective professional development tool, is thought to be a highly effective and functional resource in training a teacher profile who is open to innovations in the teaching and learning process and aims to make a difference, attaches importance to professional and personal development, is willing to acquire and implement new teaching practices, and aims for the sustainability of these practices (Brooks, 2000). The cognitive coaching approach includes a non-judgmental process that mediates the development of teachers' skills in the teaching process by focusing on increasing teachers' cognitive competencies regarding the teaching practices and professional development and on changes in latent cognitive behaviors (Costa & Garmston, 2014). The cognitive coaching approach developed by Costa and Garmston (2002) is based on the structuralist theory of John

Dewey (1984) and his ideas about reflective practices, which refer to the fundamental drivers of teacher professional development.

Constructivist approaches are based on the premise that knowledge is continuously and socially constructed, and that, in this respect, knowledge is constructed and interpreted by the individual themselves as a result of their interaction with their environment. Therefore, the constructivist approach refers to the significant influence of personal experiences in the process of knowledge construction and interpretation (Knowles et al., 2011; Lambert, 2002). At this point, it can be predicted that the cognitive coaching approach reflects the process by which teachers achieve their own personal learning through social interaction via coaching sessions and coaching practices. Because in the cognitive coaching process, teachers build their identities as members of a learning community, and as a result, they continuously construct knowledge within their social environment through interaction, solidarity, and cooperation, and develop awareness of their own teaching experiences through self-assessment.

There are some studies in the literature that examine the effects of the cognitive coaching approach within the framework of different variables such as (i) the development of teachers' reflection skills (Avant, 2012; Bjerken, 2013; Chang et al., 2014; Henry, 2012; Rinaldi, 2013); (ii) the formation of a professional school culture and climate (Knabel, 2008; Skytt et al., 2014); (iii) the creation of collaboration and solidarity among teachers (Eger, 2006; Sommer & Costa, 1993); (iv) increased job satisfaction in relation to professional development (Batt, 2010; Donnelly & Fitzmaurice, 2011; Joyce & Showers, 2002; Kennedy & Smith, 2013; Marable & Raimondi, 2007; McCloy, 2011; Rich, 2013; Van Veen et al., 2012; Van den Bengeh et al., 2015) and (v) teachers' personal development (Beltman, 2009; Edwards, 2015; Schlosser, 1998; McLymont, 2000). The findings of these studies, which examine the impact of the cognitive coaching approach in the context of different variables, reveal that cognitive coaching has significant consequences for students, teachers, trainers, administrators, and consequently, the school environment as a whole. In short, based on the results of these studies, it has been observed that cognitive coaching (i) increases teacher self-efficacy, (ii) encourages professional communication and interaction among teachers, (iii) supports innovations in the education and training process, and (iv) increases professional satisfaction. In his study, Edwards (2015) reviewed previous work on the subject and emphasized that cognitive coaching has a significant impact on teacher empowerment, enabling teachers to gain autonomy, choice, responsibility, and participation opportunities in the decision-making process. Edwards (2015) also showed in his study that cognitive coaching has important outcomes in increasing student achievement, improving teacher self-efficacy and reflection skills, creating a professional school environment, and ensuring effective communication among teachers. In this context, it can be argued that the cognitive coaching approach, in creating an effective professional development process, is expected to unleash a sustainable transformation and improvement in teachers, both professionally and personally.

Cognitive coaching focuses on developing and enhancing teachers' cognitive activities through planned, goal-oriented coaching conversations and coaching cycle. The coaching cycle helps coachees identify their own development areas by providing reflective practices through a series of questions directed to the teacher by the cognitive coach and a carefully prepared

training plan. The cognitive coaching cycle includes three main components: planning, observation, and reflective interviewing (Costa & Garmston, 2014).

(i) Planning: Planning is the first stage of the coaching cycle, in other words, it is the pre-observation interview. At this stage, the coach first asks the mentee a number of questions to determine the possible outcomes expected at the end of the cognitive coaching training process, to determine the goals, problems and needs, and to decide which approaches should be followed to achieve the determined goals (Costa & Garmston, 2014).

(ii) Observation: The observation phase focuses on collecting data about the strengths of the targeted lesson or activity. The main purpose at this stage is to give the mentee the role of both researcher and experimenter, helping him/her understand the meanings and functions underlying the actions or inactions (Costa & Garmston, 2014).

(iii) Reflection Interview: In the reflection interview, the coach asks the mentee a number of questions to help the mentee rethink and evaluate what happened in the lesson during the observation. At this point, the coach wants the teacher to share his/her impressions and experiences during the lesson observation in order to reveal in-depth evaluations about himself/herself (Costa & Garmston, 2014).

Within this framework, and in the context of the constructivist approach, which is one of the theoretical foundations upon which this research is based, it is observed that the cognitive coaching approach takes place in interviews between coaches and teachers where classroom teaching methods and techniques, and applied teaching practices are shared within a framework of collaboration and solidarity. Within the scope of this study, it can be considered that coaches and teachers mutually influence each other in the process of constructing new meanings based on their interactions, the social context in which their interactions take place, and the experiences, exchanges of ideas, and reflections they share through conversations, thereby enriching the teacher's own teaching experiences. On the other hand, Costa and Garmston (2014) also emphasized the importance of collaboration as one of the key concepts in the cognitive coaching process, stating that collaboration is a crucial characteristic for achieving quality and effective teaching in schools. Costa and Garmston (2002) argued that cognitive coaching training programs offer opportunities for collaboration with others in terms of content, planning, implementation practices, and professional development, and thus make a significant contribution to the productivity and efficiency of the school.

The cognitive coaching approach encourages teachers to think and question their own teaching practices through metacognitive mechanisms within the scope of acquiring new skills through these coaching interviews (Brooks, 2000). In this context, the cognitive coaching approach includes a metacognitive monitoring process that enables teachers to observe, reflect and experience their own cognitive processes by activating metacognitive processes, thus allowing teachers to monitor their conscious and unconscious decisions regarding the outcomes of the observation process through the metacognitive control mechanism (Perfect & Schwarts, 2002). Based on the function and content of the metacognition concept, it can be argued that the primary goal of a cognitive coaching approach, which focuses on the

development and functionality of metacognitive processes, is to train teachers with high cognitive abilities and self-regulation skills.

In light of this information, it is seen that the cognitive coaching approach, which aims to change teachers' perceptions, thinking processes, beliefs and attitudes, not their behavior, and to develop their self-control skills, helps teachers independently discover the areas they need to improve in their own practices and specialize in the context of their own needs (Knowles et al., 2011). Thus, with the cognitive coaching approach, teachers have the opportunity to discover and become conscious of the cognitive development levels they need to increase in order to meet the needs of the innovative and leadership-oriented new education age through their own teaching practices (Ürün Göker & Göker, 2024).

The fundamental idea behind the cognitive coaching model is based on studies showing that teachers with high conceptual and cognitive skills exhibit a more flexible approach in their teaching styles, methods, techniques, and classroom practices, and adapt more quickly when transferring their experiences to the educational environment (Costa & Garmston, 2002). In previous studies examining the effect of cognitive coaching as a professional development tool on teachers' instructional skills and professional development, it has been revealed that cognitive coaching is an approach that contributes to the teacher professional development process and instructional skills (Batt, 2010; Carter & Francis, 2001; Costa & Garmston, 2014; Donnelly & Fitzmaurice, 2011; Joyce & Showers, 2002; Kennedy & Smith, 2013; Marable & Raimondi, 2007). These studies reveal that the cognitive coaching approach is a professional development tool that provides support for teachers in processes such as thinking about their own teaching techniques and methods, reflecting, taking student differences into account, planning, and gaining competence in classroom management.

However, when the Turkish literature is examined, it is seen that there are not many studies in which cognitive coaching is applied to teachers and its effects on the development of teachers' professional and instructional skills are examined (Göker, 2020; Ürün Göker & Göker, 2021; Ürün Göker & Göker, 2024). The findings of these studies show that the cognitive coaching approach offers teachers the opportunity to reflect deeply on their own teaching experiences, contributes to the development of their reflective skills and thus their instructional abilities, and has a significant impact on increasing professional satisfaction. In other studies where cognitive coaching is discussed, the effects of cognitive coaching on student achievement and school administrators are examined (Bulut, 2009; Ceylan, 2011; Demir, 2009; Demir & Doğanay, 2010; Demir & Bal, 2011). Studies examining the impact of cognitive coaching on student achievement have shown that teachers who receive cognitive coaching training are more focused on student success and experience a significant improvement in student achievement. In this respect, the results of these studies support the finding that teachers experienced an effective transformation in their teaching practices after cognitive coaching training, created a calmer and more peaceful classroom environment through new methods and techniques, made teacher-student interaction more open, and contributed to the development of students' problem-solving skills (Bulut, 2009; Ceylan, 2011; Demir, 2009). On the other hand, studies examining the professional contributions of cognitive coaching to teachers and administrators have supported research findings indicating

that cognitive coaching provides professional benefits in terms of improving communication skills, effective decision-making, acquiring and implementing new strategies, building trust and collaborative relationships between administrators and teachers, and enabling teachers to communicate more openly with administrators. In addition, the findings of the studies support the idea that managers exhibit more competent attitudes and behaviors regarding leadership and are successful in transforming their managerial roles into effective leadership behaviors (Demir & Bal, 2011; Demir & Doğanay, 2010).

Therefore, studies in the Turkish literature that address the cognitive coaching approach appear to lack sufficient outcomes in providing teachers with opportunities for in-depth reflection on their own teaching experiences, teaching techniques, and the acquisition and use of classroom methods and techniques. In this context, it appears that the function of cognitive coaching as an effective monitoring tool in enriching and developing the instructional skills of teachers, who should assume the role of educational leaders as creators of an educational environment that meets the needs of the age, has not been sufficiently researched. In this context, this study aims to contribute to the literature by examining the effect of cognitive coaching as an effective monitoring tool that helps teachers develop their cognitive skills in order to analyze their own teaching practices and evaluate and enrich their instructional abilities. This is because the cognitive coaching approach, as a supervisory approach, is emphasized as improving individuals' skills in using cognitive processes such as thinking, problem-solving, and planning, thus contributing to the individual's process of constructing and structuring their thoughts. In this context, it is expected that this study will shed light on a gap in the Turkish literature, facilitate teachers' cognitive self-awareness through a cognitive coaching approach, and help teachers identify areas they need to enrich and develop regarding their teaching experiences. It is thought that this study will be an important resource in the development process of both professional and instructional skills and will contribute to the literature.

This study focuses on cognitive coaching as a professional development tool that enables teachers to become practitioners who can set goals, define success indicators, choose appropriate teaching strategies, and reflect them in their own teaching experiences. Within the framework of this information, based on the fact that cognitive development and the development of instructional skills are interrelated, the problem situation of this study reveals the impact of cognitive coaching approach on the development of teachers' instructional skills as an effective professional development and supervision tool so that teachers can respond to the changes and transformations experienced in education in the innovative age.

Overall, through an analysis of the qualitative and quantitative data collected, this study aims to answer the following research questions:

1. To what extent does cognitive coaching affect the development of English teachers' instructional skills as a whole?
2. To what extent does cognitive coaching contribute to the development of English teachers' instructional skills in terms of (i) planning; (ii) personal and professional qualities and (iii) implementation?

Method

In this research, a mixed method was used as a research method, which includes the collection, analysis and combination of qualitative and quantitative data. Thus allowing to present different solution methods in a holistic framework in the process of seeking answers to the research questions. Within the scope of the purpose and questions of this research, taking into account the collection of qualitative and quantitative data, the timing of analysis and the type of data given weight, an embedded mixed methods design was used, which included the collection and analysis of quantitative and quantitative data at the same time (Creswell, 2014). In this respect, it was aimed to make sense of the possible inconsistencies related to each research problem, to ensure that the results were based on the experiences of the teachers and to present the findings with a holistic approach through effective descriptions. In addition, this research has a single group experimental design based on a pre/post-test design. In this study, English teachers' classroom teaching practices and instructional skills were examined before and after the application of cognitive coaching. From this point of, this study is an attempt to reveal any possible effects of cognitive coaching on the development of instructional skills of English teachers.

Participants

The target group of this research is English teachers. The research sample consists of 15 English teachers, 12 female and 3 male, who volunteered to participate in the study and work at a private school in Çanakkale province in the 2022-2023 academic year. The teachers were selected using the voluntary sampling method. At this point, it was stated that English teachers would be supported through applications and practices that would enable them to self-evaluate their instructional skills and thus achieve a great gain in terms of developing and changing their classroom teaching methods. On the other hand, the teachers who participated in the study were selected through voluntary sampling method, but in the selection process, priority was given to the participant teachers' closeness to the researcher and the environment in order to avoid any possible problems during the cognitive coaching training and to facilitate the data collection process. In addition, considering that both teacher and student needs will be shaped and differentiated according to the level, different levels and different experience process variables have also been taken into account. Thus, it is assumed that the representative power of the sample is strengthened in order to make a certain and powerful conclusion regarding the research results and to exactly identify and project teacher needs and development domains. Table 1 below includes demographic information about the participants.

Table 1.
Demographic Information of the Participants

Teacher	Experience	Gender	Age	Grade
1	20	Female	45	High school
2	10	Female	38	Primary school
3	6	Female	31	Middle school
4	2	Female	26	Middle school
5	5	Female	33	Middle school
6	2	Female	26	Middle school
7	10	Male	38	Middle school
8	15	Male	38	High school
9	3	Male	26	Primary school
10	3	Female	27	Primary school
11	4	Female	28	Primary school
12	5	Female	29	High school
13	18	Female	41	High school
14	9	Female	31	High school
15	3	Female	27	High school

As shown in the Table 1, a total of 15 English teachers between the ages of 24-43, working at different levels and with different years of experience agreed to participate in the study voluntarily. Additionally, the permission was obtained from the school to conduct the research and each teacher read and signed the informed consent text indicating their voluntary participation in the study.

Data Collection Tools

In this study, qualitative and quantitative data collection tools used to provide a holistic explanation and description of the cognitive coaching approach and instructional skills examined in the context of both qualitative and quantitative data are explained in the following section.

Qualitative Data Collection Tools

In this study, the cognitive coaching training evaluation form, audio recordings of teacher and coach interviews, and video recordings of lessons were used as qualitative data collection tools and the purpose and function of each data collection tool are explained in detail. The reason for the diversity of qualitative data collection tools is to be able to clearly determine the views and thoughts of teachers referring to the development points where consensus is reached regarding the effectiveness of the training program and thus to be able to clearly evaluate the data regarding the formation process of themes and codes. In this context, CCTEF, AR and VR are thought as forceful data sources that reveal how and to what extent English teachers' instructional skills are affected by their experiences with (i) planning, (ii) personal and professional qualities, and (iii) implementation skills.

Cognitive coaching training evaluation form: Cognitive coaching training evaluation form (CCTEF) was prepared by the researcher and used to assess the impact of cognitive coaching training on English teachers' instructional skills, specifically their planning abilities, personal and professional qualities, and classroom management skills. This semi-structured form aims to reveal English teachers' satisfaction with cognitive coaching training and in what ways this training contributed to their instructional and professional skills. In other words, this form asks English teachers to share their thoughts and experiences in order

to reveal the experiences and gains they have acquired during the cognitive coaching training and to evaluate whether a change in teaching skills has occurred.

Video recordings: Video recordings of lessons are functional tools that can be used to capture every moment in the classroom environment and then reflect on it in depth. Lecture video recordings are considered an alienation tool used to gain an outside perspective on what teachers might be doing in the classroom. It has been determined that lecture video recordings, which include teachers' observations, evaluations, and discussions about their own lessons and classroom performance, serve as a stimulus for teachers' critical thinking processes and have a significant impact on the development of their educational skills (Kpanja, 2002). In this research, two video recordings were taken from each of the 15 English teachers participating in the study, one before and one after the Cognitive Coaching training program, resulting in a total of 30 video lesson recordings collected as data. These videos were recorded by the researcher herself using a telephone.

Audio recordings: Audio recordings (AR) taken during two semi-structured interviews involving the coach, the researcher and the teacher within the scope of the training program, were used. These interview sessions were conducted twice, once before and once after the cognitive coaching training, with the aim of analyzing the previously collected video recordings of the lessons from the teachers within the context of the Self-Assessment Tool for Post-Lesson Reflection' (SATPLR). In the first sessions of these interviews, teachers were asked to conduct self-assessments of their own lessons and teaching skills within the context of SATPLR and to describe the strengths and weaknesses of their lessons. In the second sessions of interviews, teachers were asked to explore areas of development and change within the context of SATPLR, aiming to help them gain awareness of their own teaching skills. Points deemed important by the researcher, particularly those concerning the effectiveness of the training program, were considered as data to be evaluated in the study.

Quantitative Data Collection Tools

In the study, the "Self-Assessment Tool for Post-Lesson Reflection" (SATPLR) (ELTE-DELPE, 2014) was used as a quantitative data collection tool in order to discover and utilize the effect of cognitive coaching training on the development of teachers' instructional skills.

Self-Assessment Tool for Post-Lesson Reflection (SATPLR): SATPLR was designed to assist teachers and monitor their progress through coaching training, along with pre- and post-lesson observation reflections. SATPLR consists of 26 items covering three basic instructional skills: (i) planning; (ii) personal and professional qualities and (iii) implementation. Within the scope of this research, a pilot study was conducted to measure the validity of the SATPLR with 15 English teachers working in different schools in Çanakkale province between August 2022 and September 2022. In the pilot study, Cronbach Alpha test was applied to measure the validity of the SATPLR and the internal consistency coefficient of the scale was found to be .80. According to Nunnally (1978) and DeVellis (2003), coefficients of .70 and above are significant. Therefore, the validity coefficient measured for this study is consistent with the coefficient stated and suggested by Nunnally (1978) and DeVellis (2003).

Data Collection Procedure

In this study, a 14-week cognitive coaching training program was implemented, which was developed by Göker (2017), based generally on the reflective practice principles of Schön (1983), and applied by a cognitive coach and the researcher to 15 English teachers attending the study. The fourteen-week cognitive coaching program includes three stages: i) a pre-interview for planning, ii) observation, and iii) a post-observation interview for reflective feedback, similar to that described by Costa and Garmston (2002). Table 2 below shows the general scope of the 14-week cognitive coaching training program and the timeline of the training program.

Table 2.

The Timeline of the Fourteen-Week Cognitive Coaching Training Program

Stage	Date	Data collection
1	September-October, 2022	<ul style="list-style-type: none"> • Quantitative data (SATPLR /pre-test) • Qualitative data
2	October-November, 2022	<ul style="list-style-type: none"> -First video recordings (15 videos) -15 hours of Cognitive Coaching training • Qualitative data -Audio recordings -Second video recordings (15 videos)
3	November-December, 2022	<ul style="list-style-type: none"> • Quantitative data (SATPLR /post- test) • Qualitative data –CCTEF

Within the timeline shown in Table 2, firstly, a single case study group was created in the context of the pre/post-test design of the study and data were collected through both quantitative and qualitative methods during the cognitive coaching training process in order to introduce a holistic description of the cognitive coaching approach and instructional skills of the teachers. Within this scope, a meeting was organized at the school's conference hall with 15 English teachers who voluntarily participated in the research, along with the researcher and coach. Subsequently, within the context of the study's pre-test design, first video recordings of the lesson were obtained from the teachers, and then individual interviews were conducted in which the coach conveyed their observations about the lesson to the teacher, with the researcher also participating. In addition, before the cognitive coaching training, teachers were informed about the SATPLR, which was used as a quantitative data collection tool in the research, and they were asked to evaluate themselves and make reflections based on the items in this scale. Following the completion of the interviews, cognitive coaching training began. As part of the training content, teachers participated in training sessions organized and implemented by the coach and the researcher at the school at specific intervals. After the cognitive coaching training was completed, the researcher obtained second video recordings of the lesson from the teachers as part of the post-test design of the study. Following this, second individual interview sessions were conducted with the coach, the researcher, and teacher, within the scope of the items included in the SATPLR. In these sessions, teachers were asked to conduct self-assessments and reflections on their own lessons. In other words, the aim of these sessions is for teachers to analyze the areas for improvement in their own teaching experiences after the training and to identify areas for development in their instructional skills. Simultaneously with individual interviews, teachers were asked to re-evaluate themselves using the SATPLR scale as part of the study's post-test design. This scale, administered to

English teachers through pre-test and post-test applications, measured the extent to which the cognitive coaching process affected the development of teachers' instructional skills. Thus, it was observed whether there was a statistically significant difference between the first and last measurements. Simultaneously, teachers were given the cognitive coaching training evaluation form, a qualitative data collection tool in the study, and asked to share their thoughts on the areas of development and change they experienced in their professional and instructional skills. In short, during the data collection process, qualitative and quantitative data collection tools were used simultaneously to enable teachers to gain cognitive awareness regarding their own teaching experiences and educational skills. Furthermore, a point that deserves particular attention during the implementation of this training is related to the atmosphere of the environment in which the training takes place and the attitude of the coach and researcher. Throughout the training, coaches and researchers acted as guides and observers, and communicated effectively with teachers in a collaborative, understanding, and completely non-judgmental environment.

Data Analysis

During the data analysis phase, SPSS 18 was used to analyze the quantitative data collected through pre-test and post-test results. Non-parametric Wilcoxon signed-rank test was implemented in the analysis of quantitative data to determine the before and after distinctions between variables in the same sample by working out the difference between the ranks of the variables (Büyüköztürk, 2019). Since this study sought to measure the instructional skills scores of 15 English teachers before and after the training, the non-parametric Wilcoxon signed-rank test was carried out due to the small sample size and the dependency of the groups. Thus, in order to test the consequence of the difference between the scores in the two related measurement sets and find out if there is a remarkable difference between the instructional skills of English teachers before and after the cognitive coaching training, the data obtained after the pre-test and post-test of the SATPLR applied before and after the cognitive coaching training were analyzed with the Wilcoxon signed-rank test. On the other hand, in order to show whether the differences between the pre-test and post-test results occurred randomly, the significance level was determined as $p < .05$ and the analyzes were examined in detail to describe the results. On the other hand, in the qualitative data analysis process of the study, the cognitive coaching evaluation form, lesson video recordings, audio recordings, reflective diaries kept by teachers were used.

As the first stage of qualitative data analysis, cognitive coaching evaluation forms containing the opinions shared by English teachers regarding the development of their instructional skills in cognitive coaching training were read within the scope of content analysis (Patton, 2002). Then, the audio recordings of the interview sessions in which the reflective statements were given, including the teacher, coach and researcher, were listened to and the necessary dialogues were noted in detail to fully understand the content and identify the themes. Afterwards, certain themes and codes were classified by taking into account the similarities and differences patterns within the scope of the SATPLR in relation to the purpose of the research. In order to ensure the reliability of the themes and codes based on the data sources, firstly three themes were created based on the three subscales of SATPLR and then,

based on the consensus reached as a result of the interviews with the teachers and within the framework of the items included in SATPLR, certain codes were tried to be determined. After the analysis of the interactions in the interview records and the content of the cognitive coaching training evaluation form, themes and codes were classified by taking into account the similarities and differences patterns within the scope of the SATPLR in relation to the purpose of the research.

Ethical Permits of Research:

In this study, all the rules specified to be followed within the scope of “Higher Education Institutions Scientific Research and Publication Ethics Directive” were complied with. None of the actions specified under the heading “Actions Contrary to Scientific Research and Publication Ethics”, which is the second part of the directive, have been taken.

Ethics Committee Permission Information:

Name of the committee that made the ethical evaluation = Çanakkale Onsekiz Mart University Ethics Committee

Date of ethical review decision = 23 June 2022

Ethics assessment document issue number = E-84026528-050.01.04-2200134567

Findings

This study aims to discover how the cognitive coaching approach can be used as an efficient and forceful resource in the improvement of teachers’ instructional skills and their cognitive awareness. Firstly, it was examined to what extent the cognitive coaching approach affected the improvement of English teachers’ instructional skills as a whole, and then, to what extent cognitive coaching affected the development processes of English teachers’ (i) planning skills, (ii) personal and professional qualities, and (iii) implementation skills in quantitative and qualitative dimensions. In this context, Wilcoxon signed-rank test was used to analyze the quantitative data of the first research question and it was determined whether a statistically meaningful difference was observed between the findings obtained through the pre-test and post-test within the scope of SATPLR applied to English teachers before and after cognitive coaching training. The table below shows the pre-test/post-test analyses obtained as a result of the Wilcoxon statistical test applied for this purpose, and the mean differences and significance values between the variables.

Table 3.*Mean Difference between Pre/Post Test Scores in the Three Subscales of SATPLR*

Subscales	Pre-post test	N	Mean rank	Rank score	Z	p*
(1) Planning	Negative rank	0	.00	.00	-3.415	.001
	Positive rank	15	8.00	120.00		
	Equal Score	0				
(2) Personal and professional qualities	Negative rank	0	.00	.00	-3.419	.001
	Positive rank	15	8.00	120.00		
	Equal Score	0				
(3) Implementation skills	Negative rank	0	.00	.00	-3.411	.001
	Positive rank	15	8.00	120.00		
	Equal Score	0				
		<i>M</i>	<i>SD</i>	Mean differences	<i>Z</i>	<i>p</i>
Score	Pre-test	85.60	10.44	36.47	-3.408	.001
	Post-test	122.07	5.23			

*p<.05

As seen in Table 3, the analysis findings of the Wilcoxon signed-rank test indicate that the cognitive coaching approach has a remarkable effect on the overall development of teachers' instructional skills measured through the SATPLR (MD=36.47, Z=-3.408, p<.05). The analysis findings demonstrate that the positive ranks obtained from the pre-post tests are 45, the negative ranks are zero, and also the average rank of the negative ranks is .00 and the positive ranks are 8.00. The rank total is .00 for negative ranks and 120.00 for positive ranks. It has been clearly seen that there is a statistically significant difference between the development levels of English teachers before and after the cognitive coaching training in terms of instructional skills (-3.408; p<.05). This difference, which emerged as a result of quantitative data, shows that the cognitive coaching application caused an overall increase in the development of English teachers' instructional skills, and therefore, when the mean ranks and the sum of the difference scores are taken into account, the cognitive coaching approach has a significant effect on the development of teachers' instructional skills. In other words, the post-test scores of teachers who tried to improve their instructional skills were significantly higher than the pre-test scores (MD=36.47).

Quantitative Data Analysis Results

Within the scope of the second research question of the study, the impact of the cognitive coaching approach on the improvement of English teachers' instructional skills has been approached in the context of the sub-items of the SATPLR, which was applied as a pre-test and post-test, and the extent to what cognitive coaching affected the development of English teachers' (i) planning skills; (ii) personal and professional qualities and (iii) implementation skills has been presented through quantitative data.

Planning Skills

The quantitative findings regarding the extent to what the cognitive coaching approach contributes to the development of teachers' planning skills in terms of factors have been presented. The content of planning skills, within the scope of SATPLR, consists of the aims and objectives of the lesson (item 1), student needs (item 2), in-class activities (item 3), techniques

used in the class (item 4), resources used in the class (item 5) and the applicability of the lesson plan (item 6). The table below shows the pre-test and post-test Wilcoxon signed-rank test results regarding the development of planning skills of fifteen English teachers before and after cognitive coaching training, addressed in six dimensions in the context of SATPLR.

Table 4.

Wilcoxon Signed Rank Test Analysis of the Development of Planning Skills

Item	Pre-post-test	N	Mean rank	Rank score	Z	p*
1	Negative Rank	0	.00	.00	-3.501	.000
	Positive Rank	15	8.00	120.00		
	Equal	0				
	Score	15				
2	Negative Rank	0	.00	.00	-3.461	.001
	Positive Rank	15	8.00	120.00		
	Equal	0				
	Score	15				
3	Negative Rank	0	.00	.00	-3.473	.001
	Positive Rank	15	8.00	120.00		
	Equal	0				
	Score	15				
4	Negative Rank	0	.00	.00	-3.473	.000
	Positive Rank	15	8.00	120.00		
	Equal	0				
	Score	15				
5	Negative Rank	0	.00	.00	-3.624	.000
	Positive Rank	15	8.00	120.00		
	Equal	0				
	Score	15				
6	Negative Rank	0	.00	.00	-3.497	.001
	Positive Rank	15	8.00	120.00		
	Equal	0				
	Score	15				
		<i>M</i>	<i>SD</i>	Mean differences	<i>Z</i>	<i>p</i>
Score	Pre-test	14.40	4.64	13.40	-3.415	.001
	Post-test	27.80	1.78			

As shown in Table 4, the analysis findings of the Wilcoxon signed-rank test show that cognitive coaching practice has a remarkable impact on the improvement of teachers' planning skills measured by SATPLR (MD=13.40, Z=-3.415, $p < .05$). The quantitative findings in the table indicate that the positive ranks obtained according to the pre/post test results were 90, and the negative ranks were 0. It was also observed that the average rank of the negative ranks was 0.00 and the positive ranks were 8.00, with a total rank of .00 for the negative ranks and 120.00 for the positive ranks. According to the findings, it was statistically revealed that there was a significant difference between the planning skills development levels of English teachers before the cognitive coaching training and their planning skills development after the training (-3.415; $p < .05$). Considering the mean ranks and the sum of the difference scores, the post-test scores regarding the development levels of teachers' planning skills are significantly higher than the pre-test (MD=13.40).

Personal and Professional Qualities

Quantitative findings are presented regarding whether the cognitive coaching approach helps teachers improve in terms of factors related to personal and professional qualities. Within the scope of SATPLR, the content of personal and professional skills consists of the

teacher's agreement with the students (item 7), the teacher's presence in the classroom (item 8), the teacher's language proficiency (item 9), the teacher's language awareness (item 10), the teacher's responsibility for the personal development of the students (item 11) and the teacher's attitude towards his/her own self-development (item 12).

Table 5.

Wilcoxon Signed Rank Test Analysis of the Development of Personal and Professional Qualities

Item	Pre-post-test	N	Mean rank	Rank score	Z	p*
7	Negative Rank	0 ^a	.00	.00	-3.473	.001
	Positive Rank	15 ^b	8.00	120.00		
	Equal	0 ^c				
	Score	15				
8	Negative Rank	0 ^d	.00	.00	-3.482	.000
	Positive Rank	15 ^e	8.00	120.00		
	Equal	0 ^f				
	Score	15				
9	Negative Rank	0 ^g	.00	.00	-2.236	.025
	Positive Rank	5 ^h	3.00	15.00		
	Equal	10 ⁱ				
	Score	15				
10	Negative Rank	0 ^j	.00	.00	-3.247	.001
	Positive Rank	13 ^k	7.00	91.00		
	Equal	2 ^l				
	Score	15				
11	Negative Rank	0 ^m	.00	.00	-3.457	.001
	Positive Rank	15 ⁿ	8.00	120.00		
	Equal	0 ^o				
	Score	15				
12	Negative Rank	0 ^p	.00	.00	-3.482	.000
	Positive Rank	15 ^q	8.00	120.00		
	Equal	0 ^r				
	Score	15				
		<i>M</i>	<i>SD</i>	Mean differences	<i>Z</i>	<i>p</i>
Score	Pre-test	17.73	3.77	10.34	-3.419	.001
	Post-test	28.07	1.66			

*p<.05

As can be seen from Table 5 above, the results of the Wilcoxon signed rank test analysis reveal that the cognitive coaching approach has a significant effect on the development of teachers in terms of personal and professional qualities measured by SATPLR (MD=10.34, Z=-3.419, p<.05). According to the quantitative findings in the table, the positive ranks obtained according to the pre- and post-test results are equal at 78 and 12, while the negative ranks are zero. It is also observed that the average rank of negative ranks is .00, while the positive ranks range from 3.00 to 8.00, with a total rank of .00 for negative ranks and 120.00 for positive ranks. The findings show that there is a statistically significant difference between the development levels of personal and professional qualities of English teachers before and after the implementation of cognitive coaching training (Z=-3.419; p<.05). When the sum of the mean ranks and difference scores are examined, it is seen that the post-test scores regarding the development levels of teachers' personal and professional qualities are significantly higher than the pre-test (MD=10.34).

However, when the statistical findings in Table 5 are examined, it is observed that the lowest rank average and score in the development of personal and professional skills is the

teacher's language proficiency (item 9). In this respect, it can be interpreted that the item in question has a low significance value and that cognitive coaching training does not have a significant effect on the teacher's language proficiency acquisition process. This situation can be considered as showing that the fifteen English teachers who participated in the research have the necessary skills and qualifications in terms of language proficiency in their fields and that they are competent in using the language.

Implementation Skills

Firstly, the extent to which the cognitive coaching approach has an impact on the development of English teachers' practical skills as the last sub-dimension of educational skills in the context of SATPLR is presented through quantitative findings. Within the scope of SATPLR, the content of implementation skills consists of the structure/framework of the lesson (item 13), textbooks and auxiliary resources in the context of the materials used in the course (item 14), teaching tools and equipment (item 15), technical equipment (item 16), use of instructions in the context of classroom management (item 17), questioning techniques (item 18), timing (item 19), different interactions and the role of the teacher (item 20), correcting student errors (item 21), providing feedback (item 22), classroom discipline (item 23), communication in the context of the learning climate (item 24), the nature of the classroom (item 25) and student autonomy (item 26). Table 6 below shows the results of the pre-test and post-test Wilcoxon signed-rank test regarding the development of application skills addressed in fourteen dimensions in the context of SATPLR of fifteen English teachers before and after cognitive coaching training.

Table 6.

Wilcoxon Signed Rank Test Analysis of the Development of Implementation Skills

Item	Pre-post-test	<i>n</i>	Mean rank	Rank score	<i>Z</i>	<i>p</i> *
13	Negative Rank	0 ^a	.00	.00	-3.508	.000
	Positive Rank	15 ^b	8.00	120.00		
	Equal Score	0 ^c	15			
14	Negative Rank	0 ^d	.00	.00	-3.531	.000
	Positive Rank	15 ^e	8.00	120.00		
	Equal Score	0 ^f	15			
15	Negative Rank	0 ^g	.00	.00	-3.372	.001
	Positive Rank	14 ^h	7.50	105.00		
	Equal Score	1 ⁱ	15			
16	Negative Rank	0 ^j	.00	.00	1.000	.317
	Positive Rank	1 ^k	1.00	1.00		
	Equal Score	14 ^l	15			
17	Negative Rank	0 ^m	.00	.00	-3.573	.000
	Positive Rank	15 ⁿ	8.00	120.00		
	Equal Score	0 ^o	15			
18	Negative Rank	0 ^p	.00	.00	-3.453	.000
	Positive Rank	15 ^q	8.00	120.00		
	Equal Score	0 ^r	15			

Continue to Table 6

19	Negative Rank	0 ^s	.00	.00	3.462	.001
	Positive Rank	15 ^t	8.00	120.00		
	Equal	0 ^u				
	Score	15				
20	Negative Rank	0 ^v	.00	.00	-3.370	.001
	Positive Rank	14 ^w	7.50	105.00		
	Equal	1 ^x				
	Score	15				
21	Negative Rank	0 ^y	.00	.00	-3.530	.000
	Positive Rank	15 ^z	8.00	120.00		
	Equal	0 ^{aa}				
	Score	15				
22	Negative Rank	0 ^{ab}	.00	.00	-3.416	.001
	Positive Rank	14 ^{ac}	7.50	105.00		
	Equal	1 ^{ad}				
	Score	15				
23	Negative Rank	0 ^{ae}	.00	.00	3.345	.001
	Positive Rank	14 ^{af}	7.50	105.00		
	Equal	1 ^{ag}				
	Score	15				
24	Negative Rank	0 ^{ah}	.00	.00	-3.573	.000
	Positive Rank	15 ^{ai}	8.00	120.00		
	Equal	0 ^{aj}				
	Score	15				
25	Negative Rank	0 ^{ak}	.00	.00	-3.345	.001
	Positive Rank	14 ^{al}	7.50	105.00		
	Equal	1 ^{am}				
	Score	15				
26	Negative Rank	0 ^{an}	.00	.00	-3.542	.000
	Positive Rank	15 ^{ao}	8.00	120.00		
	Equal	0 ^{ap}				
	Score	15				
		<i>M</i>	<i>SD</i>	Mean differences	<i>Z</i>	<i>p</i>
Score	Pre-test	37.53	7.61	28.67	-3.411	.001
	Post-test	66.20	2.48			

*p<.05

As shown in Table 6, the results of the Wilcoxon signed-rank test analysis reveal a significant effect of cognitive coaching on the development of teachers' implementation skills measured by SATPLR (MD=28.67, Z=-3.411, p<.05). Quantitative findings from the pre- and post-test results show that positive ranks are equal at 191 and 19, but negative ranks are zero. Furthermore, the average rank of negative ranks is .00, while positive ranks range from 1.00 to 8.00, with a total rank of 0.00 for negative ranks and 120.00 for positive ranks. In the light of the quantitative findings obtained, it is observed that there is a statistically significant difference between the application skills levels of teachers before and after cognitive coaching training (Z=-3.411; p<.05). When the mean ranks and the sum of the difference scores are examined, it is seen that the post-test scores regarding the development of teachers' application skills are significantly higher than the pre-test (MD=28.67).

However, it is seen that cognitive coaching has the lowest significance value in the development of English teachers' implementation skills, with an average score of -1.000 (p=.317>.05) in technical equipment usage skills (item 16). This situation can be interpreted as meaning that the English teachers participating in the study have the ability to develop and

implement materials to support teaching practices, considering variables such as their average age and the private institution they work in, and that they apply transformation and differentiation in materials through technological tools, taking into account student differences.

Finally, in order to summarize the statistical analyses and quantitative findings explained so far regarding the second research question, the table below presents the findings of the pre-test and post-test Wilcoxon signed-rank test in three subscale dimensions within the SATPLR of teachers' educational skills before and after cognitive coaching training.

Table 7.

Mean Difference Values between Pre-Test and Post-Test Scores on the Three Subscale Dimensions of the SATPLR

Scale	Subscale	Mean difference	<i>p</i> *
SATPLR	Planning	13.40	.001
	Personal and Professional Development	10.34	.001
	Implementation	28.67	.001

**p*<.05

As can be seen from the Table 7 above, when the average differences between the pre-test and post-test are taken into account, it is observed that cognitive coaching training has produced very important results and changes in the improvement of instructional skills of English teachers. As can be seen from the table above, when the average differences between the pre-test and post-test are taken into consideration, it is observed that cognitive coaching training has the highest average effect on the development of English teachers' instructional skills in application skills, and it also reveals very important results and changes in the development of English teachers' instructional skills as a whole.

Qualitative Data Analysis Results

After analyzing the quantitative data of the second research question and introducing the findings, this part of the study presents the extent to what cognitive coaching training impacts the development of English teachers' instructional skills within the scope of, i) planning skills, ii) personal and professional qualities and iii) implementation skills through qualitative data. In this context, cognitive coaching training evaluation form (CCTEF) and audio recordings (AR), which were used as qualitative data collection sources, have been examined. The qualitative findings have been analyzed and described in order to reveal the extent to which cognitive coaching training affected the development of English teachers' instructional skills within the framework of SATPLR in three sub-dimensions: planning skills, personal and professional qualities, and implementation skills. In order to find the answer to the research question in question, 3 themes have been identified within the scope of SATPLR and a total of 19 codes have been determined, including 5 codes related to planning skills, 4 codes related to personal and professional qualities, and finally 10 codes related to implementation skills. The themes, codes and frequency have been shown in detail in Table 8 below.

Table 8.*Themes, Codes and Data Collection Tools Regarding the Development of Educational Skills*

Theme	Codes	f
Planning skills	Recognizing and meeting student needs	3
	Implementing activities to engage students	3
	Developing techniques to include different types of students in the classroom	3
	Using different resources based on student differences	1
	Timing	5
Total		15
Personal and professional qualities	Establishing rapport with students and displaying a positive attitude	4
	Gaining awareness of strengths and weaknesses and demonstrating self-improvement	4
	Contributing to the social and emotional development of students	4
	Having language proficiency and awareness	2
Total		14
Implementation skills	Providing an appropriate and structured course framework	3
	Using appropriate textbooks	3
	Using the board effectively and preparing visual materials	2
	Using clear and understandable instructions	3
	Developing different questioning techniques	2
	Using time management effectively and following the lesson plan	3
	Providing effective feedback and evaluation	2
	Using different approaches and techniques to correct student errors	2
	Creating an effective classroom environment	2
	Providing student-centered practices	4
Total		26

In the following sections, examples of qualitative data related to each theme are presented to qualitatively support the answer to the research question.

Planning Skills

First of all, in order to qualitatively analyze the impact of cognitive coaching training on the development of teachers' planning skills, the findings obtained in the context of the five codes shown in Table 8 under the theme of planning skills have been examined. When the answers and thoughts of fifteen English teachers in the context of CCTEF and AR have been examined, it is understood that cognitive coaching training makes a significant contribution to the development of teachers' planning skills. In order to better ensample and make sense of teachers' development in planning skills, different teacher opinions obtained through qualitative data sources within the context of five codes specified within the framework of the theme in question are given below.

Teacher 1, who touched upon the importance and function of the feedback they received from the cognitive coach and the videos watched during the training in order to understand the needs of the students and meet these different needs in the context of the development of planning skills before and after the cognitive coaching training, explained this situation in CCTEF as follows:

“In the cognitive coaching training, the sample lesson videos we watched to make my planning skills more effective, to meet the needs and interests of the students, and to activate the existing knowledge of the students, and the feedback I received from the coach were very instructive for me. Because this situation was a struggle for me despite my professional experience. It was really nice to learn some innovations that would make a difference and

thus bring about changes in planning. I understood even better from the sample lesson video that I needed to make calmer and slower transitions in my lesson plan.”

Teacher 4 emphasized the effect of effective use of timing skills on the lesson and expressed it as follows in CCTEF:

“Before and after the cognitive coaching training, I experienced the biggest development in my time management while preparing a lesson plan. Timing had a big impact on the course and the duration of student participation in the lesson. Thanks to the videos I watched, I acquired and reinforced different techniques and thus saw that I balanced the teacher and student speaking time during the subject presentation. I developed a different perspective on myself and my lesson presentation and realized how good timing makes it easier for the teacher to conduct the lesson.”

On the other hand, teacher 15 also stated in CCTEF that the development of planning skills has an important function in attracting student interest:

“The sample videos I watched helped me understand how effective planning skills are in streamlining the lesson and helping students concentrate. Transferring the techniques I learned to the classroom environment, which encourages students to stay engaged and actively participate, greatly helped me create a student-centered lesson. Asking questions based on students’ levels provides them with different perspectives and builds confidence in their abilities. I can say that the mind maps we learned in cognitive coaching training were especially beneficial in this regard.”

Based on the qualitative examples given, it is seen that cognitive coaching training makes a significant contribution to the development of teachers’ planning skills and the qualitative findings obtained in this context are coherent with the quantitative findings presented in the previous section of the study. Therefore, based on the teachers’ opinions stated above, and in the context of the codes in Table 7, it is observed that cognitive coaching training offers significant gains and experiences in the development of teachers’ planning skills in terms of recognizing and meeting student needs, using activities to attract students’ attention, developing techniques to include different types of students in the lesson, using different resources and timing based on student differences.

Additionally, when we examine the findings in Table 7, it is understood that the codes related to “timing” are the most frequently mentioned codes in the development of cognitive coaching training in the planning dimension of English teachers’ instructional skills.

Personal and Professional Qualities

In order to qualitatively analyze the impact of cognitive coaching training on the development of teachers’ personal and professional qualities, four codes were assigned under the theme of personal and professional qualities in Table 7 and the findings obtained through qualitative data sources have been examined. The answers and thoughts of fifteen English teachers in the context of CCTEF and AR reveal that cognitive coaching training makes a significant contribution to the development of teachers’ personal and professional qualities. In order to better exemplify and detail the development of teachers’ personal and professional

qualities, different teacher opinions obtained through qualitative data sources within the context of four codes determined within the framework of the theme in question are presented below.

Teacher 14, who emphasized the development of personal and professional skills within the framework of establishing close relationships with students and demonstrating a positive attitude and stance in the classroom, reflected this situation in CCTEF as follows:

“I believe that one of the most important factors in improving the quality of a lesson is creating an effective classroom environment. Through the videos I watched before and after the cognitive coaching training and the feedback I received, I realized how crucial this is, and that establishing a good and genuine relationship with students has a significant impact on the trust and solidarity that develops in the classroom. This environment of trust increased both the quality of the lesson and the students’ potential. Furthermore, during this process, I questioned my stance as a teacher in the classroom and learned that I needed to take a clearer stance and use a more emphatic tone of voice.”

Teacher 9 evaluated the development of personal and professional skills in the process of gaining self-awareness and discovering strengths and weaknesses, and stated in CCTEF:

“With the cognitive coaching training, I realized my strengths and weaknesses as a teacher in my classes. I realized I needed to address my shortcomings in classroom management skills, especially since I work with younger students. I began applying what I learned about how to create a better and more effective classroom environment. I realized I needed to transition from one topic to another with a calmer and more relaxed demeanor. I decided to focus on my own professional development and implement it in my classes going forward.”

On the other hand, teacher 1, who evaluated the development of personal and professional qualities together with cognitive coaching training within the framework of contributing to the emotional, social and moral development of students, reflected this idea in CCTEF as follows:

“Throughout my professional life, I believe that it is an important responsibility for a teacher to contribute to the student’s personal and social development in addition to being academically competent and competent, and I have constantly tried to realize this in my teaching experience. Now, with this training, after the awareness I have experienced regarding my own cognitive and emotional needs and developments, I have reinforced how functional it will be for my students to develop an emotional and cognitive attitude in both their social and academic lives.”

Based on the qualitative examples presented above, it is seen that cognitive coaching training has significant effects on the development of teachers’ personal and professional qualities and the qualitative findings obtained are coherent with the quantitative findings presented in the previous section of the study. In this respect, in the context of the codes in Table 7, it is observed that cognitive coaching training provides important awareness in the development of teachers’ personal and professional qualities; establishing closeness with students and displaying a positive attitude, gaining awareness of their strengths and

weaknesses and demonstrating self-development, contributing to the social and emotional development of students, and having language proficiency and awareness.

Furthermore, when we consider cognitive coaching training in terms of gains within the scope of personal and professional qualifications, it is seen that the highest gains regarding the personal and professional qualifications of English teachers in cognitive coaching are realized in the context of three codes: “establishing a close relationship with students and displaying a positive attitude”, “gaining awareness of their strengths and weaknesses and demonstrating self-development” and “contributing to the social and emotional development of students”.

Implementation Skills

In order to qualitatively analyze the effect of cognitive coaching training on the development of teachers' implementation skills, the qualitative data obtained within the framework of ten codes determined under the application skills theme in Table 5 have been examined. The responses and opinions of fifteen English teachers within the scope of CCTEF and AR show that cognitive coaching training provides significant gains in the development of teachers' application skills. In order to better exemplify and make sense of teachers' development in their practice skills, different teacher opinions obtained through qualitative data sources are given below.

In terms of the development of Teacher 11, who addressed the effect of cognitive coaching training on implementation skills in terms of the benefits it provides in classroom management, touched upon the importance of effective use of instructions in CCTEF:

“I can say that cognitive coaching training contributed significantly to the development of my implementation skills and allowed me to develop awareness on how to plan the structure of my pre- and post-training course more effectively and clearly. Starting the course with an effective warm-up activity, then determining the focus of the course, conveying the target outcomes, and finally wrapping up what was learned in the course and ending the course contributed to creating an effective framework. When I did my own self-criticism, I realized that I was making sharp transitions in the course. Therefore, I realized that I needed to make calmer transitions, especially in activities, in order to ensure integrity in the course.”

When the effect of cognitive coaching training on the development of teachers' implementation skills is evaluated within the scope of developing and using different questioning techniques, it is seen that teachers benefited greatly from the videos they watched throughout the process and were satisfied with their gains. For example, teacher 1 expressed what he gained during this process in CCTEF as follows:

“In the videos I watched during this process, I found that developing different questioning techniques was quite useful and effective in measuring and controlling the student's level of understanding. Especially in the context of the subject, content questions help both to learn the subject clearly and to make comparisons between the native language and the target language easily. In other words, I think they are very functional in the student's learning process. Another very important point for me was to extend the student's

speaking time through different questions. In this way, I create different thoughts in the students' minds and allow them to reflect them using the target language and develop their communication skills."

Finally, in the context of the development of implementation skills, teacher 2 explained the outcome of the lesson being structured appropriately and effectively, having a clear integrity framework, and the functioning of the lesson in CCTEF as follows:

"I can say that the cognitive coaching training significantly contributed to the development of my application skills and allowed me to develop awareness of how to plan my pre- and post-training course structure more effectively and clearly. Starting the course with an effective warm-up activity, then determining the focus of the course, conveying the target outcomes, and finally concluding the course by summarizing what was learned helped me create an effective framework. When I self-criticized, I realized that I was making abrupt transitions. Therefore, I realized that I needed to make calmer transitions, especially during activities, to maintain cohesion in the course. By asking students for their outcomes at the end of the course, I also encouraged them to reflect deeply and gain awareness of the course."

Based on the qualitative examples presented above, which appear to be coherent with the quantitative findings, it appears that cognitive coaching training contributes greatly to the development of teachers' implementation skills. In this respect, in the context of the codes in Table 7 based on teachers' opinions, it is observed that cognitive coaching training creates significant changes and outputs in developing important awareness and enriching experiences in the development of teachers' implementation skills; providing an appropriate and structured lesson process and framework, using appropriate textbooks and support materials, using the board effectively and preparing and using visual materials, using clear and understandable instructions, developing different questioning techniques, using time management effectively and adhering to the lesson plan, providing effective feedback and evaluation, using different approaches and techniques in correcting student errors, creating an effective, moderate and disciplined classroom environment and providing student-centered practices.

Finally, in addition to this situation, when we evaluate cognitive coaching training in terms of the development and gains it provides regarding implementation skills, it is seen that the highest gain regarding implementation skills of English teachers is achieved in the context of "offering student-centered outcomes", followed by four codes with a small margin: "offering an appropriate and structured lesson process and framework", "using appropriate textbooks", "using clear and understandable instructions" and "using time management effectively and adhering to the lesson plan".

In light of the findings presented so far, it is understood that the cognitive coaching approach is generally an effective tool in the development of English teachers' instructional skills and that the cognitive coaching approach provides a professional perspective by helping teachers realize that their classroom behavior and practices affect all kinds of student behavior and learning and the importance of being a teacher.

Discussion and Conclusion

The rapid changes in today's education system have brought about innovations that have emerged with the increasing areas of responsibility of the teacher in the classroom environment and have given the teacher the identity of an educational leader beyond the role of a teacher. In this context, it is very important that the professional development of teachers is supported by practices that are free from pressure and judgment and allow for the development of teaching, classroom planning, educational and administrative skills. This study focused on the cognitive coaching approach as a professional development tool and aimed to reveal how cognitive coaching training strengthens English teachers' instructional skills within the scope of teaching methods and techniques applied in the classroom. Within the scope of this purpose, it is aimed to activate the metacognitive mechanisms of English teachers through cognitive coaching training, to enable them to experience cognitive awareness in both personal and professional dimensions, and as a result, to develop their educational skills by making self-evaluations regarding their own teaching methods and techniques.

Costa and Gramston (2002) stated that the main purpose of cognitive coaching is to increase teacher effectiveness and defined cognitive coaching as an approach that allows teachers to gain awareness at a cognitive level, increase their own appreciation, gain information about in-class teaching methods and techniques, and develop instructional skills during the teaching process. Based on the content and purpose of Costa and Gramston's (2002) cognitive coaching approach, it is seen within the scope of this research that cognitive coaching training provides significant gains in the development of English teachers' skills in using different classroom methods and techniques, and as a result, it has a strong and effective function in the development of English teachers' instructional skills examined within the scope of three subscales as (i) planning, (ii) personal and professional qualities and (iii) implementation skills. In this context, when the results regarding the extent to which cognitive coaching training affects the teaching skills of English teachers as a whole are evaluated, it has been concluded that cognitive coaching training has a holistic effect on the development of English teachers' teaching skills and in this respect, it makes significant contributions to the development of their professional skills, the acquisition and implementation of classroom practices.

In relation to the first research question, the results obtained within the scope of the second research question, which we addressed through quantitative and qualitative data in the context of three sub-scales of instructional skills, namely (i) planning, (ii) personal and professional qualities and (iii) implementation, also reveal that the cognitive coaching approach showed improvement in the three instructional skills of English teachers. However, when the scores and difference averages in the three subscales are examined in detail, it is seen that some different measurements emerge in some items. For example, when the statistical findings regarding personal and professional qualifications are examined, it is observed that the lowest rank average and score in the development of personal and professional skills is the teacher's language proficiency (item 9). The low significance value of this item can be interpreted as cognitive coaching training having no significant effect on the language

proficiency acquisition process of English teachers. This situation can be considered as an indication that the fifteen English teachers who participated in the study have the necessary skills and qualifications in language proficiency in their fields and that they are competent in using the language, and it can actually be considered as an expected result.

Furthermore, when we examine the development of cognitive coaching within the scope of English teachers' implementation skills, it is seen that the lowest significance value is the technical equipment usage skills (item 16), which received an average score of -1.000 ($p > .05$). This can be explained by the fact that English teachers have the necessary equipment, especially in the use of technology, and their proficiency levels are high in this sense. In this context, it can be stated that English teachers transfer the textbooks or supplementary books they use in the classroom to the classroom environment through technological devices, taking into account student differences and needs, and apply transformation and differentiation in the materials. In other words, considering variables such as the average age of the English teachers participating in this study and the private school they work in, it can be argued that they have the ability to develop and implement materials to support their teaching practices, and that cognitive coaching training did not create a significant effect on the development of these skills and did not reveal any change.

Previous studies examining the effects of the cognitive coaching approach on teachers' instructional skills and the development of their professional skills are similar to the results of this study (Batt, 2010; Carter & Francis, 2001; Costa & Garmston, 2002; Donnelly & Fitzmaurice, 2011; Göker, 2020; Joyce & Showers, 2002; Kennedy, 2016; Kennedy & Smith, 2013; Marable & Raimondi, 2007; Ürün Göker & Göker, 2021; Ürün Göker & Göker, 2024). These studies reveal that the cognitive coaching approach provides strong support for teachers in processes such as reflecting on their own teaching techniques and methods, adapting to the needs arising from student differences, producing solutions to problems, making effective planning, gaining competence in classroom management and becoming self-managing practitioners, and in this respect, it enables teachers' professional development. Based on the findings of this research, it can be argued that the results of this study exhibit similar patterns to other studies in literature. The results of this study demonstrate that the cognitive coaching approach is an effective model for developing English language teachers' instructional skills. In this context, it can be stated that the cognitive coaching approach affects English teachers' classroom practices, learning processes and ability to analyse student differences, and provides a professional perspective by helping them realize the importance of being a teacher.

On the other hand, as one of the research results regarding the development of instructional skills of English teachers, the cognitive coaching approach appears to be an effective source in the realization of the teacher's professional development, the development of instructional skills and teaching practices as a control tool in education by providing effective and meaningful reflective practices. Because, an important area of development in the cognitive coaching approach is the reinforcement of teachers' reflection skills through reflective practices. Quality and constructive reflective feedback is thought to guide teachers in making decisions about what and how to teach in order to meet student needs and increase success (Göker, 2017; Sergiovanni & Starrett, 2002). In this respect, it is predicted that the

feedback in the reflection process should be related to the teacher's learning and teaching process, otherwise shallow and meaningless feedback will not contribute to the teacher's development and learning process over time. Therefore, it can be stated that constructive and meaningful feedback is needed to support teachers in increasing both their reflective practices and teaching practices, thus enabling them to set and achieve new goals. In this respect, one of the results of this research is that the cognitive coaching approach, which allows teachers to gain awareness of their metacognitive processes, it is seen that cognitive coaching has an important function in the development of teachers' cognitive skills in order to analyse and evaluate their own teaching practices and instructional skills.

Many studies have shown that coaching practices are implemented as a professional development strategy embedded within teaching practices, serving as an effective and important source of authority for achieving high-quality and effective teaching practices and supporting teachers' instructional skills (Eger, 2006; Ellison & Haye, 2009; Denton & Hasbrouck, 2009; Göker, 2017; Lin, 2012; Neumerski, 2013; Pollara, 2012; Ürün Göker & Göker, 2024). These studies generally show that teachers who receive coaching support for professional development experience significant and positive changes in their teaching behaviors when provided with an appropriate program that includes dimensions of responsibility, support, companionship, solidarity, and feedback. In this context, coaching approaches, which are thought to contribute to the professional development of teachers, are evaluated as a collaborative, interactive, and evidence-based approach for teachers. This study's main focus, the cognitive coaching approach, appears to offer teachers intensive, comprehensive, and differentiated support, enabling them to incorporate new practices and approaches into their own teaching experiences. In this sense, the findings of this study show that it yields effective and meaningful results in helping teachers develop knowledge and skills in the teaching process, experience cognitive awareness in all stages of this process such as planning, teaching, analysing and implementing, and ultimately improve their instructional skills. In other words, it can be argued that the cognitive coaching approach, which forms the main subject of this study, contributes to the professional development of teachers by offering them the ability to examine similar practice patterns and recognize the latent assumptions that guide and direct their actions.

From this perspective, the results obtained at the end of this study regarding cognitive coaching and the development of instructional skills prove that cognitive coaching, as a powerful supervision and mentoring tool, has a positive effect on the development of instructional skills and professional development of English teachers. In this sense, it is observed that some changes and awareness have emerged in the development of instructional skills of English teachers with cognitive coaching training. In this context, it can be stated that for teachers to realize the acquisition and functionality of cognitive coaching as a supervisory tool within the framework of contemporary supervision approaches, in order to implement the changes and innovations created by the Education 4.0 approach in educational contexts, in other words, it is quite important to support teachers, as agents who desire change, with a cognitive coaching approach that includes innovative and reflective practices in fulfilling the new tasks and responsibilities that Education 4.0 imposes on them.

In conclusion, this study is considered to have made a theoretical contribution to the educational sciences literature by revealing the effect of the cognitive coaching approach on teachers' instructional skills and professional development, and by developing new conceptual models regarding the function of cognitive processes such as classroom planning and decision-making, developing teaching strategies, analysis, self-assessment, and reflection. Furthermore, the findings of this study regarding the contribution of improving teachers' self-assessment and reflective practice skills, thereby enhancing their professional awareness and enabling them to plan their classroom teaching processes more consciously, can also be evaluated within the context of contributions to the implementation process. In short, this study is thought to provide a basis for English teachers to evaluate their beliefs about their skills and abilities to adapt the educational content they use in their teaching contexts and to make improvements regarding their teaching methods and techniques.

Recommendations

The results of this study, in which the cognitive coaching approach was used as a powerful mentoring tool to support the development of English teachers' instructional skills, offer important implications for English teachers, but the results are evaluated within the framework of the limitations and sample of this study. In this respect, it is suggested that a cognitive coaching training program should be developed that can be implemented by planning different sample sizes and longer training periods in order to see the development of English teachers' instructional skills from a larger perspective for future studies on cognitive coaching, considering that it will contribute to the literature. Additionally, studies involving teachers from different branches may be needed to measure the effectiveness of the cognitive coaching approach on teachers working in different fields and to analyse changes specific to different subject areas. Within the limitations of this study, it is suggested that further research be conducted to examine the impact of the cognitive coaching approach on the development of teachers' instructional skills in the context of different variables such as different educational environments, different professional experiences, or gender.

On the other hand, in the Turkish literature, studies investigating the impact of the cognitive coaching approach on the development of teachers' instructional skills and self-efficacy perceptions (Göker, 2020; Ürün Göker & Göker, 2021; Ürün Göker & Göker, 2024; Pilevne, 2024) and on increasing the effectiveness of school administrators and improving student success (Akyıldız, 2015; Bulut, 2009; Ceylan, 2011; Demir, 2009; Demir & Doğanay, 2010; Demir & Bal, 2011) are found. In this context, it is observed that cognitive coaching in the Turkish literature is only examined within the scope of these variables. Therefore, considering that it would contribute to the Turkish literature, there is a need for studies that examine the impact of the cognitive coaching approach not only within these variables but also in terms of the development of teachers' reflection skills, the formation of a professional school culture and climate, the creation of collaboration and solidarity among teachers, increased professional satisfaction, and support for teachers' personal development.

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The authors declare that there is no conflict of interest or any material or individual organic link with any person or institution involved in the research.

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Mesleki Gelişim Aracı Olarak Bilişsel Koçluk Yaklaşımı: İngilizce Öğretmenlerinin Eğitsel Becerilerinin Gelişiminin İncelenmesi



Özet

Yapılandırmacı yaklaşımla birlikte değişen eğitim anlayışı, öğretmenler için farklı roller ve sorumluluk alanları tanımlamıştır. Bu bağlamda, öğretmenlerin günümüz eğitim sisteminde ortaya çıkan değişimlere uyum sağlayabilmeleri için mesleki gelişimlerini ve eğitsel becerilerini geliştirmelerini sağlayacak çağdaş denetim uygulamalarıyla desteklenmeleri oldukça önemli hale gelmiştir. Bu çalışma, çağdaş denetim uygulamalarından bilişsel koçluk yaklaşımına odaklanmakta ve bilişsel koçluğun İngilizce öğretmenlerinin eğitsel becerilerinin geliştirilmesinde işlevsel bir kaynak olarak kullanılıp kullanılmayacağını keşfetmeyi amaçlamaktadır. Bu amaç kapsamında, Çanakkale’de özel bir okulda farklı kademelerde çalışan on beş İngilizce öğretmenine 2022-2023 öğretim yılı güz dönemi boyunca on dört haftalık Bilişsel Koçluk eğitim programı uygulanmıştır. Bu araştırma, ön/son test desenine dayalı tek durum çalışması olup, araştırma yöntemi olarak nitel ve nicel analizlerin her ikisini de içeren iç içe geçmiş karma yöntem kullanılmıştır. Çalışmanın veri tabanı, nicel veri toplama aracı olarak kullanılan Ders Sonrası Öz Değerlendirme Ölçeği ile elde edilen nicel veriler ve nitel veri toplama aracı olarak kullanılan koçla yapılan bireysel görüşmelerin ses kayıtları, her bir öğretmenden alınan ders video kayıtları ve bilişsel koçluk eğitimi değerlendirme formu ile elde edilen nitel veriler kullanılarak yapılandırılmıştır. Araştırma sonuçları, bilişsel koçluğun öğretmenlerin eğitsel becerilerinin geliştirilmesinde etkili bir kaynak olduğunu göstermekte ve güçlü bir denetim aracı olarak kullanılabileceğini önermektedir.

Anahtar Kelimeler: Bilişsel koçluk, eğitsel beceriler, mesleki gelişim, denetim yaklaşımları.

Giriş

Küreselleşen ve değişen dünya, sosyokültürel, ekonomik ve teknolojik düzeyde pek çok dönüşümü beraberinde getirmiş ve tüm bu süreçte en güçlü ve önemli değişim, bireyleri toplumsal yaşama hazırlayan eğitim sisteminde yaşanmıştır. Bu süreçte eğitimin odak noktası öğrenme yönetimine evrilmiş ve öğretmenlerin eğitsel becerilerini ve etkililiklerini artırmak amacıyla yeni öğretim yöntem ve tekniklerinin sınıf ortamına aktarılması ve eleştirel düşünme, problem çözme, planlama, değerlendirme ve analiz etme gibi bilişsel becerilerin kazandırılması mesleki gelişim kapsamında büyük önem kazanmıştır (Ishak & Mansor, 2020). Geleneksel eğitim anlayışından farklı olarak yapılandırmacı yaklaşımla beraber, eğitimin öğrenme sürecine ilişkin değişen odak noktası, öğretmenlerin rol ve davranışlarında da değişime yol açmıştır (Göker, 2017). Bu kapsamda eğitimin değişen odağı, öğretmenler için farklı rol ve sorumluluk alanları tanımlamış ve onlara öğretmenlik rolünün ötesinde bir “eğitim lideri” kimliği kazandırmıştır. Eğitimde başarıya ulaşmak için öğretmenlerin mesleki gelişimlerini destekleyecek etkili stratejilerin belirlenmesinin, öğretmenlerin liderlik rolünün gerçekleştirilmesi kapsamında oldukça değerli olduğu anlaşılmaktadır (Pilevne, 2024).

Liderlik, istenilen hedeflere ulaşmak için ilişkiler kurmaya ve ortak kapasitenin geliştirilmesine dayanmaktadır. Bu nedenle öğretmenlerin liderlik becerilerinin gelişiminin, öz

güven, öğretim teknik ve yöntem, mesleki tutum, bilgi ve bakış açılarının gelişimiyle ilişkili olduğu belirtilebilir. Dolayısıyla birer eğitim lideri olarak öğretmenlerden hem bireysel hem de mesleki düzlemde becerilerini geliştirme kapsamında, sınıf içi öğretim yöntem ve tekniklerinde, sınıf yönetiminde sürekli gelişim ve değişim odaklı davranmalarının ve mesleğe ilişkin algılarını daha yaratıcı, yenilikçi biçimde yapılandırmalarının beklendiği ileri sürülebilir (Bloom vd., 2003). Bu nedenle öğretmenlerin, Eğitim 4.0'ın getirdiği değişimlere ve yeniliklere nasıl uyum sağlayacaklarına ilişkin çeşitli varsayımlar ortaya atılmıştır. Yenilikçi toplumun ihtiyaçlarını karşılamayı amaçlayan Eğitim 4.0 yaklaşımında, “öğrenme” kavramı her bireyin kendisinin en iyi nitelik ve beceriyle donatılmasıyla başka bir deyişle çağın ihtiyaçlarına uygun kalite ve becerilerin yaratılmasıyla ilişkilendirilmektedir (Katzenmeyer & Moller, 2009).

Abersek (2017) Eğitim 4.0'ın eğitim alanında hem öğretmenler hem de öğrenciler için yeni mücadele alanları ürettiğini ileri sürmüştü ve bu mücadele alanlarının üstesinden gelmek için özellikle öğretmenlerin düşünce yöntemleri, derin analiz yapma becerisi ve problem çözme teknikleri gibi nitelikler geliştirilmesinin önemine vurgu yapmıştır. Benzer biçimde Ishak ve Mansor (2020), Eğitim 4.0 kapsamındaki öğrenme eğilimlerine dayanarak, Eğitim 4.0'a cevap veren öğrenme yönetiminin, bireyleri yaratıcı ve yenilikçi olmaya hazır hale getirmeyi amaçladığını belirtmiş ve bu nedenle öğretmenlerin liderlik, işbirliği, yaratıcılık, dijital okuryazarlık, etkili iletişim, duygusal zeka, girişimcilik, küresel vatandaşlık, problem çözme, eleştirel düşünme ve grup çalışması gibi 21. yüzyıl becerileri kapsamında ele alınan özellikleri edinmesinin önemine vurgu yapmıştır. Son olarak Tanang ve Abu (2014), bu süreçte, öğretmenlerin, öğrencilere öğrenme süreçlerinde rehberlik etmek ve yol göstermek amacıyla “kolaylaştırıcı” olarak tanımlayabilecek yeni bir rol üstlenmeleri gerektiği savunmuşlar ve öğretmenlerin öğrencilerin öğrenme sürecine sunabilecekleri en büyük katkının, öğrencilerin kendilerini gerçekleştirmek adına kendi öğrenme sorumluluklarını edinmesine aracılık etmek olduğunu ileri sürmüşlerdir.

Buradan hareketle, Eğitim 4.0 ile birlikte açığa çıkan yenilikçi ve liderliğe dayalı öğrenme bağlarının öğretmenlerin hem dijital hem de fiziki sınıf ortamında işlevlerini sürdürebilmeleri adına değişimi gerçekleştirmek için yeni görev ve sorumlulukları yarattığı ve bu sürecin aktif özneleri olarak öğretmenlerin mesleki gelişimlerinin desteklenmesinin önemli hale geldiği savlanabilir. Kısaca, Eğitim 4.0 ile birlikte eğitimde yenilikçi anlayışın ve öğrenme yönetimi üzerine evrilen eğitim odağının, eğitimsel bağlamlarda daha etkin şekilde kavramsallaştırılması amacıyla çağdaş eğitim denetimi anlayışı bağlamında yeni teknik ve yöntemleri içeren öğretmen mesleki gelişim programlarının etkinleştirilmesinin önemli hale geldiği belirtilebilir. Bunu gerçekleştirmek için, öğretmenin öğretme pratiklerinde öz değerlendirme ve öz denetim becerilerinin gelişimine olanak tanıyan farklı çağdaş denetim uygulamalarının, öğretmenlerin eğitsel becerilerinin gelişimlerinin desteklenmesinde oldukça etkili kazanımlar sunacağı ileri sürülebilir.

Bu bilgiler ışığında, rol ve ilişkilerin yeniden yapılandırıldığı yansıtıcı denetim uygulamalarının, öğretmenin edilgen konumda olduğu ve hiyerarşik yapının denetim sürecinde katı bir biçimde şekillendiği geleneksel denetim anlayışının yeniden kavramsallaştırılmasına olanak tanıdığı öne sürülebilir (Göker, 2017). Knight (2009), özellikle eğitim bağlamında mesleki gelişim odaklı olan koçluk uygulamalarının, yeni eğitsel

becerilerin, pratik ve yöntemlerin edinim ve uygulanması sürecinde öğretmene sağladığı rehberlik ve destek kapsamında oldukça önemli olduğunu vurgulamıştır. Eğitimsel bağlamlarda ele alınan koçluk yaklaşımları genel olarak, öğretmenin gelişim, değişim, öğrenme yaşantıları ve koçluk uygulamasına ilişkin bakış açısı ve tutumu üzerine odaklanmakta ve söz konusu durumlar kapsamında öğretmeni desteklemektedir (Ürün Göker & Göker, 2021). Bu çalışmada yansıtıcı denetim uygulamalarından bilişsel koçluk yaklaşımına odaklanılmıştır.

Etkili bir mesleki gelişim aracı olarak bilişsel koçluk yaklaşımı, öğretme ve öğrenme sürecinde yeniliklere açık, fark yaratmayı hedefleyen, mesleki ve kişisel gelişimine önem veren, yeni öğretim uygulamalarını edinmeye ve uygulamaya istekli ve bu uygulamaların sürdürülebilirliğini hedefleyen bir öğretmen profilinin yetiştirilmesinde oldukça etkili ve işlevsel bir kaynak olarak düşünülmektedir (Brooks, 2000). Bilişsel koçluk yaklaşımı, öğretmenlerin öğretim pratiklerine ve mesleki gelişimlerine yönelik bilişsel ve duyuşsal yeterliliklerini artırmaya ve bilişsel davranışlarda kalıcı değişimlere odaklanarak, öğretim sürecinde öğretmenlerin becerilerinin geliştirilmesine aracılık eden, yargı içermeyen bir süreci kapsamaktadır (Costa & Garmston, 2014). Costa ve Garmston (2002) tarafından geliştirilen bilişsel koçluk yaklaşımının temel düşüncesi, öğretmen mesleki gelişiminin temel itici güçlerine gönderimde bulunan John Dewey'in (1984) yapısalcı kuramına ve yansıtıcı uygulamalar hakkındaki fikirlerine dayanmaktadır.

Alan yazınında bilişsel koçluk yaklaşımının, (i) öğretmenlerin yansıtma becerilerinin gelişimi (Avant, 2012; Bjerken, 2013; Chang vd., 2014; Henry, 2012; Rinaldi, 2013); (ii) profesyonel okul kültürü ve ikliminin oluşumu (Knabel, 2008; Skytt vd., 2014); (iii) öğretmenler arası iş birliği ve dayanışmanın yaratılması (Eger, 2006; Sommer & Costa, 1993); (iv) mesleki gelişimle bağıntılı olarak mesleki doyumun artması (Batt, 2010; Donnelly & Fitzmaurice, 2011; Joyve & Showers, 2002; Kennedy & Smith, 2013; Marable & Raimondi, 2007; McClay, 2014; Rich, 2013; Van Veen vd., 2012; Von der Bengeh vd., 2015) ve (v) mesleki gelişime etkisi kadar öğretmenlerin kişisel gelişimi (Beltman, 2009; Edwards, 2015; Schlosser, 1998; McLymont, 2000) gibi farklı değişkenler çerçevesinde etkisinin incelendiği çalışmalar görülmektedir. Bilişsel koçluk yaklaşımının farklı değişkenler bağlamında etkisinin incelendiği söz konusu çalışmaların bulguları, bilişsel koçluğun öğrenciler, öğretmenler, eğitimciler, yöneticiler ve dolayısıyla bir bütün olarak okul ortamı üzerinde oldukça önemli sonuçları olduğunu ortaya koymaktadır. Söz konusu çalışmaların sonuçlarına dayanarak, bilişsel koçluk yaklaşımının (i) öğretmen öz yeterlik algısını arttırdığı, (ii) öğretmenler arasında mesleki iletişim ve etkileşimi teşvik ettiği, (iii) eğitim ve öğretim sürecinde ortaya çıkan yenilikleri desteklediği ve (iv) mesleki doyumunu arttırdığı görülmektedir. Edwards (2015) yaptığı çalışmasında bugüne kadar konuyla ilgili yapılmış çalışmaları incelemiş ve bilişsel koçluğun, öğretmenlerin yetkilenmesinde önemli bir etkiye sahip olduğunu ve karar verme sürecinde öğretmenin özerlik, seçim, sorumluluk ve katılım fırsatı edinmesine olarak tanıdığını vurgulamıştır.

Bilişsel koçluk, planlı, hedef odaklı koçluk görüşmeleri ve koçluk döngüsü aracılığıyla öğretmenlerin bilişsel etkinliklerinin geliştirilmesine ve güçlendirilmesine odaklanmaktadır. Koçluk döngüsü, bilişsel koç tarafından öğretmene yöneltilen birtakım sorular ve dikkatlice

hazırlanmış bir eğitim planı aracılığıyla yansıtıcı pratikler sunarak, koçluk yapılan kişilerin kendi gelişim alanlarını belirlemelerine yardımcı olmaktadır. Bilişsel koçluk döngüsü (i) planlama; (ii) gözlem ve (iii) yansıtıcı görüşme olmak üzere toplam üç ana bileşen içermektedir (Costa & Garmston, 2014). Söz konusu bileşenler çerçevesinde, bu araştırmanın oturtulduğu teorik temellerden biri olan yapılandırmacı yaklaşım bağlamında bilişsel koçluk yaklaşımının sınıf içi uygulanan öğretim yöntem ve tekniklerin, uygulanan öğretim pratiklerinin iş birliği ve dayanışma çerçevesinde paylaşımının yapıldığı koç ve öğretmen arasındaki görüşmelerde gerçekleştiği görülmektedir. Diğer yandan, Costa ve Garmston (2002), bilişsel koçluk sürecinin kilit kavramlarından biri olarak iş birliği olgusunun önemine vurgu yapmış ve iş birliğinin, okullarda kaliteli ve etkili öğretimin gerçekleşmesi için oldukça önemli bir özelliğe sahip olduğunu belirtmişler ve aynı zamanda bilişsel koçluk eğitim programının, içerik, planlama, uygulama pratikleri ve mesleki gelişim gibi konular bağlamında başkalarıyla iş birliği yapma fırsatları sunduğunu ileri sürmüşlerdir.

Bilişsel koçluk yaklaşımı, söz konusu koçluk görüşmeleri ile birlikte öğretmenlerin yeni beceriler edinim sürecinde üst-bilişsel mekanizmalar aracılığıyla kendi öğretim yöntem ve pratikleri üzerine düşünmelerini ve sorgulamalarını teşvik etmektedir (Brooks, 2000). Bu bağlamda bilişsel koçluk yaklaşımı, öğretmenlerin üst-bilişsel süreçlerini harekete geçirerek kendi bilişsel süreçlerini gözlemlemelerine, yansıtılmalarına ve deneyimlemelerine olanak tanıyan bir üst-bilişsel izleme sürecini içermekte ve böylece öğretmenlerin gözlem sürecinin çıktılarına ilişkin bilinçli ve bilinçsiz kararlarını üst-bilişsel kontrol mekanizması aracılığıyla izlemelerine olanak tanımaktadır (Perfect & Schwarts, 2002).

Bu bilgiler ışığında, öğretmenlerin davranışlarını değil, algılarını, düşünme süreçlerini, inançlarını ve tutumlarını değiştirmeyi ve böylece öz farkındalık geliştirmelerini hedefleyen bilişsel koçluk yaklaşımının, öğretmenlerin kendi eğitsel pratiklerinde geliştirmeleri gereken alanları bağımsız olarak keşfetmelerine ve kendi ihtiyaçları bağlamında uzmanlaşmalarına yardımcı olduğu görülmektedir (Knowles vd., 2011). Böylece bilişsel koçluk yaklaşımıyla öğretmenler, kendi öğretim uygulamaları aracılığıyla yenilikçi ve liderlik odaklı yeni eğitim çağının ihtiyaçlarını karşılayabilmek için artırmaları gereken bilişsel gelişim düzeylerini keşfetme ve bilinçlendirme fırsatına sahip olmaktadırlar (Ürün Göker & Göker, 2024).

Bilişsel koçluk modelinin temel düşüncesi, yüksek kavramsal ve bilişsel becerilere sahip olan öğretmenlerin öğretim biçimlerinde, uyguladıkları yöntem ve tekniklerde, sınıf içi pratiklerinde daha esnek bir tutum sergiledikleri ve deneyimlerini eğitim ortamına aktarırken daha hızlı uyum sağladıklarını ortaya koyan çalışmalara dayanmaktadır (Costa & Garmston, 2002). Bilişsel koçluğun bir mesleki gelişim aracı olarak öğretmenlerin eğitsel becerileri ve mesleki gelişimleri üzerindeki etkisinin incelendiği önceki çalışmalarda, bilişsel koçluğun öğretmenlerin mesleki gelişim sürecine ve eğitsel becerilerine katkı sağlayan bir yaklaşım olduğu ortaya konmuştur (Batt, 2010; Carter & Francis, 2001; Costa & Garmston, 2002; Donnelly & Fitzmaurice, 2011; Joyce & Showers, 2002; Kennedy & Smith, 2013; Marable & Raimondi, 2007). Söz konusu araştırmalar, bilişsel koçluk yaklaşımının, öğretmenlere kendi öğretim teknik ve yöntemleri hakkında düşünme, yansıtma, öğrenci farklılıklarını dikkate alma, etkili ders planı hazırlama, sınıf yönetiminde yeterlilik kazanma gibi süreçlerde destek sağlayan mesleki bir gelişim aracı olduğunu ortaya koymaktadır.

Ancak Türk alan yazını incelendiğinde, bilişsel koçluğun öğretmenlerin mesleki ve eğitsel becerilerinin gelişimi üzerindeki etkilerinin incelendiği çok fazla çalışmanın olmadığı görülmektedir (Göker, 2020; Ürün Göker & Göker, 2021; Ürün Göker & Göker, 2024). Söz konusu çalışmaların bulguları, bilişsel koçluk yaklaşımının, öğretmenin kendi öğretim yaşantısına ve deneyimine ilişkin derinlemesine düşünme fırsatı sunduğunu, öğretmenin yansıtma becerilerinin ve böylece eğitsel becerilerinin gelişimine katkı sağladığını ve mesleki doyumun artması noktasında önemli etkiler yarattığını göstermektedir. Bilişsel koçluğun ele alındığı diğer çalışmalara bakıldığında ise bilişsel koçluğun öğrenci başarısı ve okul yöneticileri üzerine etkilerinin incelendiği görülmektedir (Bulut, 2009; Ceylan, 2011; Demir, 2009; Demir & Doğanay, 2010; Demir & Bal, 2011). Bilişsel koçluk sürecinin öğrenci başarısı üzerine etkisinin incelendiği çalışmalarda, bilişsel koçluk eğitimi alan öğretmenlerin öğrenci başarısına daha odaklı oldukları ve öğrenci başarısında önemli yükselme görüldüğü ortaya konmuştur. Bu açıdan öğretmenlerin bilişsel koçluk eğitiminin ardından öğretim pratiklerinde etkili bir dönüşüm yaşadıkları, yeni yöntem ve teknikler aracılığıyla daha sakin ve huzurlu sınıf ortamı yarattıkları, öğretmen ve öğrenci etkileşimini daha açık hale getirdikleri ve öğrencilerin problem çözme becerilerinin gelişimine katkı sağladıkları bu çalışmaların sonuçlarıyla desteklenmiştir. Diğer taraftan bilişsel koçluğun öğretmen ve yöneticilere mesleki açıdan sağladığı katkıların incelendiği çalışmalarda ise bilişsel koçluğun, öğretmenlerin ve yöneticilerin iletişim becerileri, etkili karar verme, yeni stratejileri edinme ve uygulama, yönetici ve öğretmen arasında güven ve iş birliğine dayalı ilişki inşa etme, öğretmenlerin yöneticilerle daha açık iletişim kurma gibi nitelikler bağlamında mesleki fayda sağladıkları araştırma sonuçlarıyla desteklenmiştir. Ek olarak yöneticilerin liderlik ile ilgili daha yetkin tutum ve tavır sergiledikleri ve yöneticilik rollerini etkili liderlik davranışlarına dönüştürmede başarılı oldukları da çalışmaların bulgularıyla desteklenmiştir.

Bu nedenle bilişsel koçluk yaklaşımının ele alındığı Türk alan yazındaki çalışmaların, öğretmenin kendi öğretim yaşantısına, öğretme deneyimine ve sınıf içi yöntem ve tekniklerin edinim ve kullanım becerisine ilişkin derinlemesine düşünme fırsatı sunmada yeterli çıktılar sağlamadığı görülmektedir. Bu anlamda bilişsel koçluğun çağın gereksinimlerini karşılayacak eğitim ortamının yaratıcıları olarak eğitim lideri rolü üstlenmesi gereken öğretmenlerin, eğitsel becerilerinin zenginleşmesi ve gelişimine ilişkin kazanımların ortaya konmasında etkili bir denetim aracı olarak işlevinin yeterli düzeyde araştırılmadığı anlaşılmaktadır. Bu bağlamda bu çalışmada, bilişsel koçluğun, öğretmenin kendi öğretim pratiklerini çözümlenmek ve kendi eğitsel becerilerini değerlendirmek ve zenginleştirmek adına bilişsel becerilerinin gelişimine yardımcı olan bir denetim aracı olarak etkisinin incelenmesi alan yazına sağlayacağı katkı olarak düşünülmektedir. Çünkü, bilişsel koçluk yaklaşımının, denetsel bir yaklaşım olarak, bireyin düşünme, problem çözme, planlama gibi bilişsel süreçleri kullanım becerilerini geliştirdiği ve böylece bireyin düşüncelerini inşa etme ve yapılandırma sürecine katkı sağladığı vurgulanmaktadır. Bu bağlamda, bu çalışmanın Türk alan yazınındaki boşluğa ışık tutması, bilişsel koçluk yaklaşımıyla öğretmenlerin bilişsel farkındalık kazanması ve kendi öğretim deneyimlerine ilişkin zenginleştirmeleri ve geliştirmeleri gereken alanları belirlemelerine yardımcı olması beklenmektedir. Kısaca, bu çalışmanın öğretmenlerin hem mesleki hem de eğitsel becerilerin geliştirilmesi sürecinde önemli bir kaynak olacağı ve alan yazına katkı sağlayacağı düşünülmektedir.

Bu çalışmada, öğretmenlerin hedef belirleyebilen, başarı göstergelerini tanımlayabilen, uygun öğretim stratejilerini seçebilen ve bunları kendi öğretim deneyimlerine yansıtabilen uygulayıcılar haline gelmelerini sağlayan mesleki gelişim aracı olarak bilişsel koçluk ele alınmaktadır. Bu bilgiler çerçevesinde, bilişsel gelişim ile eğitsel becerilerin gelişiminin birbiriyle ilişkili olduğu gerçeğinden yola çıkılarak, bu çalışmanın problem durumu, öğretmenlerin yenilikçi çağda eğitimde yaşanan değişim ve dönüşümlere cevap verebilmeleri için etkili bir mesleki gelişim ve denetim aracı olarak bilişsel koçluk yaklaşımının öğretmenlerin eğitsel becerilerinin geliştirilmesi sürecinde işlevselliğini ortaya koymaktadır.

Bütün bu bilgilerden yola çıkarak, bu çalışmada nitel ve nicel verilerin analizi yoluyla aşağıdaki araştırma sorularına yanıt bulmak amaçlanmaktadır:

1. Bilişsel koçluk, İngilizce öğretmenlerinin eğitsel becerilerinin gelişimini bütün olarak ne ölçüde etkilemektedir?

2. Bilişsel koçluk, İngilizce öğretmenlerinin (i) planlama, (ii) kişisel ve mesleki nitelikler ve (iii) uygulama becerilerinin gelişimine ne ölçüde katkı sağlamaktadır?

Yöntem

Bu çalışmada, araştırma yöntemi olarak hem nitel hem de nicel araştırma yöntemini kapsayan karma yöntem kullanılmıştır. Bu araştırmanın amacı ve soruları kapsamında nitel ve nicel verilerin toplanması, analizinin zamanlaması ve ağırlık verilen veri türü dikkate alınarak, nicel ve nitel verilerin aynı zamanda toplanıp analizini içeren eş zamanlı iç içe geçmiş karma yöntem tasarımı kullanılmıştır. Bu bağlamda eş zamanlı iç içe geçmiş karma yöntem aracılığıyla, nicel ve nitel bileşenlerden ayrı ayrı elde edilen sonuçlar birleştirilmiş ve analiz edilmiştir. Diğer taraftan, bilişsel koçluk yaklaşımının belirli bir olgu olarak ele alındığı bu araştırma, ön/son test tasarımına dayanan tek grup deneysel desene sahiptir ve İngilizce öğretmenlerinin sınıf içi öğretim pratik ve becerileri bilişsel koçluk uygulaması öncesi ve sonrası ele alınıp incelenmiştir.

Araştırmanın çalışma grubunu, 2022-2023 eğitim-öğretim yılında, Çanakkale ilinde bir özel okulda ilköğretim, ortaokul ve lise kademelerinde görev yapan, 24-43 yaş arasında 12'si kadın 3'ü erkek olmak üzere çalışmaya gönüllü olarak katılan toplam 15 İngilizce öğretmeni oluşturmaktadır. Katılımcı öğretmenler, gönüllü örnekleme yöntemiyle seçilmiş ve araştırmanın gerçekleştiği okuldan araştırmanın uygulanması için gereken izin alınmıştır.

Bu çalışmada hem nitel hem de nicel veriler bağlamında incelenen bilişsel koçluk ve eğitsel beceriler arasındaki bağıntıya bütünsel bir betimleme ortaya koymak amacıyla, nitel veri toplama aracı olarak bilişsel koçluk eğitim değerlendirme formu (BKEDF); ders video kayıtları (DVK); koçla yapılan bireysel görüşmelerin ses kayıtları (KYBGSK) kullanılmıştır. Söz konusu nitel veri toplama araçlarının çeşitliliğinin nedeni, eğitim programının etkililiğine ilişkin uzlaşma sağlanan gelişim noktalarına gönderimde bulunan öğretmen görüş ve düşüncelerin net biçimde saptanması ve böylece tema ve kodların oluşum sürecine ilişkin verilerin açık bir şekilde belirlenmesidir. Diğer taraftan, bilişsel koçluk eğitiminin öğretmenlerin eğitsel becerilerinin gelişimi üzerindeki etkisini ortaya çıkarmak amacıyla bu çalışmada nicel veri toplama aracı olarak "Ders Sonrası Değerlendirme için Öz Değerlendirme Ölçeği" (DSÖDÖ) (ELTE-DELP, 2014) kullanılmıştır. DSÖDÖ, öğretmenlere bilişsel koçluk

eğitimi ile birlikte ders öncesi ve sonrası gözlemler aracılığıyla ilerlemelerine yardımcı olmak için tasarlanmış ve (i) planlama; (ii) kişisel ve mesleki nitelikler ve (iii) uygulama olmak üzere üç temel öğretim becerisini kapsayan 26 maddeden oluşmaktadır.

Verilerin analizi aşamasında ön test ve son test sonuçlarıyla toplanan nicel veriler SPSS 18 kullanılarak analiz edilmiştir. Bu çalışmada 15 İngilizce öğretmeninin eğitim öncesi ve sonrası eğitsel becerilerinde ortaya çıkan puanlar ölçüleceği için, örneklem büyüklüğünün küçük olması ve grupların birbirine bağımlı olması nedeniyle parametrik olmayan Wilcoxon işaretli sıralama testi uygulanmıştır. Bu nedenle, iki ilişkili ölçüm setindeki puanlar arasındaki fark sonuçlarını test etmek ve İngilizce öğretmenlerinin bilişsel koçluk eğitimi öncesi ve sonrası eğitsel becerileri arasında anlamlı bir fark olup olmadığını ortaya koymak amacıyla, DSÖDÖ'nün ön test ve son testinden sonra elde edilen veriler Wilcoxon işaretli sıralar testi ile analiz edilmiştir. Nitel veri analizinin ilk aşaması olarak, İngilizce öğretmenlerinin bilişsel koçluk eğitiminde eğitsel becerilerinin gelişimine ilişkin paylaştıkları görüşleri içeren bilişsel koçluk değerlendirme formları içerik analizi kapsamında okunmuştur (Patton, 2002). Daha sonra öğretmen, koç ve araştırmacının da yer aldığı görüşme oturumlarının ses kayıtları dinlenerek, içeriğin tam olarak anlaşılması ve temaların belirlenmesi için gerekli diyaloglar ayrıntılı olarak not alınmıştır. Son olarak da araştırmacının amacına uygun olarak DSÖDÖ kapsamında benzerlik ve farklılık örüntüleri dikkate alınarak belirli temalar ve kodlar sınıflandırılmıştır. Veri kaynaklarına dayalı olarak oluşturulan tema ve kodların güvenilirliğini sağlamak amacıyla öncelikle DSÖDÖ'nün üç alt ölçeğine dayalı olarak üç tema oluşturulmuş, ardından öğretmenlerle yapılan görüşmeler sonucunda sağlanan uzlaşa ve fikir birliği dikkate alınarak ve yine DSÖDÖ'de yer alan maddeler çerçevesinde belirli kodlar saptanmıştır.

Araştırmanın Etik İzinleri:

Bu çalışmada “Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi” kapsamında uyulması gerektiği belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan “Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler” başlığı altında belirtilen eylemlerin hiçbiri gerçekleştirilmemiştir.

Etik Kurul İzin Bilgileri:

Etik değerlendirmeyi yapan kurulun adı = Çanakkale Onsekiz Mart Üniversitesi Etik Kurulu

Etik Kurul Etik inceleme karar tarihi = 23 Haziran 2022

Etik değerlendirme belgesi konu numarası = E-84026528-050.01.04-2200134567

Bulgular

Bu çalışmanın amacı, bilişsel koçluk yaklaşımının, İngilizce öğretmenlerin eğitsel beceri ve bilişsel farkındalıklarının geliştirilmesinde etkili bir kaynak olarak nasıl kullanılabileceğini ortaya koymaktır. Bu amaç kapsamında, nicel ve nitel veri analizler çerçevesinde öncelikle bilişsel koçluk yaklaşımının İngilizce öğretmenlerinin eğitsel becerilerinin gelişimine bir bütün olarak ne ölçüde etki ettiği, ardından bilişsel koçluğun İngilizce öğretmenlerinin (i) planlama becerileri, (ii) kişisel ve mesleki nitelikler ve (iii) uygulama becerilerinin gelişimine ne ölçüde etki ettiği incelenmiştir. Çalışmanın birinci

araştırma sorusu kapsamında, Wilcoxon işaretli sıra testinin analiz bulguları, bilişsel koçluk yaklaşımının DSÖDÖ ile ölçülen öğretmenlerin eğitsel becerilerinin genel gelişimi üzerinde dikkate değer bir etkiye sahip olduğunu göstermektedir (MD=36.47, Z=-3.408, p<.05). Nicel veriler sonucunda, öğretmenlerin son test puanları, ön test puanlarından anlamlı derecede yüksek çıkmıştır (MD=36.47). Dolayısıyla söz konusu fark, bilişsel koçluk eğitiminin İngilizce öğretmenlerinin eğitsel becerilerinin gelişimi üzerinde anlamlı bir etkiye sahip olduğunu göstermektedir.

Çalışmanın ikinci araştırma sorusu kapsamında, ilk olarak bilişsel koçluk yaklaşımının öğretmenlerin planlama becerilerinin gelişimine ne ölçüde katkı sağladığına ilişkin nicel ve nitel bulgular incelenmiştir. Bu noktada DSÖDÖ kapsamında planlama becerilerinin içeriği; dersin amaç ve hedefleri (madde 1), öğrenci ihtiyaçları (madde 2), sınıf içi etkinlikler (madde 3), derste kullanılan teknikler (madde 4), derste kullanılan kaynaklar (madde 5) ve ders planının uygulanabilirliği (madde 6) başlıkları çerçevesinde ele alınmıştır. Belirtilen altı boyutta Wilcoxon işaretli sıra testinin analiz bulguları, bilişsel koçluk uygulamasının İngilizce öğretmenlerin planlama becerilerinin gelişiminde dikkate değer bir etkiye sahip olduğunu göstermektedir (MD=13.40, Z=-3.415, p<.05). Diğer taraftan çalışmanın ikinci araştırma sorusu bağlamında, bilişsel koçluk yaklaşımının öğretmenlerin kişisel ve mesleki niteliklerin gelişimine etkisi, DSÖDÖ kapsamında öğretmenin öğrencilerle anlaşması (madde 7), öğretmenin sınıfta bulunması (madde 8), öğretmenin dil yeterliği (madde 9), öğretmenin dil farkındalığı (madde 10), öğretmenin öğrencilerin kişisel gelişiminden sorumlu olması (madde 11) ve öğretmenin kendi öz gelişimine yönelik tutumu (madde 12) boyutlarında elde edilen nicel ve nitel bulgular aracılığıyla incelenmiştir. Bu kapsamda, Wilcoxon işaretli sıra testi analiz sonuçları, bilişsel koçluk yaklaşımının kişisel ve mesleki nitelikler açısından İngilizce öğretmenlerinin gelişimi üzerinde anlamlı bir etkiye sahip olduğunu ortaya koymaktadır (MD=10.34, Z=-3.419, p<.05). Son olarak yine çalışmanın ikinci araştırma sorusu bağlamında, bilişsel koçluk yaklaşımının öğretmenlerin uygulama becerilerinin gelişimine etkisi, DSÖDÖ çerçevesinde, dersin yapısı (madde 13), ders kitapları ve yardımcı kaynaklar (madde 14), öğretim araç ve gereçleri (madde 15), teknik donanım (madde 16), sınıf yönetimi bağlamında yönerge kullanımı (madde 17), soru sorma teknikleri (madde 18), zamanlama (madde 19), farklı etkileşimler ve öğretmenin rolü (madde 20), öğrenci hatalarının düzeltilmesi (madde 21), geri bildirim sağlanması (madde 22), sınıf disiplinini sağlama (madde 23), olumlu öğrenme iklimi yaratma (madde 24), sınıfın doğası (madde 25) ve öğrenci özerkliği (madde 26) düzlemlerinde elde edilen nicel ve nitel bulgular aracılığıyla irdelenmiştir. Bu bağlamda Wilcoxon işaretli sıra testi analizinin sonuçları, bilişsel koçluğun İngilizce öğretmenlerin uygulama becerilerinin gelişimi üzerinde anlamlı bir etkiye sahip olduğunu ortaya koymaktadır (MD=28.67, Z=-3.411, p<.05).

Tartışma ve Sonuç

Günümüz eğitim sisteminde yaşanan hızlı değişimlerin, öğretmenlere sınıf içinde farklılaşan rol ve sorumluluklar tanımladığı ve sonucunda öğretmene öğretmen rolünün ötesinde bir eğitim lideri kimliği kazandırdığı görülmektedir. Bu bağlamda öğretmenlerin mesleki gelişimlerinin baskı ve yargıdan uzak, yeni öğretim yöntem ve tekniklerin edinimine, etkili sınıf planlamasına, eğitim ve yönetim becerilerinin geliştirilmesine olanak tanıyan

uygulamalarla desteklenmesinin büyük önem taşıdığı belirtilebilir. Bu çalışmada bir mesleki gelişim aracı olarak bilişsel koçluk yaklaşımı ele alınmış ve bilişsel koçluğun sınıf ortamında uygulanan öğretim yöntem ve teknikler kapsamında İngilizce öğretmenlerinin eğitsel becerilerini nasıl ve ne ölçüde güçlendirdiğini ortaya koymak amaçlanmıştır. Bu amaç kapsamında, bilişsel koçluk eğitimi ile İngilizce öğretmenlerinin üst-bilişsel mekanizmalarının harekete geçirilerek hem kişisel hem de mesleki boyutta bilişsel farkındalık yaşamlarının sağlanması ve bunun sonucunda kendi öğretim yöntem ve tekniklerine ilişkin öz değerlendirmeler yaparak eğitsel becerilerinin geliştirilmesi hedeflenmektedir.

Costa ve Gramston'un (2002) bilişsel koçluk yaklaşımının içeriği ve amacı temel alınarak bu araştırma kapsamında, bilişsel koçluk eğitiminin, İngilizce öğretmenlerinin sınıf içi yöntem ve teknikleri edinim ve uygulama sürecindeki becerilerinin geliştirilmesinde önemli kazanımlar sağladığı ve sonuç olarak İngilizce öğretmenlerinin (i) planlama, (ii) kişisel ve mesleki nitelikler ve (iii) uygulama becerileri olmak üzere üç alt ölçek kapsamında incelenen eğitsel becerilerinin geliştirilmesinde güçlü ve etkili bir işleve sahip olduğu görülmektedir. Bu çalışmanın bulguları da bilişsel koçluğun İngilizce öğretmenlerinin eğitsel becerilerinin gelişimi üzerinde bütüncül bir etkiye sahip olduğunu ve İngilizce öğretmenlerinin mesleki becerilerinin gelişiminde, sınıf içi uygulamalarının ediniminde önemli katkılar sağladığını ortaya koymaktadır.

Birinci araştırma sorusuyla bağıntılı olarak, eğitsel becerilerin üç alt boyutu olan (i) planlama, (ii) kişisel ve mesleki nitelikler ve (iii) uygulama bağlamında nicel ve nitel veriler aracılığıyla ele aldığımız ikinci araştırma sorusu kapsamında elde edilen sonuçlar da bilişsel koçluk yaklaşımının İngilizce öğretmenlerinin söz konusu üç alt beceri boyutunda önemli çıktıları olduğunu ortaya koymaktadır. Ancak söz konusu üç alt ölçek boyutunda yer alan bazı maddeler incelendiğinde ortaya çıkan puanların farklı anlamlılık değeri yansıtmadığı görülmektedir. Örneğin, kişisel ve mesleki yeterliliklere ilişkin istatistiksel bulgular incelendiğinde, kişisel ve mesleki becerilerin geliştirilmesinde en düşük sıra ortalaması ve puanın öğretmenin dil yeterliliği (madde 9) olduğu görülmektedir. Bu maddenin düşük anlamlılık değeri, bilişsel koçluk eğitiminin İngilizce öğretmenlerinin dil yeterliliği edinme süreci üzerinde anlamlı bir etkisi olmadığı ve çalışmaya katılan on beş İngilizce öğretmenin kendi alanlarında dil yeterliliği konusunda gerekli beceri ve yeterliliklere sahip olduklarının bir göstergesi olarak değerlendirilebilir. Ayrıca, İngilizce öğretmenlerinin uygulama becerileri kapsamında bilişsel koçluğun gelişimi incelendiğinde, en düşük anlamlılık değerine sahip maddenin teknik ekipman kullanım becerisi (madde 16) olduğu görülmektedir. Bu durum, İngilizce öğretmenlerinin özellikle teknoloji kullanımı konusunda gerekli donanıma sahip olmaları ve bu konudaki yeterlilik düzeylerinin yüksek olmasıyla açıklanabilir. Bu bağlamda, İngilizce öğretmenlerinin sınıfta kullandıkları ders kitaplarını veya yardımcı kitapları, öğrenci farklılıklarını ve gereksinimleri dikkate alarak teknolojik ekipmanlar aracılığıyla sınıf ortamına aktardıkları ve materyallerde dönüşüm ve farklılaştırma uyguladıkları söylenebilir.

Diğer taraftan, bilişsel koçluk yaklaşımının öğretmenlerin mesleki ve eğitsel becerilerinin gelişimi üzerindeki etkilerinin incelendiği önceki çalışmalar da bu çalışmanın sonuçlarına benzerlik göstermektedir (Batt, 2010; Carter & Francis, 2001; Costa & Garmston, 2002; Donnelly & Fitzmaurice, 2011; Göker, 2020; Joyce & Showers, 2002; Kennedy, 2016;

Kennedy & Smith, 2013; Marable & Raimondi, 2007; Ürün Göker & Göker, 2021; Ürün Göker & Göker, 2024). Söz konusu araştırmalar, bilişsel koçluk yaklaşımının öğretmenlere kendi öğretim teknik ve yöntemleri üzerine düşünme, öğrenci farklılıklarından kaynaklanan ihtiyaçlara uyum sağlama, sorunlara çözüm üretme, etkili planlama yapma, sınıf yönetiminde yetkinlik kazanma ve öz yönetim uygulayıcıları olma gibi süreçlerde güçlü bir destek sağladığını ve bu bağlamda öğretmenlerin mesleki gelişimlerine olanak sağladığını ortaya koymaktadır. Bu araştırmanın bulgularına dayanarak, bu çalışmanın sonuçlarının da literatürdeki diğer çalışmalarla benzer örüntüler sergilediği savlanabilir. Bu bağlamda, bilişsel koçluk yaklaşımının İngilizce öğretmenlerinin sınıf içi uygulamalarını, öğrenme ve öğretmen süreçlerini ve öğrenci farklılıklarını analiz etme becerilerini etkilediği ve öğretmen olmanın önemini anlamalarına yardımcı olarak profesyonel bir bakış açısı sağladığı ileri sürülebilir.

Ek olarak, İngilizce öğretmenlerinin eğitsel becerilerinin gelişimine ilişkin ulaşılan araştırma sonuçlarından biri olarak bilişsel koçluk yaklaşımının, etkili ve anlamlı yansıtıcı pratikler sunarak, öğretmenin mesleki gelişiminin gerçekleşmesinde, öğretim becerilerinin geliştirilmesinde ve eğitimde bir kontrol aracı olarak öğretim pratiklerinin gerçekleştirilmesinde etkili bir kaynak olduğu görülmektedir. Çünkü bilişsel koçluk yaklaşımında önemli bir gelişim alanı, öğretmenlerin yansıtma becerilerinin yansıtıcı uygulamalar yoluyla güçlendirilmesidir. Bu bağlamda, yansıtma sürecindeki geri bildirim öğretmenin öğrenme ve öğretme süreciyle ilişkili olması gerektiği, aksi takdirde yüzeysel ve anlamsız geri bildirim öğretmenin zaman içindeki gelişimine ve öğrenme sürecine katkı sağlamayacağı öngörülmektedir. Dolayısıyla öğretmenlerin hem yansıtıcı uygulamalarını hem de öğretim uygulamalarını artırmada, dolayısıyla yeni hedefler belirleme ve bu hedeflere ulaşmada destekleyici, yapıcı ve anlamlı geri bildirimlere ihtiyaç duyulduğu söylenebilir. Bu bağlamda, öğretmenlerin meta-bilişsel süreçlerine ilişkin farkındalık kazanmalarını sağlayan bilişsel koçluk yaklaşımının, öğretmenlerin kendi öğretim uygulamalarını ve öğretim becerilerini analiz edip değerlendirebilmeleri açısından bilişsel becerilerinin geliştirilmesinde önemli bir işlevi olduğu bu araştırmanın sonuçlarından biridir.

Yapılan pek çok çalışmada koçluk uygulamaları, etkili ve önemli bir yetki kaynağı olarak, kaliteli ve nitelikli öğretim pratiklerinin gerçekleşmesi ve öğretmenin eğitsel becerilerinin desteklenmesi amacıyla sunulan öğretim uygulamalarının içine yerleşik olarak konumlanan bir mesleki gelişim stratejisi olarak uygulanmaktadır (Denton & Hasbrouck, 2009; Eger, 2006; Ellison & Haye, 2009; Göker, 2017; Lin, 2012; Neumerski, 2013; Pollara, 2012; Ürün Göker & Göker, 2024). Söz konusu çalışmalar, genel olarak mesleki gelişim amaçlı koçluk desteği alan öğretmenlerin sorumluluk, destek, eşlik, dayanışma ve geri bildirim boyutlarını içeren uygun program sağladığında öğretimsel davranışlarında önemli ve pozitif değişimlerin yaşandığını göstermektedir. Bu kapsamda öğretmen mesleki gelişimine katkı sağladığı düşünülen koçluk yaklaşımları, öğretmenler için iş birlikçi, etkileşimsel ve kanıta dayalı bir yaklaşım olarak değerlendirilmektedir. Bu çalışmanın temel inceleme konusu olan bilişsel koçluk yaklaşımının da öğretmenlere, yoğun, kapsamlı ve farklılaştırılmış destek sağlayan pratikler sunarak öğretmenlerin kendi öğretim yaşantılarına ilişkin yeni uygulama ve pratikleri dahil etmelerine olanak tanıdığı görülmektedir. Bu anlamda bu çalışmanın bulguları, öğretmenleri öğretim sürecinde bilgi ve beceri geliştirmesinde ve bu sürecin planlama, öğretme, analiz etme ve uygulama gibi tüm aşamalarında bilişsel farkındalık yaşamasında ve

nihai olarak eğitsel becerilerinin geliştirmesinde etkili ve anlamlı sonuçlar ortaya koyduğunu göstermektedir. Başka bir ifadeyle, bu çalışmanın temel inceleme konusunu oluşturan bilişsel koçluk yaklaşımının, öğretmene benzer uygulama biçimlerini inceleme ve onları eyleme yönelten ve yöneten gizli varsayımları tanıma yeteneği sunarak, öğretmenlerin mesleki gelişimlerinin artmasına katkı sağladığı öne sürülebilir.

Tüm bu bilgiler ışığında, bilişsel koçluk ve eğitsel becerilerin geliştirilmesine ilişkin bu çalışma sonunda elde edilen sonuçlar, güçlü bir denetim ve mentorluk aracı olarak bilişsel koçluğun, İngilizce öğretmenlerinin eğitsel becerilerinin geliştirilmesi ve mesleki gelişimleri üzerinde olumlu bir etkiye sahip olduğunu göstermektedir. Bu anlamda bilişsel koçluk eğitimi ile İngilizce öğretmenlerinin öğretim becerilerinin gelişiminde bazı değişimlerin ve farkındalıkların ortaya çıktığı görülmektedir. Bu kapsamda, Eğitim 4.0 yaklaşımının eğitim bağlamlarında yarattığı değişim ve yenilikleri gerçekleştirmek için çağdaş denetim yaklaşımları bağlamında bilişsel koçluk uygulamasının bir denetim aracı olarak, öğretmenler tarafından edinim ve işlevselliğinin farkına varılmasının, başka bir ifadeyle, Eğitim 4.0'ın öğretmenlere yüklediği yeni görev ve sorumlulukların gerçekleştirilmesinde, değişimi isteyen birer özne olarak öğretmenlerin, yenilikçi ve yansıtıcı pratikler içeren bilişsel koçluk yaklaşımıyla desteklenmesinin oldukça önemli olduğu belirtilebilir.

Sonuç olarak bu çalışmanın, bilişsel koçluk yaklaşımının öğretmenlerin eğitsel beceri ve mesleki gelişim üzerindeki etkisini ortaya koyarak, sınıf içi planlama ve karar verme, öğretim stratejileri geliştirme, analiz etme, öz değerlendirme yapma, yansıtılarda bulunma gibi bilişsel süreçlerin işlevine ilişkin yeni kavramsal modeller geliştirilmesi kapsamında eğitim bilimleri alan yazınına teorik açıdan katkı sağladığı düşünülmektedir. Ayrıca bu çalışmanın, öğretmenlerin öz değerlendirme ve yansıtıcı uygulama becerilerini artırarak mesleki farkındalıklarını geliştirmelerine ve öğretmenlerin sınıf içi öğretim süreçlerini daha bilinçli planlanmalarına katkı sağlamasına ilişkin ulaşılan sonuçlar da uygulama sürecine yönelik katkılar bağlamında değerlendirilebilir. Kısaca, bu çalışmanın, İngilizce öğretmenlerinin, bilişsel koçluk eğitim aracılığıyla, öğretim bağlamlarında kullandıkları eğitim içeriklerini uyarlama ve öğretim yöntem ve tekniklerinde iyileştirmeler yapma konusunda beceri ve yeteneklerine ilişkin inançlarını değerlendirmeleri ve mesleki deneyimlerini zenginleştirmeleri için bir temel sağladığı düşünülmektedir.

Öneriler

Bilişsel koçluk yaklaşımının İngilizce öğretmenlerinin eğitsel becerilerinin gelişimini desteklemek amacıyla güçlü bir mentorluk aracı olarak ele alındığı bu çalışmanın sonuçları İngilizce öğretmenleri açısından önemli çıkarımlar sunmakla birlikte, sonuçlar bu çalışmanın sınırlılıkları ve örnekleme çerçevesinde değerlendirilmiştir. Bu bağlamda, bilişsel koçluk alanında yapılacak ileriki çalışmalarda, İngilizce öğretmenlerinin eğitsel becerilerinin gelişimini daha geniş bir perspektiften görebilmek adına farklı örnekleme büyüklükleri ve daha uzun eğitim süreleri planlanarak uygulanabilecek bilişsel koçluk eğitim programının geliştirilmesinin literatüre katkı sağlayacağı öngörülebilir. Ayrıca, bilişsel koçluk yaklaşımının farklı alanlarda çalışan öğretmenler üzerindeki etkililiğini ölçmek ve farklı konu alanlarına özgü değişimleri analiz etmek için farklı branşlardaki öğretmenleri kapsayan çalışmalara ihtiyaç duyulabilir. Bu çalışmanın sınırlılıkları kapsamında, bilişsel koçluk yaklaşımının,

öğretmenlerin eğitsel becerilerinin gelişimine etkisinin farklı eğitim ortamı, farklı mesleki deneyim veya cinsiyet gibi farklı değişkenler bağlamında gelişimini inceleyen çalışmaların yapılması önerilebilir.


Diğer yandan Türk alan yazınında, bilişsel koçluk yaklaşımının, öğretmenlerin eğitsel beceriler ve öz-yeterlik algılarının gelişimine (Göker, 2020; Ürün Göker & Göker, 2021; Ürün Göker & Göker, 2024; Pilevne, 2024) ve okul yöneticilerinin etkililiğın artmasına ve öğrenci başarısının gelişimine (Akyıldız, 2015; Bulut, 2009; Ceylan, 2011; Demir, 2009; Demir & Doğanay, 2010; Demir & Bal, 2011) ilişkin değişkenler kapsamında etkisinin araştırıldığı çalışmalara rastlanmaktadır. Bu bağlamda Türk alan yazınında bilişsel koçluğun yalnızca söz konusu değişkenler kapsamında incelendiği görülmektedir. Bu açıdan Türk alan yazınına katkı sağlayacağı düşünülerek, bilişsel koçluk yaklaşımının, söz konusu değişkenlere ek olarak, öğretmenlerin yansıtma becerilerinin gelişimi, profesyonel okul kültürü ve ikliminin oluşumu, öğretmenler arası iş birliğı ve dayanışmanın yaratılması, mesleki doyumun artması ve mesleki gelişime etkisi kadar öğretmenlerin kişisel gelişiminin desteklenmesi gibi farklı değişkenler çerçevesinde etkisinin incelendiğı çalışmalara ihtiyaç duyulabilir.



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The Ethical Compass of Digital Classrooms: Teachers' Perspectives on AI Ethics in Education

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Abstract

The aim of the study is to examine primary school teachers' perspectives on the ethics of artificial intelligence [AI] in education in depth. The research was conducted using a phenomenological design. The study group consisted of 62 primary school teachers working in Türkiye. Data were analyzed using an inductive content analysis approach, allowing themes and categories to emerge directly from the participants' responses. The results indicate that teachers recognize both the potential benefits and challenges of AI in classroom settings. Participants highlighted concerns regarding ethical risks, the need for effective control and oversight of AI tools, precautions against technical problems, and the impact of security vulnerabilities on student data. Teachers also emphasized the importance of ensuring privacy, fairness, and equal opportunities in AI-supported education, as well as informing stakeholders about AI decision-making processes. Furthermore, the results underscore the necessity of establishing clear ethical rules and assigning accountability for AI errors. These insights provide a comprehensive understanding of responsible AI implementation in educational contexts and offer guidance for policymakers, administrators, and educators aiming to integrate AI technologies in ways that enhance learning while upholding ethical and security standards.

Keywords: Artificial intelligence, ethics, artificial intelligence ethics, primary school teachers, education.

Introduction

The 21st century represents a period in which artificial intelligence [AI] technologies have not only infiltrated every aspect of social life but have also had transformational effects on educational systems. From AI-based learning analytics systems to adaptive learning software and automated assessment tools, many applications make it possible to conduct learning processes in a more effective, individualized and data-driven manner. However, the integration of AI into educational environments brings with it ethical debates. Issues such as data privacy, student privacy, algorithmic bias, transparency, and accountability necessitate an ethical inquiry into the use of AI in education (Bensason et al., 2024; Floridi et al., 2018).

The integration of AI in education presents both great opportunities and significant ethical challenges. Teachers recognize the transformative power of this technology and are generally embracing it. However, addressing ethical issues such as data privacy, algorithm bias, and accountability is vital for the responsible and beneficial use of AI in education (Solak et al., 2025). AI ethics presents the basic principles guiding responsible AI development and addresses moral dilemmas such as the balance between privacy and innovation, the conflict between bias and fairness (Bayan, 2024). The questioning of the ethical dimension of AI in education raises the question of the extent to which technologies are compatible not only with pedagogical effectiveness but also with fundamental principles such as justice, inclusion, and human rights. Practices such as labeling, observing, or tracking students through algorithmic decisions go beyond pedagogical benefit and are also related to universal ethical norms such as children's rights and respect for human dignity (Crawford, 2021; Williamson & Eynon, 2020). Therefore, the use of AI applications in educational settings should be addressed within the framework of not only technical and pedagogical, but also moral and social responsibilities.

The rapid integration of AI technologies into social life and educational systems has necessitated a governance approach based on ethical principles. AI ethics supports the

development of systems that respect human rights and fundamental values and uphold principles such as transparency, accountability, and security (Santhoshkumar et al., 2023). In particular, potential negative impacts such as discrimination, invasion of privacy, and economic inequality are critical issues that need to be addressed within an ethical framework. In this context, designing AI systems in a fair, transparent, and accountable manner is of great importance in terms of protecting individual rights and preventing discriminatory outcomes (Sahoo, 2024). In the context of education, the ethics of AI takes on the task of protecting a value-based approach while supporting technological innovations. For institutions, educators, and policy makers, ethical principles provide a guiding framework for ensuring the responsible use of AI in education and preventing potential risks (Owino & Paschal, 2023). Therefore, the development and use of AI technologies in a sustainable and equitable manner requires interdisciplinary collaboration and policies based on ethical principles.

Although there are many studies in the literature on the use of AI in education, the ethical dimensions of these applications are generally secondary; especially, the ethical perceptions of primary school teachers are not sufficiently examined (Gouseti et al., 2024; Seyrek et al., 2024). However, teachers are the actors who can most closely observe and direct the ethical reflections of the applications of technologies in the classroom. This study aims to contribute to the theoretical and practical gaps in this field by examining primary school teachers' perceptions and perspectives on the ethical use of AI in education.

The aim of this study is to examine primary school teachers' perspectives on the ethics of AI in education in depth. By investigating how teachers evaluate the use of AI within the framework of ethical principles (human rights, data privacy, security, justice, and transparency), the study will reveal their awareness of the ethical integration of AI in the classroom environment. In this way, it is aimed to contribute to the shaping of AI applications in education in line with ethical foundations and the development of educational policies in this field. In line with the aim of the study, following research questions were addressed.

1. How do teachers perceive the ethical risks of using AI in education?
2. How do teachers perceive the control and oversight of AI in educational settings?
3. How do teachers perceive the precautions needed for potential technical problems with AI tools in classrooms?
4. How do teachers perceive the effects of AI-related security vulnerabilities in classrooms?
5. How do teachers perceive AI's ability to ensure student data privacy and security?
6. How do teachers perceive the need to inform and involve students, parents, and colleagues in AI decision-making processes?
7. How do teachers perceive AI's role in promoting equality and justice in education?
8. How do teachers perceive the potential for AI to cause discrimination in educational settings?

9. How do teachers perceive the development of AI to support educational processes and stakeholders?

10. How do teachers perceive who should be responsible when AI produces erroneous results?

11. How do teachers perceive the necessity and content of ethical rules for using AI in classrooms?

Ethics of AI in Education

AI technologies lead to radical transformations in education, as in many areas of life (Solak et al., 2025). AI applications in education emerged with limited uses at the end of the 20th century, with the increase in the need for personalized learning as well as developments in data collection and modeling processes. Since the beginning of the 21st century, these applications have become increasingly widespread and have found a wider usage area in the field of education (Jackson & Papa, 2023). The use of AI in education aims to make students' learning processes more effective, individualized, and interactive (Keskin & Seveli, 2024). It is stated that AI makes significant contributions in terms of providing personalized learning opportunities, providing effective feedback and improving student assessment processes. It also helps to identify at-risk students early and increases teaching efficiency through real-time, individualized feedback. However, in order to effectively utilize this potential, important issues such as data quality and ethical concerns need to be considered (Duarte et al., 2023). However, although AI applications in education have the potential to improve learning processes, they also raise important ethical issues such as security, transparency, and privacy. Ethical discussions on artificial intelligence are generally based on two main philosophical approaches: deontological ethics, which emphasizes responsibilities such as data privacy and individual rights, and utilitarian ethics, which focuses on maximizing social benefit; therefore, scholars highlight the need for a multidimensional ethical framework that prioritizes transparency, auditability, and justice in decision-making processes (Pinto & Garcia, 2024). AI ethics is a field that questions the effects of the actions of AI systems on humans and how these systems can be developed in a responsible, reliable, and socially beneficial manner (Russell & Norvig, 2021). It is also an interdisciplinary field of study that examines the moral responsibilities that arise in the design, development, and use of AI systems. AI ethics provides a broad ethical framework covering issues such as data use, algorithmic decision-making, transparency, accountability, bias, and discrimination (Floridi & Cowls, 2019). However, AI ethics emphasizes the need for trustworthiness and transparency in order to develop and use these systems responsibly and safely. The ultimate goal is to minimize the potential ethical risks and harms associated with AI applications (Sethy et al., 2024). The ethical use of AI in a field such as education, where human relations are intense, can be possible with fair and inclusive practices that take into account individual differences and respect student rights. Seven basic AI ethical principles developed within the framework of the European Commission [EC] provide guidance in this regard (EC, 2019); (1) human oversight, (2) technical robustness and security, (3) privacy and data management, (4) transparency, (5) non-discrimination, (6) social welfare, and (7) accountability. These principles emphasize that the use of AI in education should be conducted in a human-centered and ethics-based framework.

Developments in the field of AI have gained a legal framework with the European Union's regulation known as the "AI Law". This law aims to regulate the use of AI systems as well as to promote innovation and protect the fundamental rights of individuals (Council of the EU, 2023; Görentaş & Çiftçi, 2024). The ethics of AI in education requires addressing issues such as mass data collection, privacy violations, algorithmic bias, and the negative consequences of automated decision-making. This includes ensuring fair access to technology, protecting student data, and ensuring that AI tools support each individual's learning process without discrimination. In addition, promoting critical and ethical thinking and increasing the competencies of educators in this field are of great importance for the effective integration of AI in digitalized educational environments (Bernardo et al., 2024).

Establishing transparency, explainability, confidentiality, responsibility, and accountability mechanisms in AI applications plays a critical role in ensuring equality in education. These approaches increase trust in AI systems among educators and students and support their responsible use (Contreras & Jaimes, 2024). Teachers are responsible for ensuring that AI-supported assessments are fair, reliable, and valid, as well as ensuring the ethical use of student data by protecting their privacy (Köse et al., 2023). Teachers' perspectives are of great importance for the effective integration of AI applications in education. Teachers, who know the classroom environment best, have the competence to observe and evaluate the practical functioning of AI technologies (Yolcu, 2024). With the rapid development of technology, teachers' ethical evaluations and perspectives on this field positively affect both the development of students and the effectiveness of teaching processes (Seyhan, 2024). Teachers who use AI applications in their lessons encourage students to use these technologies effectively. Teachers approach these applications positively due to the advantages of AI, such as increasing creativity, supporting productivity, providing new perspectives, adapting to individual learning speed, and saving time (Yılmaz & Çakır, 2024). While AI allows teachers to focus more on teaching, ethical concerns such as data privacy and the reduction of human touch in teaching are also raised (Ali & Okon, 2024). Teachers expressed concerns about the effects of AI on student data privacy and the ethical use of this data, especially in teaching and assessment processes (Kölemen, 2024; Uygun, 2024). In addition, it is important to prevent students from having their homework done by AI and to raise awareness to detect such ethical violations (Yılmaz & Çakır, 2024). Some pre-service teachers have concerns about autonomy and control in terms of the impact of AI on decision-making processes in education (Guggemos et al., 2024).

In recent years, the concept of "AI Literacy" emphasizes the need to equip educators with skills to use AI technologies ethically, critically, and responsibly (Long & Magerko, 2020). Therefore, examining the ethical perceptions of primary school teachers towards the use of AI in education is thought to be necessary not only for technological competence but also for raising awareness about digital ethics. Primary school teachers, as students' first guides in the educational process, play a crucial role in supporting the effective and safe use of digital technologies and helping students become responsible individuals in the digital world (Kaya et al., 2023). When the literature on the use of AI in education is examined, it is seen that the number of studies addressing the perspectives of different stakeholders, such as teachers, prospective teachers and school administrators has increased in recent years. Most of these

studies focus on evaluating how AI tools are used in educational environments, their adoption levels and their contributions to teaching processes. Sontay et al. (2024) reported that primary school teachers view AI applications as tools that support teaching processes and individualized learning. At the same time, it was also revealed that teachers think that ethical principles should be considered when using AI and that they have concerns that these technologies may weaken social and cultural values. Similarly, in a qualitative study conducted by Seyhan (2024) with social studies teachers, it was emphasized that AI provides significant convenience to teachers, especially in material preparation and measurement and evaluation processes. However, it was also stated that some teachers were cautious about these technologies due to their concerns about ethical issues and data privacy. This situation shows that not only functional aspects but also ethical dimensions should be addressed regarding the use of AI in education. In this context, examining the ethical perceptions of primary school teachers towards AI will contribute to the understanding of not only technological competencies but also the ethics of AI in education. Therefore, it is thought that this study will fill the ethics-oriented gap in the existing literature and contribute to the development of a more holistic understanding of AI ethics through the unique positions of primary school teachers.

In other studies focusing on teachers' opinions, general trends, and implementation practices for the use of AI technologies in education are evaluated. In this context, factors such as teachers' attitudes towards technology, application habits and the difficulties they face were analyzed (Özer et al., 2023; Seyrek et al., 2024; Yılmaz & Çakır, 2024). In addition, quantitative data revealing that primary school teachers' attitudes towards AI differ according to demographic variables also contribute to the literature (Aksakal et al., 2024). In studies examining pre-service teachers' awareness of the concept of AI, pre-service teachers defined AI as a structure created on the basis of human intelligence, and stated that these technologies can be used in the education and training process in order to teach lessons, carry out classroom teaching practices, support the teacher, evaluate students individually and eliminate their deficiencies (Çam et al., 2021). In a study focusing on the perspective of administrators, school administrators' opinions on AI were examined, and various difficulties encountered in the use of technology, such as data security, manipulative algorithms, and inequalities in access to technology, were pointed out (Kurt, 2024). These studies are important in terms of showing the way AI is perceived and used by different actors in the field of education. In the literature, it is observed that topics such as ethical principles related to AI, the reflection of these principles in educational environments, and stakeholders' views on AI ethics are not sufficiently addressed. This situation reveals the need for AI to be evaluated holistically, not only in terms of its pedagogical and technical dimensions, but also in terms of its social and ethical impacts.

When the literature on the ethical dimensions of AI is examined, it is seen that studies are largely shaped by the frameworks developed by technology design, industry practices, and policymakers. In this context, ethical guidelines and policy documents developed by various national and international organizations define general principles for the responsible use of AI (Bensason et al., 2024; Thiebes et al., 2021). In the context of education, ethical debates are addressed in a more limited number of studies. Sain and Lawal (2024) examined the opinions

of higher education lecturers on the ethics of AI and found that these individuals have ethical concerns in terms of both technological and pedagogical responsibilities. Similarly, Öksüz Gül (2024) analyzed the opportunities and risks faced by academics on AI ethics in education. Although research focusing on the K-12 level is more limited, it contains remarkable findings. The systematic literature review conducted by Gouseti et al. (2024) was created by analyzing 25 peer-reviewed studies published between 2010 and 2023. This study highlighted key themes and concerns regarding AI ethics at the compulsory education level. In another study focusing on the factors affecting teachers' ethical sensitivity towards AI technologies, Viberg et al. (2024) found that teachers' level of trust in AI is closely related to their level of knowledge and self-efficacy regarding these technologies, based on research conducted in six different countries. The literature provides an important framework for understanding the role of AI ethics in education. However, the perceptions and concerns of primary school teachers, who play a crucial role in helping students acquire foundational knowledge and skills, regarding the ethical dimensions of AI technologies have not been sufficiently explored. Therefore, investigating primary school teachers' ethical concerns is important for the conscious and responsible use of AI in education. This study aims to address this gap in the literature.

The effective use of AI technologies in education by considering ethical principles depends on teachers' perspectives on AI ethics. This is because if teachers find AI ethically problematic or unreliable, this can make it difficult to adopt the technologies. Challenges hindering the widespread use of AI in education systems in Europe include ethical concerns, incomplete knowledge, insufficient policy guidelines, and concerns about data use. Therefore, extensive research is needed to understand whether AI can provide quality educational opportunities to more students without jeopardizing student safety (Seyrek et al., 2024). Therefore, determining teachers' perspectives on AI ethics can lead to more effective and ethical use of AI applications in education. Lubis et al. (2024) stated that teachers play an important role not only in transferring academic knowledge but also in guiding students to grow up as responsible individuals who can cope with global challenges and have strong moral values. Bölükbaş et al. (2023) stated that teachers are role models especially for young children by exhibiting appropriate behaviors and attitudes in the use of technology and teaching the necessary rules for safe and ethical technology use. In addition, educators provide guidance on digital ethics by teaching children how to protect themselves from the harms of technology and help them act responsibly in the digital world. In this context, it can be said that primary school teachers can play an important role in helping children recognize the ethical risks of AI systems, such as bias generation, privacy violation, and transparency, and in providing them with early AI ethical awareness. In addition, by guiding children on issues such as the processing of their personal data, impartiality and security, they can support them to become conscious individuals about AI in the future. The ethical principles (such as privacy, fairness, transparency) described in detail in the TRAI AI Ethical Principles and Legal Regulations Report (Bensason et al., 2024) can be conveyed by primary school teachers through simple examples, and games that primary school students can understand. For example, topics such as the importance of protecting personal information in the digital environment or the need for AI systems to be fair in their decisions can be covered. For this reason, it is thought that the

results obtained from the research by determining the perspectives of primary school teachers on AI ethics in education will make a significant contribution to the literature.

Method

Research Design

In the study, phenomenology, one of the qualitative research designs, was used in order to examine the perspectives of primary school teachers on the subject of AI ethics in education in depth. Phenomenology is an approach that aims to understand how individuals experience a particular phenomenon. In this context, the aim of phenomenological studies is to reveal the participants' perceptions, feelings, and thoughts about a particular phenomenon in depth based on their experiences (Moustakas, 1994). The phenomenological approach tries to understand the essence of individuals' experiences, and in this process, the researcher should stay away from his/her own prejudices and approach the phenomenon from the participants' point of view (Van Manen, 2016). The phenomenon examined in this study is the concept of "AI ethics". In this context, phenomenology design was used in order to directly access primary school teachers experiences regarding AI ethics in education.

Study Group

The study group consisted of 62 primary school teachers working in a province in Turkey. The participants were determined by a convenience sampling method. This type of sampling is a practical selection strategy that allows the researcher to collect data from accessible participants with easy access (Patton, 2014). Participants were determined on a voluntary basis, and care was taken to ensure the participation of teachers from different seniority, and gender groups in order to ensure the diversity of the data. The distribution in the professional seniority of the participants ensured that the perspectives of teachers from different experience levels were included.

In qualitative research, the sample size is determined not based on statistical power calculations as in quantitative studies, but on factors such as the diversity of participants who can answer the research questions in depth and the repetitiveness of the data obtained. In this context, data saturation was taken as the basis for determining the sample size (Patton, 2014). Data saturation is when new themes, opinions, or meaningful information no longer emerge in the data obtained from new participants (Guest et al., 2006). In this study, during the extensive open-ended data collection process with participants from different genders, seniority, and geographical regions, it was observed that certain themes started to recur and new findings were limited. This indicates that the sample reached sufficient information richness for the research purpose, and data saturation was achieved. Therefore, the data obtained from 62 primary school teachers allowed for an in-depth examination of the research questions and was found sufficient to ensure representativeness and diversity. Details about the demographic characteristics of the participants are given in Table 1.

Table 1.*Demographic Characteristics of the Participants*

Professional seniority	Female (f)	Male (f)	Total	Female % (In-group)	Male % (In-group)	Total % (General)
1-5 years	16	10	26	62%	38%	42%
6-10 years	5	4	9	56%	44%	15%
11-15 years	5	4	9	56%	44%	15%
16-20 years	10	2	12	83%	17%	19%
Over 20 years	2	4	6	33%	67%	10%
Total	38	24	62	61%	39%	100%

Table 1 presents the distribution of teachers according to working time and gender, both within the group and overall. According to the data, 61% of the participants were female and 39% were male. The highest participation rate was 42% among teachers with 0-5 years of experience. In this group, the female rate is 62% and the male rate is 38%. In the ranges of 6-10 years and 11-15 years, the female rate is similarly 56% and the male rate is 44%. The majority (83%) of teachers with 16-20 years of service are women. On the other hand, the proportion of men is higher in the over 20 years group with 67%.

Data Collection Tool***Interview Form***

The semi-structured interview method was used to obtain data in line with the aim of the research. In the research the semi-structured interview form was used. The interview questions were prepared based on the principles of AI ethics in the literature (Bensason et al., 2024) (e.g., transparency, fairness, data privacy, responsibility), and content validity was ensured by obtaining the opinions of two faculty members who are experts in the field of AI. Corrections were made to the interview form according to the feedback received from the experts. One expert stated that preparing the interview questions with clearer and more specific expressions would allow the participants to understand the subject better and thus give more meaningful answers. For example, in the first stage, examples of ethical risks for the first interview question are provided in parentheses. In line with the experts' recommendations, it was noted that presenting participants with only the concept of 'ethical risks' would facilitate them in expressing their own unique views based on their experiences and perceptions. After the expert opinion, the questions were sent to three primary school teachers for pilot implementation. Thus, the representativeness of the concepts to be measured was increased. During this process, teachers expressed that they found the questions clear and understandable.

Sample questions:

1. What do you think are the ethical risks that may arise for the use of AI in educational processes?
2. How should teachers control and oversight AI in educational processes?

In the final version of the interview form, 11 open-ended questions were included to obtain the opinions of primary school teachers on the ethics of AI in education. The interview form includes basic principles such as ethical risks, data security, control, and oversight

processes, equal opportunity, potential for discrimination, accountability, and educational contribution.

Data Collection Process

The data were collected online between 11.02.2025 and 20.06.2025. At the beginning of the form, teachers were informed about the purpose and scope of the study. The semi-structured interview form was sent to the teachers via Google Form. This method allowed teachers to respond freely and thoughtfully in their own time. The responses were collected anonymously to ensure the confidentiality of the teachers. During the data collection process, care was taken to include the participants in the study on a voluntary basis. Before the teachers were asked open-ended questions online, they were presented with the interview protocol and asked to read it carefully. In the protocol, the purpose of the research, data use, confidentiality and anonymity principles were clearly stated. After reading the protocol, the teachers gave their consent and participated in the interview process. With this application, both ethical principles were complied with and the informed consent of the participants was obtained.

Data Analysis

The interview data were analyzed using inductive content analysis. Inductive content analysis is an approach to construct meaning based on data without relying on predetermined theories. This process is carried out by coding the data, categorizing similar codes into categories, and developing themes from these categories (Saldaña, 2016). In the data analysis process, the data were first examined in depth by the researcher, and the data were coded in detail. During the coding phase, the researcher collaborated with an academician specialized in AI to ensure the accuracy and consistency of the codes. Categories and themes were created based on the resulting codes, and these themes were reviewed with the expert and evaluated in terms of scope and meaning. The themes were restructured and clarified when necessary. A few sample revisions made in the analysis of the third question of the study, in line with the expert opinion, are presented in Table 2.

Table 2.

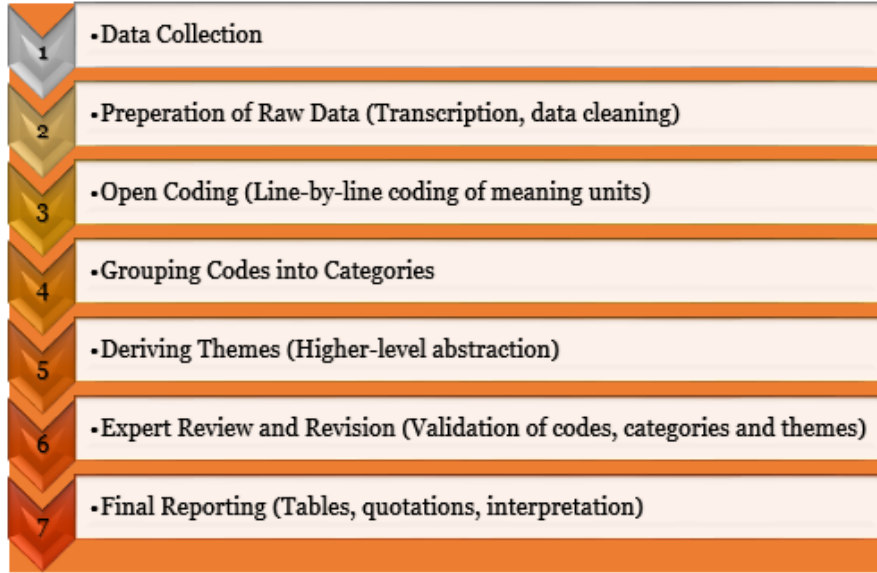
Revisions Based on Expert Opinion

First theme	Corporate infrastructure and expert support	Conscious use	Corporate infrastructure
First category	Expert support	Preparation and planning	Technical support
First code	Getting expert support	Preliminary preparation	The organization provides infrastructure
Revised theme	Security measures	-	Corporate infrastructure and expert support
Revised category	Emergency response	Preparation and compliance check	Technical infrastructure support
Revised code	Getting expert support	Preparation/testing	The organization provides technical infrastructure and support
Revision justification	Changed the theme as the content directly refers to intervention in a security crisis.	Expanded the category scope with expert suggestion, clarified the code.	The scope was expanded and explicitly renamed.

In data analysis, attention was paid to researcher neutrality, and clarity, and consistency were observed in the coding of meaning units. In addition, presenting the findings with supportive direct quotations enabled the reader to follow the interpretation process. Finally, the themes, categories, and codes obtained for each research question were tabulated and reported. The data analysis process is given in Figure 1.

Figure 1.

Data Analysis Process



Validity and Reliability

In qualitative research, validity and reliability are accepted as the basic criteria for ensuring the credibility of the study and the accuracy of the findings (Lincoln & Guba, 1985). In this context, in order to increase the internal validity of the research, the semi-structured interview form used to collect the data was created by taking into account the literature review. In order to ensure the content validity of the interview form, the opinions of two academicians in the field of AI ethics were consulted, a pilot study was conducted and the questions were revised in line with the suggestions received. This process was effective in evaluating whether the data collection tool was sufficient in terms of content (Yıldırım & Şimşek, 2011).

In the analysis of the data obtained, the inductive content analysis method was used, and the coding process was carried out separately by the researcher and an expert. After the independent analysis by the coders, the codes obtained were compared, the differences in meaning were discussed, and a common consensus was reached. This process was carried out in accordance with the principles of data triangulation, systematicity, and transparency suggested by Patton (2014) to increase reliability in qualitative research. In the interpretation of the data obtained in the study, direct quotations were used to avoid researcher bias, and participant opinions were supported by the findings. In addition, in the analysis of the data, the formation of themes and categories was clearly defined and the process of reaching findings from the data was reported transparently. Thus, the external validity and transferability of the study were tried to be increased (Creswell, 2016).

Limitations

This study has some limitations. First, the study was conducted with primary school teachers working in only one province. This situation limits the generalizability of the results obtained and prevents the reflection of teachers' perspectives in different geographical, socioeconomic, and cultural contexts. Secondly, written responses to open-ended questions were used as a qualitative data collection method. This method may have limited the level of in-depth expression of the participants' thoughts and also caused the responses to vary in detail. In addition, since the data is based on teachers' subjective statements, there is a possibility that participants may give more positive or representative answers due to the social expectation effect. Finally, the data analysis process was based on the seven ethical principles recommended by TRAI (Bensason et al., 2024).

Ethical Permits of Research:

In this study, all the rules specified to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with. None of the actions specified under the heading "Actions Contrary to Scientific Research and Publication Ethics", which is the second part of the directive, have been taken.

Ethics Committee Permission Information:

Name of the committee that made the ethical evaluation = Muş Alparslan University Scientific Research and Publication Ethics Committee

Date of ethical review decision = 10 February 2025

Ethics assessment document issue number = 66

Findings

The analyses conducted to the first question of the study are given in Table 3.

Table 3.*Ethical Risks of Using AI in Education*

Theme	Category	Code	Teacher
Privacy and data governance	Personal data security and invasion of privacy	Data privacy and violation	P11, P12, P13, P28, P29, P30, P31, P32, P34
		Academic ethical violation	P49, P1, P2, P6, P17, P35
		Data security problem	P45, P51, P8, P31, P34
		Unauthorized data use	P4, P33
Reduced responsibility for learning	Causing superficial learning	Access to ready information	P39, P47, P57, P6, P18, P19, P21
	Digital addiction	Failure to provide deep learning	P10, P18
		Technology addiction	P47, P15
		Violation of duty	P42
Diversity, discrimination and fairness	Inequality of access and injustice	Limited access to technology	P7, P30
		Lack of personalization	P22, P35
		Risk of peer bullying	P53
		Socioeconomic inequality	P7
		Unfair scoring	P17
		Generating biased content	P34
		Discrimination	P26
The problem of information reliability	Questioning the accuracy of information	Risk of false and unverifiable information	P41, P52, P56, P61, P11, P16, P38
Security	Security risks	Malicious use	P42, P48, P58, P7, P23, P37
		Cyber attacks	P10, P28
Loss of professional role	Teacher role	Weakening of the role of the teacher	P40, P49, P61, P62, P20, P30
Negative effects on the learning process	Decline in human values	Human and emotional deprivation	P3, P30, P27
	Machine learning processes	Lack of experiential and natural learning	P43
	Communication breakdown	Decrease in teacher-student communication	P8
	Time management	Waste of time	P40
Social and cultural influences	Failure to protect social and cultural values	Incompatibility with social and cultural values	P50, P55, P13
		Disappearance of traditional education	P54
		Risk of harmful content	P44, P46
Human control	Control issues	Risk of loss of control	P51, P52, P5, P9, P36
Readiness for artificial intelligence	Pedagogical deficit	Lack of readiness	P24
	Lack of infrastructure	Inadequate school infrastructure	P24
Accountability	Uncertainty of responsibility	Risks to authenticity	P59, P60, P25
		No ownership of erroneous results	P26
Perception of ethical risk	Lack of perception of ethical risk	Do not think there is an ethical risk	P14

Note: Participants gave more than one answer all tables.

When Table 3 is analyzed, it is seen that teachers have strong ethical concerns, especially about the privacy of personal data, discrimination, and information reliability and security. In addition, concerns were also expressed about the negative effects of AI tools on learning processes and students' cognitive development. Teachers perceive that AI may

diminish their professional role in educational decision-making, obscure responsibilities, and weaken control mechanisms. In addition, statements pointing to pedagogical and technical infrastructure deficiencies indicate that the level of readiness for AI tools and the application conditions in schools are not yet sufficient. It is seen that teachers have multidimensional perspectives on the ethical risks that AI technologies may pose in the educational environment. These opinions were expressed in various dimensions such as pedagogical processes, ethical values, data security, and social responsibility. Direct quotations from teachers' opinions are given below.

P4: *"I think there are ethical risks in terms of violating personal rights and freedoms. For example, using a person's voice tone without their consent to make a speech material."*

P1: *"There may be labor theft. Taking the information directly from AI tools and using it as it is without reaching its source, without mentioning its source, can be considered as doing an injustice to the labor of the researchers who put that information forward."*

The analyses conducted to the second question of the study are given in Table 4.

Table 4.
Control and Oversight of AI

Theme	Category.	Code	Teacher
Teacher's oversight and control over AI	Teacher responsibility	The teacher is in oversight	P39, P40, P46, P47, P49, P62, P3, P10, P14, P16, P19, P26, P30, P33
		Teacher being directive	P49, P60, P2
	Teacher-AI interaction	Raising technology literate individuals	P4, P18
		Teaching the use of AI	P48
		Student-oriented time planning	P19
		Balanced application of control	P53
		AI as a supportive and productive tool	P54, P55, P7, P20, P35
		AI undermines the authority of the teacher	P55, P62, P5
	Teacher competence	AI makes teachers lazy	P2
		Increased control through teacher training	P58, P13, P36
Control affects occupational motivation		P60, P40	
Ability to control AI		P28	
Oversight mechanisms	Decline in social skills	P22	
	Systematic control of AI	P44, P57, P7, P23, P30, P34	
The impact of using AI on students	Risks of lack of oversight	Misuse	P45, P53, P15, P15, P21, P29, P37, P38
		Incorrect learning and assessment	P60, P31, P14
		Risk of unlimited use	P47, P7, P51
	Learning process and development	Difficulty in obtaining information	P12
		Student learning to learn	P51
		Cognitive laziness	P43, P48, P7, P9, P17
	Ensuring individual development	P60, P46	
	Isolation as a result of overuse	P19	
Content and information control	Accuracy and reliability of information	Transferring false and unreliable information to students	P41, P46, P52, P1, P6, P7, P11
		Confirmation of the source of information	P1, P32
		Misinformation negatively affects the process	P61, P33
	Content quality and relevance	Information pollution	P56
		Content inappropriate for the age level	P59
		Imitation content	P59
	Biased content	P34	
	Tracking irrelevant content	P50	
Impacts on The education process	Process management	Disruption of the education process	P5, P27, P12, P28
		Weakening of teacher-student relationship	P7, P30
	The role of AI in the process	Managing the process by the teacher	P42, P43
		AI as an auxiliary resource	P41
	Teacher and course resource orientation	P41	
	Class-independence of AI	P55	
Ethical and social risks	Data security and privacy	Confidentiality of student data	P7, P26, P30
	Equality and justice	Invasion of privacy	P7
		Inequality of opportunity	P7
	Social and moral values	There are injustices	P57
		Failure to transmit human qualities	P13
	Materialism and moral risks	P13, P51	
	Damage to rights and freedoms	P8	

When Table 4 is examined, it is seen that teachers prioritize keeping the responsibility of oversight and control over AI in their hands, especially in classroom processes; they show sensitivity in preventing negativities that may arise in students' learning processes and ensuring the reliability of the content used. It has been determined that teachers have perspectives in multidimensional areas such as the role of AI in the integration of AI applications into the educational environment, control, responsibility, teacher-AI interaction, student development, and teacher competence. These opinions were not only limited to the functional dimension of technology but also associated with the management of educational processes and the risks that may occur in the lack of control and social values. Direct quotations from teachers' opinions are given below:

P30: *“The use of AI in education must be under teacher oversight. The teacher should check content accuracy, student suitability, and ethical sensitivities. If this control is missing, students may be misguided, personal data may be compromised, and the student-teacher relationship may weaken. AI is a tool; the teacher should always be the guide.”*

P43: *“The teacher should control the process; if the necessary control is not provided, students remain passive in learning.”*

The analyses conducted to the third question of the study are given in Table 5.

Table 5.
Precautions for Technical Problems

Theme	Category	Code	Teacher
Conscious use	Teacher training	Providing training to teachers	P53, P57, P59, P6, P8, P9, P11, P17, P19, P20, P21, P22, P25, P30
		Attending AI seminars/courses Mandatory AI education at university	P46, P3, P18, P23, P29 P52, P19
	Preparation and compliance check	Preparation/testing	P51, P55, P2, P12, P26, P28, P34
		Using a program appropriate to the level	P51
	User awareness and information	Knowing the program feature	P39, P28
		Providing preliminary information	P45, P35
	Source verification	Keeping documents related to the use of AI	P62, P28
		Confirmation with primary sources	P41, P61
		Not dependent on AI	P44
	Student training	Providing preliminary training to students	P53
Security measures	Emergency response	Getting expert support	P40, P48, P50, P52, P57, P4, P13, P25, P29, P30, P37
		Shutting down the system Ensuring physical and digital security of the classroom	P42, P5, P30, P31, P37, P38 P40, P7, P30, P34
	Digital security	Establish backup and recovery plans	P26, P30, P31, P31, P32, P33, P34
		Secure software selection	P44, P33
		Selection of up-to-date and original software	P59, P38
		Use of an encryption method	P10, P16
		Audit software	P60
		Powerful system control	P43
	Turn to alternative practices	Attending class with traditional methods	P42, P62, P12
		Using alternative learning methods	P54, P30, P34
		Orientation to different applications	P41, P60
		Research on the internet	P58
	Oversight	Orientation to encodings	P54
		Teacher oversight	P15, P31
		Technical oversight	P30, P38
Institutional infrastructure and expert support	Expert support	Having technical staff	P14, P22, P23, P28
		Getting support from school computer teachers	P61, P3, P27
		Establishment of cyber security units in schools	P8
	Technical infrastructure support	Assigning AI teachers to schools	P52
		The organization provides technical infrastructure and support	P49, P24
No comments	Lack of knowledge and experience	No response	P47, P1
		Lack of experience	P56
		Lack of training	P36

When Table 5 is analyzed, it is seen that teachers' perspectives are concentrated on "Conscious use", "Security measures", "Institutional infrastructure and expert support", "Teacher training", and "Emergency response". Teachers stated that preparations should be made at both individual and institutional levels for the conscious and safe use of AI in the classroom; they emphasized the need for training on preliminary information, source verification, pedagogical adaptation, and increasing AI literacy. The need for institutional infrastructure and expert support shows the importance of planning in the fields of technical hardware, cybersecurity, and expertise. Within the scope of security measures, practices such as digital security protocols, system oversight, data backup, and shutting down the system when necessary were emphasized. It was also found that some teachers lacked knowledge and experience in AI ethics. Teachers emphasized the need for institutional support and expert help, as well as teacher training, user awareness, and appropriate preparation and attention to technical problems that may be encountered; they also emphasized measures such as emergency response and digital security. Direct quotations from teachers' opinions are given below:

P52: *"In such a situation in the classroom, if there is a malfunction that is beyond my knowledge, I ask for help from people who understand. As a precaution, an AI teacher can be assigned to each school. Or this course can be compulsory for teachers at universities."*

P3: *"I would get help from the computer teacher of the relevant institution. In order to prevent such failures, possible failures can be minimized through seminars and courses on the use of AI tools."*

The analyses conducted to the fourth question of the study are given in Table 6.

Table 6.

Effects of Security Vulnerabilities

Theme	Category	Code	Teacher	
Precautions	Technical measures	Strong encryption methods	P60, P62, P11, P12, P15, P16, P16, P17, P18, P34, P38	
		Using blocking/filtering programs	P49, P54, P57, P58, P59, P60, P61, P3, P22, P25	
		Control/update of software	P55, P3, P24, P26	
	Software security	Use of trusted/government-approved apps	P40, P51, P1, P3, P13, P13, P21, P22, P24, P25, P34, P35	
		Access restrictions	Access and time limitation Child/parent lock	P9, P11, P24 P9, P12
	Oversight and support Education and awareness raising	Teacher oversight	P29, P31	
		Expert intervention/support	P46, P19, P28, P38	
		Providing cyber security training	P41, P4, P6, P19, P34, P38	
		Not sharing personal information	P40, P44, P50, P6, P32	
	Psychosocial impacts	Misuse	Cyberbullying	P61, P62, P4, P7, P8, P23
Unwanted image/video			P53, P2, P12, P30, P31,	
Risk of misleading students Unintentional involvement in crime			P39, P7, P36 P28, P29	
Trust problems		Damage to trust	P13, P21, P25	
		Distance from technology	P13	
Effects on the teacher		Weakening of the teacher's authority and control	P53, P7, P12	
Data security violations		Violation of confidentiality of personal information	Theft of student-teacher information	P40, P48, P1, P7, P10, P11, P20, P21, P23, P25, P25, P30, P33, P35
			Invasion of privacy Information leakage	P51, P56, P61, P3, P5 P7, P11, P18, P34, P38,
Systemic security risks		Disruption of the education process	Deviation/discontinuity from the course objective	P43, P55, P57, P7, P22, P30, P38
			Lack of access to accurate information	P52, P61
	Reduced productivity		P34	
	Mismatch of ideas between students and teachers		P52	
	Unauthorized access Cyber attacks	Unauthorized access to accounts	P61, P1, P5, P30, P38	
		Interception of passwords	P61, P23	
Lack of risk perception	Perception of no risk	Damage to digital materials	P7, P30, P38	
		Breakdown of devices	P7, P38	
		No perception of risk due to use The responsibility is not seen in the teacher The difficulty of taking precautions	P45 P14 P42	
Opinion not available	Unspecified	No response	P47, P27, P37	

When Table 6 is analyzed, it is seen that teachers' perspectives focus on topics such as "Precautions", "Data security violations", and "Psychosocial effects". In addition, themes such as "Systemic security risks" and "Lack of risk perception" are also noteworthy. Teachers attach importance to areas such as privacy of personal information, disruption of the educational process, misuse, technical measures, and training and awareness raising. It was also observed that some participants did not respond to the issue. In general, the table reveals primary school teachers' opinions on data security, systemic, and psychosocial risks that may be encountered in AI tools, technical and pedagogical measures to be taken against these risks, and differences in risk perception. It was found that teachers developed a strong sensitivity towards the protection of personal information, technical security measures, awareness raising, and oversight mechanisms; at the same time, some teachers did not perceive any risk perception regarding security vulnerabilities.

P51: "The possibility of violating the right to privacy is very high. Storing information prolongs the process of this violation. The authorization of such software should be restricted by the state itself."

P33: "Students' data may fall into the hands of malicious people. Teachers may have problems accessing the systems. Strong encryption, teacher and student training, and the use of secure software should be emphasized."

The analyses conducted to the fifth question of the study are given in Table 7.

Table 7.

AI and Student Data Privacy and Security

Theme	Category	Code	Teacher	
Negative perception	Privacy violations	The idea that confidentiality is not ensured	P46, P45, P56, P10, P8, P10, P10, P13, P20, P24, P26, P27, P36	
		Unauthorized sharing of personal data	P41, P44, P2, P4, P7, P18, P30	
		Uncontrolled access to personal data	P52, P58, P61, P15, P19, P23, P33	
		Data processing and storage uncertainty	P48, P60, P19, P32	
		Digital track and trace	P42, P51, P59, P12	
		Misuse of personal information	P60, P17, P28, P30	
		Failure to protect sensitive data	P7, P30	
		Security violations	Risk of cyber attack	P40, P43, P3, P31
			General vulnerability	P55, P1, P3
			International data war	P52
	Failure to comply with the rules		P62	
	Password vulnerability		P61, P5	
	Unauthorized access	The idea that security is not ensured	P45, P56, P10, P8, P10, P26, P27	
		Data leakage and theft	P6, P7, P18, P34, P38	
		Unauthorized control of the system	P47, P53, P7	
		Difficulty limiting access	P50	
		Lack of transparency	P7, P30, P33, P38	
	Data accuracy	Recurrent information	P57	
		Information validation issue	P58	
		Unlimited responsiveness	P9	
Persistent data on the Internet		P22		
Inadequate infrastructure		Lack of infrastructure	P29	
Precautions	Recommendations for technical measures	Safe app usage	P7, P29, P33, P34	
		Taking cyber security measures	P7	
		Use strong passwords	P34	
	User training and awareness raising	Schools taking precautions	P38	
		Digital literacy and awareness trainings	P4, P34	
		The need for teacher training	P30	
		Unconscious use	P11	
	Oversight	Lack of oversight	P7, P25, P30, P38	
		Establishment of data protection policies	P30	
		No security problems	P54, P16	
Positive perception	Perception that security is ensured	The idea that security is ensured	P39	
		Data retention to prevent information pollution	P49	
		presence of trusted companies	P28	
No comments	Lack of Information	Lack of opinion	P14, P21, P35, P37	

When Table 7 is analyzed, it is seen that the majority of teachers' opinions are gathered under the theme of "Negative perception". This theme focuses on critical issues such as privacy and security violations. A small number of teachers stated that security is ensured and information pollution is prevented within the scope of "Positive perception". The "Precautions" theme includes suggestions for technical measures, user training, and addressing oversight deficiencies. It was determined that some teachers did not express an opinion due to a lack of knowledge on the subject. It has been determined that teachers have significant concerns about privacy and data security issues related to AI tools; however, they have opinions on eliminating these concerns with technical and educational measures.

P59: *"No, I don't think so, because all kinds of data entry can be easily obtained with cookie permissions and digital footprint."*

P31: *"No, I don't think so. Unfortunately, data loss may occur in any cyber attack."*

The analyses conducted to the sixth question of the study are given in Table 8.

Table 8.

Informing Stakeholders on AI Decisions

Theme	Category	Code	Teacher
Need to inform stakeholders	Stakeholder engagement and information	Informing stakeholders	P39, P43, P44, P45, P46, P51, P56, P61, P2, P5, P10, P12, P14, P17, P20, P21, P24, P25, P29, P35, P36
		Need for information due to lack of knowledge	P40, P41, P42, P43, P25, P26
	AI usage knowledge and management	Parental control and involvement	P60, P47, P30, P37, P33, P34
		Increasing student participation	P30, P33, P34
		Students know the evaluation criteria	P60, P30
		Expert support	P32
		Providing information for efficient and effective use	P53, P54, P3, P4, P6, P13, P21, P34
		Stakeholders know the working principle of AI	P1, P7, P19, P30, P34
		Teachers' process management knowledge	P19, P27, P28, P30,
		Recognition of benefit and harm	P52, P18, P23, P29
		The teacher informs the parent	P62, P22
		Knowing the intended use and methods	P49, P54
Awareness of controlled use		Awareness-raising against malicious use	P48, P57, P58, P16
		Limited use requirement	P8
		Incorrect use can cause technical failures	P15
		Exposure to harmful content	P19
Transparency and trust		Personal data security	P59, P11
		Transparency inspires confidence	P7, P30, P33, P34
		Explanation of decision making processes	P7, P38, P30, P33
		Knowing the effects of decisions	P7, P17, P19
		Preventing misunderstandings	P7, P34
		Knowledge of data sources	P7
		Impartiality briefing	P7
Sharing responsibility	Areas of use	Information for transparency in education	P55
		Teacher control gives confidence	P38
		Attribution of responsibility to a single person	P29
		Evaluating student performance	P7, P30
		Teaching optimization	P7
Digital literacy and education		Personalized learning	P7
		Providing interactive digital literacy trainings	P9, P31
		Developing students' digital skills	P38
Limitations in providing information	Information difficulties	Difficulty of informing in village schools	P50

When Table 8 is analyzed, it is seen that the most concentrated point of the teachers is “The need to inform stakeholders”. In this context, sub-headings such as stakeholder participation and information, knowledge, and management of AI use come to the fore. Especially the necessity of raising awareness due to lack of information, parental control, and increasing student participation are among the main issues emphasized by teachers. It is also emphasized that digital skills should be developed and interactive digital literacy training should be provided. One teacher stated that stakeholder information could not be provided due to the difficulty of providing information. Primary school teachers attach importance to the necessity of active participation and informing stakeholders in the decision-making processes of AI, controlled use, digital literacy, and training activities, and the creation of an environment of transparency and trust.

P58: *“Yes, they should be informed. Because it is a platform that is open to misuse.”*

P34: *“Yes, I think it should be informed because knowing how AI works both builds trust and prevents misunderstandings. Students will follow the process more consciously, teachers will provide the right guidance, and parents can be involved in the process in a healthier way. This information is important for transparency, ethical, and effective use.”*

The analyses conducted to the seventh question of the study are given in Table 9.

Table 9.*AI and Educational Fairness*

Theme	Category	Code	Participant
Injustice	Access and use	Not all students have access to technology	P41, P48, P59, P17, P28, P32, P33, P34, P37
		Inaccessibility for students without financial means	P40, P42, P55, P57, P2, P8
	Unfair learning	Difficulty of use by disadvantaged students	P58, P5, P30,
		Ready access to information for the non-working student	P47, P17
	Professional competence	Differences in professional competence among teachers	P60
	Neutrality	AI is not neutral	P31
Ensuring equality and justice	Widespread access to	Access to technology	P54, P3, P12, P13, P15, P16, P19, P36
		Free AI tools	P54, P11
	Personalized learning opportunity	Easier access to information	P18
		Low cost	P19
	Neutrality	Delivering experiences based on individual needs	P7, P33, P34
		Providing opportunities for disadvantaged groups	P7
		Non-discrimination of people	P51, P52, P54
		Giving what is demanded	P51, P52
		Impartial and fair work	P49
Conditional equality	Providing conditional equality	Provision in any place and institution if the learner can access it	P50, P53, P60, P20, P21, P28, P29, P30
		Ensuring correct use	P45, P4, P33, P34
		Providing equal opportunities through education and information	P11, P29, P38
		Ensuring equality in the classroom	P44
		Providing the student who wants to develop	P45
Technological inequality in education	Inadequate technological infrastructure and equipment	Regional hardware differences	P61, P62, P25, P1, P22, P30
		Lack of infrastructure	P40, P43, P23, P37
	Digital competence	Internet access problems	P55, P9, P30
		Student conflicts due to digital skills gap	P58
		Lack of AI literacy	P29
Limitations of AI	Uncontrolled use	Laziness	P41
		Technological dependence	P41
		Uncontrolled use	P6
	Limited role	AI's inadequacy in equity and justice	P1, P24, P30
		Limited trust in AI	P27
Negative perception	Unjustified	No	P46, P56, P10, P14
Unconsciousness	Lack of information	No information	P26, P35
Positive perception	Unjustified	Yes	P39

When Table 9 is analyzed, it is seen that the themes of “injustice”, “ensuring equality and justice” and “conditional equality” stand out in teachers’ opinions on AI. Teachers state that there are significant inequalities among students due to technological infrastructure inadequacies, internet access problems, and financial impossibilities. It is emphasized that this situation negatively affects, especially disadvantaged students’ access to and effective use of AI technologies. On the other hand, some teachers think that AI can contribute to equality of opportunity by stating that free or low-cost AI tools facilitate access to information and offer personalized learning opportunities. However, alongside these positive opinions, there are also concerns about the uncontrolled use of technology, the risks of addiction, and the reliability of AI tools. It is seen that some teachers make definite judgments that AI can or cannot provide equality and justice in education without having sufficient knowledge. In general, teachers are aware of the potential benefits of AI in terms of equal opportunities; however, they do not ignore the risks such as the digital divide, impartiality issues, and infrastructure deficiencies.

P57: “There may be various inequalities because it is difficult for individuals without economic means to access it.”

P7: “While AI applications have the potential to help ensure equality of opportunity and fairness in education, it is difficult to say that it is currently fully realizing this goal. By providing personalized learning experiences, AI can ensure that students receive education based on their individual needs and create opportunities for disadvantaged groups by facilitating access to learning materials.”

The analyses conducted to the eighth question of the research are given in Table 10.

Table 10.*Possibility of AI Discrimination*

Theme	Category	Code	Participant
Based on usage discrimination	Digital competence gap	Students who use it well have an advantage	P39, P57, P61, P4, P20, P35
		Access facilities	P62, P8, P12, P15, P24, P37
		Those with access exclude others	P58
		Lack of infrastructure and hardware	P24
		Economic differences	P25
Algorithm-based discrimination	Content sensitivity	Personalized information presentation according to the question format	P61, P1, P18
		Achieving advantageous results with accurate data entry	P60, P36
	Data-driven discrimination	Discrimination due to incomplete/biased data	P2, P7, P30, P31, P33, P34
		Biased data from AI system developers	P11, P28
		Software replacement	P23
The neutrality of AI	Software limitations	Lack of ability to discriminate	P9, P28, P29
		Present only what is uploaded	P19, P28, P29
	Individuality	Software change	P40, P16
		Lack of individual decision-making authority	P47, P19
		No physical contact	P16
		Not knowing the students	P49, P17
	Lack of information		
	Ethical approach	Compliance with ethical principles	P26
Risk of human-induced segregation	Human orientation	Discrimination based on orientation	P53, P59, P3, P29
		Discrimination is inherent to human beings	P21
	Change of control	Shift of software control to AI	P52, P13
	Use abuse	Malicious users	P41
		Access to information without effort	P6
The emotional deprivation of AI	Emotion-based decision making	Inability to discriminate because they have no feelings	P48, P50, P54, P55, P23, P28
		Discriminate because they have no feelings	P42
General perception of discrimination	Unjustified	AI does not discriminate	P43, P44, P44, P45, P46, P22
	Unjustified	Discrimination by AI	P56, P10
Recommendation	Human control	There should be teacher control	P33, P34, P38
Uncertainty	Indecision	The possibility of discrimination in the future	P51, P14, P32
Technical error	Error-human distinction	Machines can make mistakes	P5
Violation of the principle of equality	The problem of student relativity	Ignoring individual differences	P27

When Table 10 is analyzed, it is seen that teachers' perspectives are grouped under various themes. Teachers' perceptions regarding the discrimination caused by AI vary, and the themes of usage-based and algorithm-based discrimination come to the fore. Teachers state that usage-based reasons, such as digital competence differences, inequalities in access opportunities, and economic and infrastructure differences, can lead to discrimination. In addition, there are also risks of discrimination due to algorithmic reasons such as lack of data,

bias, and content sensitivity. Under the theme of impartiality of AI, factors such as software limitations and compliance with ethical principles are evaluated; the opinion that the human factor is determinant in discrimination is expressed with categories such as human-induced discrimination risk and AI's emotion-based decision-making. While emphasizing the necessity of human control in AI systems, teachers emphasize the possibility of future discrimination in the theme of uncertainty and indecision. However, there are also teachers who unjustifiably think that AI does not discriminate or does discriminate. It has been determined that teachers' awareness of the potential of AI to discriminate, their understanding of the conditions of use, and the role of data sources; they also emphasized the importance of human control and an ethical approach.

P50: *"No, it does not. Because there is no emotion or feeling."*

P11: *"AI tools can discriminate between students with biased practices of their producers and biased, inaccurate data."*

The analyses conducted to the ninth question of the research are given in Table 11.

Table 11.*AI Contribution to Education and Stakeholders*

Theme	Category	Code	Teacher	
Potential to contribute to education	Integration into the education process	Integrate into education processes	P44, P48, P51, P51, P52, P53, P60, P11, P36	
		Saving time and space	P41, P1, P9, P28, P30	
		Supporting the teaching process	P61, P62, P23, P24, P28	
		Facilitate follow-up of the process by stakeholders	P41, P58, P30, P34	
		Enriching the process	P39, P7, P24, P28	
	Digital adaptation in education	Improving the efficiency of the process	Improving the efficiency of the process	P7, P30, P33
			The need for digital transformation	P40, P42, P45, P53, P5, P8, P11, P12, P13, P15, P18, P19, P21, P25, P28, P29
		Contribution to the student	Effective and efficient use of technology	P21, P29
	Providing an individualized learning experience		P54, P7, P24, P30, P34	
	Guiding students in accessing information		P59, P16, P21	
The role of AI	Supporting creativity	Supporting creativity	P3	
		Being a supportive tool	P13, P30	
		Lack of decision-making authority	P30	
Effects on the teacher	Positive	Reducing the teacher's workload	P41, P1, P7, P20, P22, P28, P31, P32, P33, P34, P38	
	Negative	Declining teacher function	P50, P61	
Conditional contribution	Usage	Controlled and correct use	P45, P51, P52, P57, P1, P6, P7, P20, P21, P30	
	Development	Contributing if development is achieved	P43, P35	
	Oversight	Carrying out oversight	P52	
Critical approach	Negative impact	Accustoming the student to the ready-made	P55, P1, P4, P17	
		Weakening of scientific process skills	P55, P17	
	Ethical risks	Reducing productivity	P4	
		Ethical principles must be followed	P2, P30	
Overall positive perception	Unjustified	Providing secure infrastructure	P13	
		Yes	P46, P47, P56, P10, P14, P27	
Preliminary preparation	Information	Information about AI	P3, P26	
		Introducing students to technology	P49, P31	
Social contribution	Community development support	Ensuring social development	P60	
No comments	No comments	No response	P37	

When Table 11 is examined, it is seen that teachers' perspectives are concentrated especially in the themes of "Potential to contribute to education", "Effects on the teachers", and "Conditional contribution". Teachers attach great importance to the potential of AI in terms of its integration into the educational process; they emphasize contributions such as enriching the process, increasing efficiency, supporting the teaching process, and saving time and space. While critical opinions reveal that the use of AI should be carefully evaluated in terms of its pedagogical effects, the unjustified positive responses of some participants suggest that there are also superficial or unclear perceptions on this issue.

P41: "Yes, I think so. Thanks to AI tools, it saves time, space, and labor. It makes it easier to follow up on work to be done."

P13: "Yes, because our age makes these technologies necessary and useful, but I think it is right to create a security infrastructure and keep it as a tool."

The analyses conducted to the tenth question of the research are given in Table 12.

Table 12.

AI and Accountability

Theme	Category	Code	Teacher	
Accountability	Practitioner/user responsibility	The teacher is responsible	P39, P43, P47, P53, P58, P1, P16, P23, P29, P33, P34, P38	
		The user is responsible	P44, P45, P50, P56, P62, P2, P6, P26, P28, P35	
		The student is responsible	P48, P58, P17, P23, P38	
		The parent is responsible	P47, P58, P37	
		The teacher is not responsible	P14	
	Software developer responsibility	Program/software developer person/company		P40, P42, P59, P61, P62, P5, P8, P18, P30, P31, P32
				P41, P42, P52, P54, P57, P59, P62, P9, P21, P23, P28
				P55, P1, P20, P27, P30, P34
	Decision makers	Authority/institution approving integration into education		P60, P3, P15, P31
				P7, P11, P12, P37
Oversight authority	Multiple shared responsibility	Sharing responsibility among all stakeholders	P7, P11, P12, P37	
		Contingent liability	The level and source of the error determines responsibility	P22, P24
Strengthening accountability	No accountability	No one is held accountable	P46, P49, P51, P25	
		Precautions	Providing training	P25, P29
			Oversight and system control	P13, P36
			Establishment of responsible government units	P19
			Responsibility agreement	P4
No comments	Lack of information	Lack of knowledge	P10	

When Table 12 is analyzed, it is determined that the most emphasized theme is "accountability". Teachers stated that teachers, students, parents, and users should be responsible for AI applications. In addition, it was stated that software developers and service provider companies should also be evaluated within the scope of accountability. Some participants mentioned the concepts of multiple shared responsibility and contingent

responsibility, stating that responsibility should not be limited to only one party. It was emphasized that decision-makers, and supervisory institutions, and individuals should also assume responsibility. Another prominent theme was "Strengthening Responsibility", which included suggestions such as training, contracts, and state control. Some teachers stated that no one can be held responsible, and one participant could not give an opinion due to a lack of information.

P62: In AI tools, everyone who first makes the software, then approves it, and gives training to use it is guilty.

P20: I think administrators should be held responsible because they are the ones who will integrate it into education.

The analyses conducted to the eleventh question of the study are given in Table 13.

Table 13.

Establishing Classroom Ethical Rules

Theme	Category	Code	Teacher		
Ethical principles required	Human control and oversight	There should be human/teacher control	P47, P49, P52, P1, P6, P9, P30, P33, P38		
		There should be human/teacher oversight	P49, P60, P13, P15, P16, P30, P34, P38		
		Training on use should be provided	P52, P17		
		Protection of human values	P59, P1		
		Should not replace the teacher	P54		
		Student interaction should be ensured	P23		
		Usage limits should be defined	P25		
	Social and environmental well-being	Compliance with cultural and moral values	Ethical use	P40, P52, P58, P12, P13, P24, P27	
			Social contribution and public benefit	P43, P60, P22, P31, P36	
			Sharing	P60, P61, P12, P21	
		Discrimination and justice	Use legal software	Continuity	P59
				Environmental sustainability	P5
				There must be equality	P28
			Must be fair use	Accessibility must be ensured	P38
	There must be impartiality			P57, P59, P6, P28, P30, P33, P38	
	Non-discrimination			P7, P28, P30, P34	
	Human rights must be respected			P44, P59, P34, P38	
	Technical robustness and safety	Content must be respectful	There must be respect for labor	P11, P34	
			Security	P40, P60	
			Reliability	P60	
		Provide accurate information	Robustness	P53	
			Protection of personal data	P57	
			Reliability	P42, P26, P28, P29, P33, P34	
Topicality			P7, P60, P6, P21		
Privacy and data governance	Provide accurate information	Robustness	P59, P6		
		Protection of personal data	P52		
		Reliability	P60		
Accountability	Responsible use	Responsibility	P41, P60, P2, P4, P11, P13, P24, P28, P29, P30, P32, P34		
		There must be a certain framework	P41, P60, P28, P34		
		Authenticity	P45, P62, P8, P29		
Transparency	Plagiarism must be prevented	Plagiarism must be prevented	P59		
		Transparency	P2		
		Aperture	P42, P60, P30, P33, P34, P38		
		Understandability	P19, P38		
		Integrity	P44		
Unjustified	Yes	Integrity	P59		
		Yes	P39, P46, P51, P56, P10, P14, P20, P37		
Ethical principles not required	Unjustified	No.	P55, P18		
		Teacher is adequate	P48		
		Moral codes are enough	P48		
		Knowledge of use is sufficient	P48		
		Regional variation of ethical principles	P50		
		Emotion deprivation	P3		
No comments	Lack of information	No information	P35		

When Table 13 is analyzed, it is seen that the majority of the teachers expressed their perspectives on the theme “The necessity of ethical principles”, followed by the theme “Ethical principles are not necessary”. The most emphasized ethical principles are “Human control and oversight”, “Social and environmental welfare”, “Discrimination and justice”, “Technical robustness and security”, and “Privacy and data governance”. On the other hand, some teachers stated that there is no need to establish ethical principles for reasons such as the competence of the teacher, the lack of emotional aspect of AI, and that it is sufficient to have knowledge of its use. There is also a teacher who stated that he/she did not have any information about the subject. It shows that the majority of primary school teachers think that it is necessary to determine ethical principles for the use of AI in the classroom.

P48: *“I don’t think ethical principles need to be established in general. Only how it should be used and some moral rules should be mentioned. Teachers are enough.”*

P28: *“Yes, I think so. There can be principles such as Privacy, Security, Responsibility, Continuity, Equality, and Justice.”*

Discussion and Conclusion

The results obtained from the first question of the study show that primary school teachers have multidimensional ethical risk perceptions regarding the use of AI in education. The prominent themes are “privacy and data governance”, “reduced responsibility for learning”, “diversity, discrimination and justice”, and “security”. This may be due to the impact on teachers of the uncertainty created by the lack of clarity in ethical, legal, and pedagogical regulations in the process of rapid integration of AI tools into the field of education. The literature shows that teachers have intense ethical concerns, especially about personal data violations (Floridi et al., 2018; Jobin et al., 2019), weakening of learning processes (Araujo Sandoval, 2024; Ivanov, 2023), discrimination risk (Binns, 2018), and cybersecurity threats (Brundage et al., 2018). In addition, teachers’ opinions under the themes of “loss of professional role”, “human control”, and “accountability” indicate that AI applications may overshadow the decision-making and guidance function of the teaching profession (Chisega-Negrilă, 2024; Williamson & Eynon, 2020). The emphasis on pedagogical and technical infrastructure deficiencies reveals insufficient systemic preparation in the implementation process (Zawacki-Richter et al., 2019). These results are in line with critical pedagogical and ethical dimensions such as inclusiveness, equity, teacher preparation, quality of data systems, and ethics and transparency in data use, as outlined in United Nations Educational, Scientific and Cultural Organization’s [UNESCO] report on challenges and opportunities in the field of AI-enhanced education for sustainable development (AIEd) (Pedró et al., 2019).

The results obtained from the second question of the study show that teachers believe in the necessity of human-centered and effective oversight mechanisms for the control and oversight of AI in education. In this context, it was stated that the responsibility of the teacher to manage the pedagogical process should continue, while AI should be positioned as a tool that supports this process. In the literature supporting the research results, it is stated that teachers can maintain their leadership roles by strengthening their professional development, promoting human-machine collaboration, and increasing their AI literacy (Li & Dan, 2024).

This shows that in the age of AI, the teacher should be a leader who not only uses technology but also directs and integrates it into education. Indeed, Albahijan et al. (2025) emphasize that the integration of AI in education poses various risks, and therefore, effective oversight mechanisms are needed. Leong et al. (2025) draw attention to the importance of governance frameworks in line with the principles of data privacy, fair access and responsible use. Ružičić et al. (2024) argue that educators, researchers, and policymakers should take decisive roles in decision-making processes based on ethical principles. In parallel with these studies, the results of the current study reveal that teachers think that both technical infrastructure and ethical oversight should be addressed simultaneously for the effective use of AI technologies in educational environments. However, although in some scenarios it was thought that AI could replace the teacher or school administrator, it was stated that current AI systems are not capable of assuming these roles. It is considered more realistic and functional to position AI as an assistant instead of replacing teachers or school principals (Çetin & Aktaş, 2021).

The results obtained from the third question of the research show that primary school teachers are aware of the technical problems that may occur in AI tools and that they adopt pedagogical, technical, pre-service, and in-service training support requirements for the solution of these problems. This situation shows that primary school teachers adopt the importance of continuous education and institutional support mechanisms in order to increase their competencies in this field as well as being prepared for technical problems for the effective and uninterrupted use of AI technologies in educational environments. In this context, Filiz et al. (2025) found that technical infrastructure problems are prioritized among the difficulties faced by teachers in AI integration and that teachers expect adequate support and training against these problems. Similarly, Dimitriadou and Lanitis (2023) emphasized the importance of teachers preparing back-up plans, having alternative teaching materials, and effective operation of technological support systems against technical problems that may occur during the use of AI and emerging technologies in smart classrooms. Furthermore, Arranz-Garcia et al. (2025) reported that teachers take conscious steps to improve their digital skills against technical problems and to increase their competencies in this field through continuous professional training. This points to the need to develop teachers' technopedagogical skills as well as their pedagogical competencies. In addition, it is important to strengthen technical support mechanisms for teachers, disseminate professional development programs, and establish crisis management plans in schools.

The results obtained from the fourth question of the research show that primary school teachers have knowledge and awareness about data security, systemic risks, and precautions that can be taken for AI applications, but very few teachers lack knowledge on these issues and cannot perceive security risks sufficiently. This shows that teachers are aware that AI applications may have various security vulnerabilities such as data privacy violations, cyber-attacks, unauthorized access, and system availability. They emphasize that these risks should be carefully evaluated, managed, and audited. The literature supports teachers' perspectives. Schaeffer et al. (2024) state that the vulnerabilities of AI tools can lead to negative consequences such as prejudice and discrimination. Kamenskih (2022) points out that the access of AI systems to sensitive student data increases the risks of data violation and unauthorized access. Similarly, Bu (2022) emphasizes that the integration of AI in education

brings serious security risks such as data violations and misuse of personal information, which threaten student and educator privacy. In addition, Karan and Angadi (2023) state that AI tools in the classroom can lead to threats such as privacy and autonomy risks, AI biases, accuracy issues, and deepfakes, which can harm the learning environment and teaching quality. Ma and Jiang (2023) state that excessive data collection jeopardizes students' personal safety by increasing the risks of data leakage, unauthorized data use, and hacking. Therefore, technical security measures, data protection policies and awareness programs for teachers and students should be implemented in schools to prevent these risks. Thus, the integrity of the learning environment can be ensured by protecting the privacy and security of both students and educators.

The results obtained from the fifth question of the research show that primary school teachers have serious concerns about the privacy and data security of AI applications; however, they think that these concerns can be reduced through technical measures, user training, and awareness-raising, and that it is important to fulfil ethical responsibilities. While this reflects teachers' awareness of the risks to data privacy and security, it also reveals the importance of the technical and awareness-raising approaches mentioned under the "Precautions" theme. It is noteworthy that some teachers lack knowledge of the subject. There are similar results in the literature. Jose (2024) emphasizes that although AI technologies can improve educational experiences, they pose significant risks in terms of student data privacy and security. Robust data protection frameworks and strategies are needed to effectively manage these threats. Huang (2023) states that the proliferation of AI in education reduces student privacy and complicates data security; therefore, educational institutions, governments, and AI developers should collaborate to create effective data protection mechanisms. In their study, Ismail and Alosi (2025) state that current regulations in AI-oriented education are insufficient, and growing surveillance concerns increase the need for comprehensive data governance and educator training on the privacy and security of student data. Schleiss et al. (2022) emphasize that although AI offers new analytical opportunities in education, the protection of student data needs to be supported by technical and organizational measures. In light of these results, it is of great importance to implement strong and holistic data protection policies in educational environments, to raise teachers' awareness on this issue, and to strengthen the technological security infrastructure in order to address teachers' concerns about data privacy and security.

The results obtained from the sixth question of the research show that primary school teachers think that it is important to actively inform and involve stakeholders in the decision-making processes of AI. They also believe that digital literacy training, transparency, and a trust environment should be created. This shows that teachers think that transparent and participatory management of AI applications is important for ensuring trust and effective use in education. Similarly in the literature, informing stakeholders, transparency, and explainability stand out as the basic principles in AI decision-making processes. Bhat (2024) emphasizes that increasing AI literacy among non-expert users contributes to a critical understanding of these technologies and strengthens ethical awareness. This makes it meaningful for teachers to address the problems they face in accessing information due to a lack of digital literacy, especially in rural areas. MoDastoni (2023) states that Explainable

Artificial Intelligence (XAI) applications and advanced visualization tools increase user trust and make AI decisions more transparent. In this context, teachers' efforts to convey how AI tools work in the classroom to both students and parents can form the basis for a more explainable and reliable use of AI in education. Similarly, Pentland (2021) states that informing users about decision processes can reduce overdependence on AI and prevent errors by increasing human oversight. Aldossari (2024) emphasizes that when AI decisions are understandable, users develop a sense of control, and this supports ethical AI practices. As a result, the fact that primary school teachers emphasize the need for transparency, information, and digital literacy regarding the decision-making processes of AI is extremely valuable in terms of both the ethical use of technology and the active participation of educational stakeholders in these processes.

The results obtained from the seventh and eighth questions of the study show that primary school teachers have serious concerns about the ethics of AI (AI) in education, especially about ethical problems such as discrimination, bias, inequality of opportunity, and justice. This shows that primary school teachers are sensitive to the ethical dimensions of AI in education in terms of equal opportunity, justice and discrimination, and that they consciously evaluate the ethical risks of AI in education. At the same time, it reveals that teachers embrace the need for human oversight and ethical guidance necessary for the effective, fair, and ethical use of AI applications. These results are in line with critical evaluations in the literature. For example, Williamson et al. (2023) point out that AI systems can reproduce cultural biases and reinforce socioeconomic inequalities and draw attention to the importance of interdisciplinary and ethical approaches in this context. Similarly, Bhavana et al. (2025) emphasize that biased data sets have the potential to shape education and argue for the necessity of ethical AI design and systematic evaluation processes. According to the research results, teachers drew attention to the risk that AI tools may not be unbiased in assessing student achievement and potential, and expressed concern that especially vulnerable groups may be excluded. This is in line with Ahmed et al.'s (2024) study, which emphasizes that teachers should receive ongoing training and support to use technology ethically and fairly. On the other hand, Li (2023) states that AI can further deepen existing inequalities if equal access to resources in education is not ensured. At this point, it is seen that teachers think that technological equipment and infrastructure inadequacies prevent equality of opportunity for students, especially in rural and low-income areas. Despite these concerns, some teachers also expressed that AI can increase equity and inclusion through its capacity to create personalized learning environments. These opinions are supported by Roshanaei et al. (2023) and Edam (2024). In particular, the ability to tailor educational content to individual needs can enable students to find opportunities for progress despite their different starting points. However, the fair delivery of these opportunities depends not only on technical competence but also on ethical design and transparent algorithmic processes. Edam (2024) has stated that AI has the potential to provide equal opportunities in education, but that these technologies raise concerns due to ethical issues and data bias. It has been emphasised that AI systems operating with incorrect or biased data can lead to discrimination and undermine fair education. Therefore, it has been stated that AI must be used responsibly, fairly, and inclusively

in education. As a result, teachers' perspectives show that AI in education has a bidirectional potential in providing equal opportunities.

The results obtained from the ninth question of the research show that the majority of teachers think that it is important and necessary to develop AI in a way that contributes to educational processes. Teachers state that AI offers contributions such as enriching the teaching process, increasing efficiency, supporting the process, and saving time and space. However, it is noteworthy that some teachers were critical about the pedagogical effects, while some participants expressed superficial or unclear perceptions with unjustified positive statements. This situation shows that both conscious evaluations and teacher training are needed for the effective use of AI applications in the classroom environment. These results coincide with Wangdi's (2024) finding that integrating AI into education promotes personalized learning, increases productivity, and supports collaboration among stakeholders. In particular, teachers' perception of AI as a "guiding tool to support teaching" reflects the potential for optimizing assessment processes and increasing school management efficiency through the strategic use of AI, as suggested by Patrizi et al. (2025). Moreover, teachers point out that for this contribution to be realized effectively, teachers and students need to be informed in advance, technological competencies need to be developed, and ethical controls need to be conducted. Indeed, Malik (2024) states that AI can support personalized learning and inclusive education, but emphasizes that ethical challenges such as data privacy and algorithmic biases need to be addressed for these benefits to be sustainable. Some of the teachers' reservations can also be considered in this context. For example, critical approaches or superficially positive attitudes about the pedagogical implications of the technology suggest that negative effects such as overconfidence in AI, low explainability, invasion of privacy, and loss of skills should not be ignored, as Ivanov (2023) suggests. Teachers' perspectives point to the necessity of integrating AI in education with a holistic approach and critical awareness. Unless not only technological competence but also ethical responsibility and pedagogical relevance are considered, the contribution of AI applications may be limited and potentially problematic.

The results obtained from the tenth question of the study show that the vast majority of teachers think that the ultimate responsibility should lie with the human being in case AI tools produce erroneous results in education. However, the participants are not satisfied with only individual responsibility, but emphasize that technical and structural actors such as software developers, service provider companies, decision makers, and supervisory institutions should also be accountable in these systems. This may have resulted from the teachers' understanding of the complex and multi-actor structure of AI systems and their realization that the errors that may occur in the education process depend not only on the user but also on the parties who develop and manage the technology. This perception of multi-layered responsibility is in line with Zainuddin's (2024) opinion that faulty results arising from AI are primarily the responsibility of the developer companies, but a collective control mechanism should be established in cooperation with educational institutions and policymakers. The fact that participants emphasized the concepts of "multiple shared responsibility" and "situational responsibility" reveals the need for a flexible and context-sensitive approach to this issue. In line with the hybrid understanding of responsibility

advocated by Ninaus and Sailer (2022), this situation brings up the necessity of evaluating both the predictions of AI and human judgment together. It is clear that placing the responsibility solely on the software or the user will not produce ethical and fair results in complex educational processes. Mishara (2024) similarly emphasizes the need for clear accountability structures between technological actors, educators, and policymakers, without which biases may increase and student privacy may be at risk. Moreover, the fact that some teachers did not provide an opinion due to “no one being held accountable” (f=6) or “lack of knowledge” points to a lack of awareness in this area. This result, as suggested by Mubofu and Kitali (2024), clearly shows the need for institutional arrangements, continuous monitoring systems, and strengthening the critical thinking skills of both staff and students in order to develop a culture of responsibility in the use of AI. As Salloum (2024) emphasizes, educators knowing the limitations of AI, policy makers providing ethical guidelines, and developers producing transparent algorithms will form the basis for a culture of accountability in these systems.

The results obtained from the eleventh question of the research show that the majority of teachers think that it is necessary to determine ethical principles for the use of AI in the classroom. This result indicates that in a period when AI applications in education have become widespread, teachers have realized not only technological competence but also the need for ethical governance. Among the ethical principles most emphasized by teachers, “human control and oversight”, “social and environmental welfare”, and “discrimination/justice” stood out. This shows that, as Şenocak et al. (2024) emphasize, multidimensional ethical structures such as transparency, diversity, accountability and invasion of privacy in AI applications have started to be accepted on a global scale. The importance given to ethical principles reveals not only the sensitivity of individual teachers but also the necessity to reflect on the societal impacts of AI. Meylani (2024) argues that teachers should be equipped with ethical guidelines against the potential risks of AI systems such as the potential for bias in classrooms and data privacy violations. The theme of “privacy and data governance” in the research results also supports that these concerns are shared at the teacher level. In particular, the necessity of using AI-developed systems in the classroom in accordance with ethical principles on sensitive issues such as data security and student privacy shows that teachers’ responsibility in the classroom is not only pedagogical but also extends to digital ethics. The fact that some teachers argue that there is no need for ethical rules or that only the technical competence of the teacher is sufficient reveals that there is diversity in the level of ethical sensitivity. This makes it clear that, as Paschal and Melly (2023) state, for the integration of AI in education, not only technical infrastructure but also continuous ethical training programs, regular monitoring of biases, and mechanisms to address unintended consequences need to be established. In addition, the fact that teachers consider “technical soundness and security” among the ethical principles shows that ethical AI use is also integrated with technological security. This shows that ethical rules in educational settings provide an important framework for teachers to use technology consciously, safely, and responsibly. As a result, it is concluded that primary school teachers largely support the establishment of ethical rules to guide AI, and that these rules should be based on core values such as human control, justice, data privacy and security.

Recommendations

In line with the first result of the study, it is recommended that teachers be provided with informative training about AI and ethical risks. In line with the second result, it is recommended to clarify the human role in AI oversight and to increase the competencies of teachers in this subject. In line with the third result, it is recommended to provide pre-service and in-service training support to teachers against technical problems. In line with the fourth and fifth results, it is recommended that studies should be conducted to raise teachers' awareness on data security and privacy issues, and privacy and security measures for AI applications should be strengthened in educational processes. In line with the sixth result, it is recommended to ensure active information and participation of stakeholders in AI decision-making processes. In line with the seventh and eighth implications, it is recommended to ensure the impartiality and fairness of AI algorithms and to support the technopedagogical skills of teachers to address concerns about ethical issues such as discrimination, bias, inequality of opportunity, and fairness. In line with the ninth results, it is recommended to design applications that take into account the needs and expectations of teachers, are compatible with pedagogical goals, and support learning-teaching processes in the process of developing AI technologies. In line with the tenth result, it is recommended that responsibility and accountability principles should be clearly defined and cooperation models should be established between software developers, service providers, and educational institutions. In line with the eleventh result, it is recommended to determine and implement ethical principles for the use of AI in the classroom with students. In future studies, it is recommended to provide a multidimensional perspective by including teachers from different branches, school administrators, parents, and students. In future studies, it is recommended to reach more generalizable results by using mixed research method approaches supported by quantitative data collection tools.

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Notice of Use of Artificial Intelligence

The author utilised artificial intelligence tools for the language editing (e.g., grammar, spelling and clarity improvements).



Dijital Sınıfların Etik Pusulası: Sınıf Öğretmenlerinin Eğitimde Yapay Zekâ Etiğine Yönelik Görüşleri

Özet

Çalışmanın amacı, sınıf öğretmenlerinin eğitimde yapay zekâ [YZ] etiğine ilişkin görüşlerini derinlemesine incelemektir. Araştırma, fenomenolojik desen kullanılarak yürütülmüştür. Çalışma grubunu, Türkiye’de bir ilde görev yapan 62 sınıf öğretmeni oluşturmaktadır. Veriler, katılımcıların yanıtlarından temalar ve kategorilerin doğrudan ortaya çıkmasına olanak tanıyan tümevarımsal içerik analizi yaklaşımıyla analiz edilmiştir. Araştırmadan elde edilen sonuçlar, öğretmenlerin sınıf ortamlarında YZ’nin kullanımının hem potansiyel yararlarını hem de karşılaşılabilecek güçlüklerini fark ettiklerini göstermektedir. Sınıf öğretmenleri etik riskler, YZ araçlarının etkili biçimde kontrol edilmesi ve denetlenmesi gerekliliği, teknik sorunlara karşı alınması gereken önlemler ile güvenlik açıklarının öğrenci verileri üzerindeki etkilerine ilişkin kaygılarını dile getirmiştir. Öğretmenler ayrıca, YZ destekli eğitimde gizlilik, adalet ve fırsat eşitliğinin sağlanmasının önemini vurgulamış; YZ’nin karar verme süreçleri hakkında tüm paydaşların bilgilendirilmesi gerektiğini belirtmiştir. Bununla birlikte, bulgular YZ’ye ilişkin açık etik kuralların oluşturulması ve YZ kaynaklı hatalar için sorumluluğun net biçimde tanımlanması gerekliliğine işaret etmektedir. Elde edilen bu sonuçlar, eğitim bağlamında sorumlu yapay zekâ uygulamalarına ilişkin kapsamlı bir anlayış sunmakta ve öğrenmeyi desteklerken etik ve güvenlik standartlarını gözeten YZ entegrasyonu hedefleyen politika yapımcılar, yöneticiler ve eğitimciler için yol gösterici nitelik taşımaktadır.

Anahtar Kelimeler: Yapay zekâ, etik, yapay zekâ etiği, sınıf öğretmenleri, eğitim.

Giriş

21. yüzyıl, yapay zekâ [YZ] teknolojilerinin toplumsal yaşamın her alanına sızmasıyla birlikte, eğitim sistemlerinde de dönüşümsel etkiler yarattığı bir dönemi temsil etmektedir. YZ tabanlı öğrenme analitiği sistemlerinden, uyarlanabilir öğrenme yazılımlarına ve otomatik değerlendirme araçlarına kadar pek çok uygulama, öğrenme süreçlerinin daha etkili, bireyselleştirilmiş ve veri odaklı bir biçimde yürütülmesini mümkün kılmaktadır. Bununla birlikte, YZ’nin eğitim ortamlarına entegrasyonu beraberinde etik tartışmaları da getirmektedir. Veri gizliliği, öğrenci mahremiyeti, algoritmik önyargı, şeffaflık ve hesap verebilirlik gibi sorunlar, YZ’nin eğitimdeki kullanımına dair etik bir sorgulamayı zorunlu kılmaktadır (Bensason vd., 2024; Floridi vd., 2018).

Eğitimde YZ’nin entegrasyonu hem büyük fırsatlar sunmakta hem de önemli etik zorlukları beraberinde getirmektedir. Öğretmenler, bu teknolojinin dönüştürücü gücünün farkındadır ve genel olarak bu teknolojiyi benimsemektedirler. Ancak, veri gizliliği, algoritma ön yargısı ve hesap verebilirlik gibi etik konuların ele alınması, YZ’nin eğitimde sorumlu ve faydalı bir şekilde kullanılabilmesi için hayati önem taşımaktadır (Solak vd., 2025). YZ etiği, sorumlu YZ gelişimine rehberlik eden temel ilkeleri sunar ve gizlilik ile yenilik arasındaki denge, ön yargı ile adalet arasındaki çatışma gibi ahlaki ikilemleri ele alır (Bayan, 2024). Eğitimde YZ’nin etik boyutuna ilişkin sorgulamalar teknolojilerin sadece pedagojik etkinliğiyle

değil, aynı zamanda adalet, kapsayıcılık ve insan hakları gibi temel ilkelerle ne derece uyumlu olduğu sorusunu da gündeme getirmektedir. Öğrencilerin algoritmik kararlar yoluyla etiketlenmesi, gözlemlenmesi ya da izlenmesi gibi uygulamalar, pedagojik yararın ötesinde, çocuk hakları ve insan onuruna saygı gibi evrensel etik normlarla da ilintilidir (Crawford, 2021; Williamson & Eynon, 2020). Bu nedenle, eğitim ortamlarında YZ uygulamalarının kullanımı, sadece teknik ve pedagojik değil, aynı zamanda ahlaki ve toplumsal sorumluluklar çerçevesinde ele alınmalıdır.

Literatürde, YZ'nin eğitimdeki kullanımına ilişkin çok sayıda çalışma bulunmakla birlikte, bu uygulamaların etik boyutları genellikle ikinci planda kalmakta; özellikle ilköğretim düzeyinde görev yapan sınıf öğretmenlerinin etik algıları yeterince incelenmemektedir (Gouseti vd., 2024; Seyrek vd., 2024). Oysa öğretmenler, teknolojilerin sınıf içindeki uygulamalarının etik yansımalarını en yakından gözlemleyebilecek ve yönlendirebilecek aktörlerdir. Bu çalışma, sınıf öğretmenlerinin YZ'nin eğitimdeki etik kullanımına ilişkin algılarını ve görüşlerini inceleyerek, bu alandaki kuramsal ve uygulamalı boşluklara katkı sunmayı amaçlamaktadır.

Bu araştırmanın amacı, sınıf öğretmenlerinin eğitimde YZ etiği konusuna ilişkin görüşlerini derinlemesine incelemektir. Çalışmada, öğretmenlerin YZ kullanımını etik ilkeler (insan hakları, veri gizliliği, güvenlik, adalet ve şeffaflık) çerçevesinde nasıl değerlendirdikleri araştırılarak, YZ'nin sınıf ortamında etik bir şekilde entegrasyonuna dair farkındalıkları ortaya konacaktır. Bu sayede, eğitimde YZ uygulamalarının etik temeller doğrultusunda şekillenmesine ve bu alandaki eğitim politikalarının geliştirilmesine katkı sunulması hedeflenmektedir. Araştırmanın amacı doğrultusunda aşağıdaki araştırma sorularına yanıt aranmıştır.

1. Sınıf öğretmenlerinin, YZ'nin eğitimde kullanımına yönelik etik riskler hakkındaki görüşleri nasıl şekillenmektedir?
2. Sınıf öğretmenlerinin, YZ'nin eğitimde kontrol ve denetimi konusunda görüşleri nasıl şekillenmektedir?
3. Sınıf öğretmenlerinin, sınıfta YZ araçlarında meydana gelebilecek teknik sorunlara ilişkin alacakları önlemlere yönelik görüşleri nasıl şekillenmektedir?
4. Sınıf öğretmenlerinin, YZ'nin sınıfta yaratabileceği güvenlik açıklarının etkilerine yönelik görüşleri nasıl şekillenmektedir?
5. Sınıf öğretmenlerinin, YZ'nin öğrenci verilerinin gizliliğini ve güvenliğini sağlayıp sağlamadığına yönelik görüşleri nasıl şekillenmektedir?
6. Sınıf öğretmenlerinin, YZ uygulamalarının karar alma süreçleri hakkında öğretmen, öğrenci ve velilerin bilgilendirilmesine yönelik görüşleri nasıl şekillenmektedir?
7. Sınıf öğretmenlerinin, YZ'nin eğitimde fırsat eşitliği ve adaleti sağlama konusundaki görüşleri nasıl şekillenmektedir?
8. Sınıf öğretmenlerinin, YZ'nin eğitimde ayrımcılık yapma ihtimali konusundaki görüşleri nasıl şekillenmektedir?

9. Sınıf öğretmenlerinin, YZ'nin eğitim süreçlerine ve paydaşlarına katkı sağlayacak biçimde geliştirilmesi konusundaki görüşleri nasıl şekillenmektedir?

10. Sınıf öğretmenlerinin, YZ hatalı sonuçlar verdiğinde sorumluluğun kimde olması gerektiği konusundaki görüşleri nasıl şekillenmektedir?

11. Sınıf öğretmenlerinin, sınıfta YZ kullanımına yönelik etik kuralların oluşturulması gerekliliği ve bu kuralların içeriği hakkındaki görüşleri nasıl şekillenmektedir?

Yöntem

Araştırmanın Deseni

Araştırmada sınıf öğretmenlerinin eğitimde YZ etiği konusuna ilişkin görüşlerini derinlemesine incelemek amacıyla nitel araştırma desenlerinden fenomenoloji kullanılmıştır. Fenomenoloji, bireylerin belirli bir olguyu nasıl deneyimlediklerini anlamayı amaçlayan bir yaklaşımdır. Fenomenolojik yaklaşım, bireylerin yaşantılarının özünü anlamaya çalışır ve bu süreçte araştırmacının kendi ön yargılarından uzak durması, olguya katılımcıların bakış açısından yaklaşması gerekmektedir (Van Manen, 2016). Bu araştırmada incelenen fenomen "YZ etiği" kavramıdır. Bu bağlamda, sınıf öğretmenlerinin eğitimde YZ etiğine ilişkin deneyimlerine doğrudan ulaşmak amacıyla fenomenoloji deseni kullanılmıştır.

Çalışma Grubu

Araştırmanın çalışma grubunu, Türkiye'de bir il merkezinde görev yapan toplam 62 sınıf öğretmeni oluşturmaktadır. Katılımcılar gönüllülük esasına göre belirlenmiş ve verilerin çeşitliliğini sağlamak adına farklı kıdem ve cinsiyet gruplarından öğretmenlerin katılımına özen gösterilmiştir. Katılımcıların mesleki kıdemlerindeki dağılım, farklı deneyim düzeylerinden öğretmenlerin görüşlerine yer verilmesini sağlamıştır.

Veri Toplama Aracı

Araştırmanın amacı doğrultusunda veriler elde edilmesinde yarı yapılandırılmış görüşme yarı yapılandırılmış formu kullanılmıştır. Görüşme soruları, literatürdeki YZ etiği ilkeleri (Bensason vd., 2024), (ör. şeffaflık, adalet, veri gizliliği, sorumluluk) temel alınarak hazırlanmış 11 sorudan oluşmaktadır.

Veri Toplama Süreci

Veriler, araştırmacılar tarafından geliştirilen açık uçlu sorulardan oluşan yarı yapılandırılmış görüşme formu aracılığıyla yüz yüze toplanmıştır. Görüşmeler okulun sessiz alanlarında bireysel olarak yapılmış, süreleri 11 ile 35 dakika arasında değişmiştir. Katılımcıların yanıtları kayıt altına alınmış ve görüşmeler sonrasında yazılı döküme aktarılmıştır. Tüm süreç boyunca gizlilik ilkesi korunmuş ve elde edilen veriler sadece bilimsel amaçlarla kullanılmıştır.

Verilerin Analizi

Görüşme verileri, tümevarımsal içerik analizi yöntemiyle analiz edilmiştir. Tümevarımsal içerik analizi, önceden belirlenmiş kuramlara bağlı kalmadan, veriden yola çıkarak anlam oluşturmaya yönelik bir yaklaşımdır. Bu süreç verilerin kodlanması, benzer kodların kategorilere ayrılması ve bu kategorilerden temaların geliştirilmesiyle gerçekleştirilir

(Saldaña, 2016). Veri analiz sürecinde, ilk olarak arařtırmacı tarafından derinlemesine incelenmiř ve veriler detaylı řekilde kodlanmıřtır. Kodlama ařamasında, arařtırmacı ile YZ alanında uzman bir akademisyen ile iř birlięi yapılarak kodların doęruluęu ve tutarlılıęı saęlanmıřtır. Ortaya çıkan kodlar üzerinden kategoriler ve temalar oluřturulmuř, bu temalar uzmanla birlikte gözden geçirilerek kapsam ve anlam açasından deęerlendirilmiřtir. Gerekli görölen durumlarda temalar yeniden yapılandırılmıř ve netleřtirilmiřtir.

Arařtırmanın Etik İzinleri:

Bu çalıřmada “Yükseköğretim Kurumları Bilimsel Arařtırma ve Yayın Etięi Yönergesi” kapsamında uyulması gerektięi belirtilen tüm kurallara uyulmuřtur. Yönergenin ikinci bölümü olan “Bilimsel Arařtırma ve Yayın Etięine Aykırı Eylemler” bařlıęı altında belirtilen eylemlerin hiçbiri gerçekteřtirilmemiřtir.

Etik Kurul İzin Bilgileri:

Etik deęerlendirmeyi yapan kurulun adı = Muř Alparslan Üniversitesi Bilimsel Arařtırma ve Yayın Etięi Kurulu

Etik Kurul Etik inceleme karar tarihi = 10 řubat 2025

Etik deęerlendirme belgesi konu numarası = 66

Bulgular

Sınıf öęretmenlerinin, YZ'nin eęitimde kullanımına yönelik etik riskler hakkındaki görüşleri incelendięinde, öęretmenlerin özellikle kiřisel verilerin gizlilięi, ayrımcılık yapmama ve bilgi güvenilirlięi ve güvenlik konusunda güçlü etik kaygular tařıdığı belirlenmiřtir. Ayrıca, YZ araçlarının öęrenme süreçleri ve öęrencilerin biliřsel geliřimleri üzerindeki olumsuz etkileri konusunda da endiřeler dile getirilmiřtir. Öęretmenler, YZ'nin eęitimde karar alma süreçlerinde mesleki rollerinin azalabileceęi, sorumlulukların belirsizleřebileceęi ve kontrol mekanizmalarının zayıflayabileceęi yönünde algılara sahiptir. Bunun yanı sıra, pedagojik ve teknik altyapı eksikliklerine iřaret eden ifadeler, YZ araçlarına yönelik hazırbulunluřluk düzeyinin ve okullardaki uygulama kořullarının henüz yeterli olmadıęını göstermektedir. Öęretmenlerin YZ teknolojilerinin eęitim ortamında oluřturabileceęi etik risklere karřı çok boyutlu görüşlere sahip olduęunu görölmektedir. Bu görüşler pedagojik süreçler, etik deęerler, veri güvenlięi ve toplumsal sorumluluk gibi çeřitli boyutlarda ifade edilmiřtir.

Sınıf öęretmenlerinin YZ'nin eęitimde kontrol ve denetimi konusunda görüşleri incelendięinde, öęretmenlerin özellikle sınıf içi süreçlerde YZ üzerindeki denetim ve kontrol sorumluluęunu ellerinde tutmayı öncelikli gördükleri belirlenmiřtir. Ayrıca öęrencilerin öęrenme süreçlerinde ortaya çıkabilecek olumsuzlukları engelleme ve kullanılan içeriklerin güvenilirlięini saęlama konusunda duyarlılık gösterdikleri tespit edilmiřtir. Öęretmenlerin YZ uygulamalarının eęitim ortamına entegrasyonunda YZ'nin rolü, kontrol, sorumluluk, öęretmen–YZ etkileřimi, öęrenci geliřimi ve öęretmen yeterlilięi gibi çok boyutlu alanlarda görüşlerinin olduęu belirlenmiřtir. Bu görüşler yalnızca teknolojinin iřlevsel boyutuyla sınırlı kalmayıp, aynı zamanda eęitim süreçlerinin yönetimi ile denetim eksiklięinde meydana gelebilecek riskler ve toplumsal deęerlerle de iliřkilendirilmiřtir.

Sınıf öğretmenlerinin, sınıfta YZ araçlarında meydana gelebilecek teknik sorunlara ilişkin alacakları önlemlere yönelik görüşleri incelendiğinde, öğretmenlerin görüşlerinin “Bilinçli kullanım”, “Güvenlik önlemleri”, “Kurumsal altyapı ve uzman desteği”, “Öğretmen eğitimi” ve “Acil müdahale” konularında yoğunlaştığı belirlenmiştir. Öğretmenler, YZ'nin sınıf içinde bilinçli ve güvenli kullanımı için hem bireysel hem kurumsal düzeyde hazırlık yapılması gerektiğini belirtmiş; ön bilgilendirme, kaynak doğrulama, pedagojik uyum ve YZ okuryazarlığının artırılmasına yönelik eğitim ihtiyacına vurgu yapmıştır. Kurumsal altyapı ve uzman desteği gereksinimi ise teknik donanım, siber güvenlik ve uzmanlık alanlarında planlamaların önemini göstermektedir. Güvenlik önlemleri kapsamında dijital güvenlik protokolleri, sistem denetimi, veri yedekleme ve gerektiğinde sistemin kapatılması gibi uygulamalara dikkat çekilmiştir. Ayrıca, bazı öğretmenlerin YZ etiği konusunda bilgi ve deneyim eksikliği yaşadığı tespit edilmiştir. Öğretmenlerin karşılaşılabilecek teknik sorunlar konusunda öğretmen eğitimi, kullanıcı bilinci ve uygun hazırlık ve gibi dikkat edilmesi gereken noktaların yanı sıra, kurumsal destek ve uzman yardımına duyulan ihtiyacı vurguladığı; ayrıca acil müdahale ve dijital güvenlik gibi önlemlere önem verdikleri görülmektedir.

Sınıf öğretmenlerinin YZ'nin sınıfta yaratabileceği güvenlik açıklarının etkilerine yönelik görüşleri incelendiğinde, öğretmen görüşlerinin “Önlemler”, “Veri güvenliği ihlalleri” ve “Psikososyal etkiler” gibi konulara yoğunlaştığı belirlenmiştir. Ayrıca “Sistemsal güvenlik riskleri” ve “Risk algısı yokluğu” gibi temalar da dikkat çekmektedir. Öğretmenler, kişisel bilgilerin gizliliği, eğitim sürecinin aksaması, kötüye kullanım, teknik önlemler ile eğitim ve bilinçlendirme gibi alanlara önem vermektedir. Bazı katılımcıların konuya ilişkin yanıt vermediği de gözlemlenmiştir. Bulgular genel olarak, sınıf öğretmenlerinin YZ araçlarında karşılaşılabilecek veri güvenliği, sistemsal ve psikososyal risklere dair görüşlerini, bu risklere karşı alınması gereken teknik ve pedagojik önlemleri ve risk algısındaki farklılıkları ortaya koymaktadır. Öğretmenlerin, kişisel bilgilerin korunması, teknik güvenlik önlemleri, bilinçlendirme ve denetim mekanizmalarına yönelik güçlü bir duyarlılık geliştirdikleri; aynı zamanda bazı öğretmenlerin güvenlik açıklarına dair risk algısı taşımadığı belirlenmiştir.

Sınıf öğretmenlerinin YZ'nin öğrenci verilerinin gizliliğini ve güvenliğini sağlayıp sağlamadığı konusunda görüşleri incelendiğinde, öğretmen görüşlerinin büyük çoğunluğunun “Olumsuz algı” teması altında toplandığı belirlenmiştir. Bu tema, özellikle gizlilik ve güvenlik ihlalleri gibi kritik konulara odaklanmaktadır. Az sayıda öğretmen ise “Olumlu algı” kapsamında, güvenliğin sağlandığına ve bilgi kirliliğinin önlenmesine dair görüş belirtmiştir. “Önlemler” teması, teknik tedbirler, kullanıcı eğitimi ve denetim eksikliklerinin giderilmesine yönelik önerileri içermektedir. Bazı öğretmenlerin ise konu hakkında bilgi eksikliği nedeniyle görüş belirtmediği tespit edilmiştir. Öğretmenlerin YZ araçlarıyla ilgili gizlilik ve veri güvenliği konularında önemli kaygılar taşıdıklarını; bununla birlikte teknik ve eğitsel önlemlerle bu kaygıların giderilmesine yönelik görüşlerinin olduğu belirlenmiştir.

Sınıf öğretmenlerinin YZ uygulamalarının karar alma süreçleri hakkında öğretmen, öğrenci ve velilerin bilgilendirilmesine yönelik görüşleri incelendiğinde öğretmenlerin en çok yoğunlaştığı noktanın “Paydaşların bilgilendirilmesi gerekliliği” olduğu belirlenmiştir. Bu kapsamda, paydaş katılımı ve bilgilendirme, YZ kullanım bilgisi ve yönetimi gibi alt başlıklar öne çıkmaktadır. Özellikle bilgi eksikliği nedeniyle bilinçlendirme gerekliliği, veli kontrolü ve

öğrenci katılımının artırılması gibi unsurlar öğretmenlerin üzerinde durduğu başlıca konular arasında yer almaktadır. Ayrıca dijital becerilerin geliştirilmesi ve etkileşimli dijital okuryazarlık eğitimlerinin verilmesi gerektiği de vurgulanmaktadır. Bir öğretmen ise bilgilendirme zorluğu nedeniyle paydaş bilgilendirilmesinin yapılamayacağını belirtmiştir. Sınıf öğretmenlerinin YZ'nin karar alma süreçlerinde paydaşların aktif katılımı ve bilgilendirilmesinin gerekliliğine, kontrollü kullanım, dijital okuryazarlık ve eğitim faaliyetlerine, şeffaflık ve güven ortamının oluşturulmasına önem verdikleri belirlenmiştir.

Sınıf öğretmenlerinin, YZ'nin eğitimde fırsat eşitliği ve adaleti sağlama konusundaki görüşleri incelendiğinde, özellikle “adaletsizlik”, “eşitlik ve adaleti sağlama” ve “koşula bağlı eşitlik” temalarının öne çıktığı tespit edilmiştir. Öğretmenler, teknolojik altyapı yetersizlikleri, internet erişim sorunları ve maddi imkânsızlıklar nedeniyle öğrenciler arasında önemli eşitsizlikler yaşandığını belirtmektedir. Bu durumun, özellikle dezavantajlı öğrencilerin YZ teknolojilerine erişimini ve bu teknolojileri etkin kullanabilmesini olumsuz etkilediği vurgulanmaktadır. Öte yandan, bazı öğretmenler, ücretsiz veya düşük maliyetli YZ araçlarının bilgiye erişimi kolaylaştırdığını ve kişiselleştirilmiş öğrenme imkânları sunduğunu ifade ederek YZ'nin fırsat eşitliğine katkı sağlayabileceğini düşünmektedir. Ancak bu olumlu görüşlerin yanında, teknolojinin kontrolsüz kullanımına, bağımlılık risklerine ve YZ araçlarının güvenilirliğine yönelik kaygılar da dile getirilmektedir. Bazı öğretmenlerin ise yeterli bilgiye sahip olmadan YZ'nin eğitimde eşitlik ve adaleti sağlayabileceği ya da sağlayamayacağı yönünde kesin yargılarda bulunduğu görülmektedir. Genel olarak bakıldığında, öğretmenler YZ'nin fırsat eşitliği açısından potansiyel faydalarının farkındadır; ancak dijital uçurum, tarafsızlık sorunları ve altyapı eksiklikleri gibi riskleri de göz ardı etmemektedir.

Sınıf öğretmenlerinin, YZ'nin eğitimde ayrımcılık yapma ihtimaline yönelik görüşleri incelendiğinde, öğretmenlerin YZ'nin ayrımcılık yapmasına ilişkin algılarının çeşitlilik gösterdiği, “kullanım temelli” ve “algoritma kaynaklı” ayrımcılık temalarının öne çıktığı belirlenmiştir. Öğretmenler, dijital yeterlilik farkları, erişim olanaklarındaki eşitsizlikler, ekonomik ve altyapı farklılıkları gibi kullanım kaynaklı nedenlerin ayrımcılığa yol açabileceğini belirtmektedir. Ayrıca, veri eksikliği, yanlılık ve içerik duyarlılığı gibi algoritmik nedenlerle de ayrımcılık risklerinin mevcut olduğu ifade edilmektedir. YZ'nin tarafsızlığı teması altında, yazılımsal sınırlamalar ve etik ilkelere uyum gibi faktörler değerlendirilmekte; insan kaynaklı ayırım riski ve YZ'nin duyguya dayalı karar verme gibi kategorilerle insan faktörünün ayrımcılıkta belirleyici olduğu görüşü dile getirilmektedir. Öğretmenler, YZ sistemlerinde insan denetiminin gerekliliğine vurgu yaparken, belirsizlik ve kararsızlık temasında gelecekte ayrımcılık yapma ihtimali üzerinde durmaktadır. Bununla birlikte, YZ'nin ayrımcılık yapmadığını veya yaptığını gerekçesiz şekilde düşünen öğretmenlere de rastlanmaktadır. Öğretmenlerin YZ'nin ayrımcılık yapma potansiyeline yönelik farkındalıklarını, kullanım koşulları ve veri kaynaklarının rolünü kavradıklarını; ayrıca insan denetimi ve etik yaklaşımın önemine dikkat çektikleri belirlenmiştir.

Sınıf öğretmenlerinin, YZ'nin eğitim süreçlerine ve paydaşlarına katkı sağlayacak biçimde geliştirilmesi konusundaki görüşleri incelendiğinde, öğretmen görüşlerinin özellikle “YZ'nin eğitim sürecine entegrasyonu”, “Öğretmene etkileri” ve “Koşula bağlı katkı sağlama”

temalarında yoğunlaştığı belirlenmiştir Öğretmenler, YZ'nin eğitim sürecine entegrasyonu açısından potansiyeline büyük önem vermekte; süreci zenginleştirme, verimliliği artırma, öğretim sürecine destek olma ve zaman-mekan tasarrufu sağlama gibi katkıları vurgulamaktadırlar. Eleştirel görüşler, YZ kullanımının pedagojik etkileri açısından dikkatle değerlendirilmesi gerektiğini ortaya koyarken; bazı katılımcıların gerekçesiz olumlu yanıtları, bu konuda yüzeysel ya da henüz netleşmemiş algıların da bulunduğunu düşündürmektedir.

Sınıf öğretmenlerinin, YZ hatalı sonuçlar verdiğinde sorumluluğun kimde olması gerektiği konusundaki görüşleri incelendiğinde, en fazla vurgu yapılan temanın “Hesap verilebilirlik” olduğu belirlenmiştir. Öğretmenler, öğretmen, öğrenci, veli ve kullanıcıların YZ uygulamalarında sorumlu olması gerektiğini belirtmiştir. Bunun yanında, yazılım geliştiriciler ve hizmet sağlayıcı şirketlerin de hesap verilebilirlik kapsamında değerlendirilmesi gerektiği ifade edilmiştir. Bazı katılımcılar, sorumluluğun sadece bir tarafla sınırlı kalmaması gerektiğini belirterek çoklu paylaşılan sorumluluk ve duruma bağlı sorumluluk kavramlarını dile getirmiştir. Karar vericiler ile denetleyici kurum ve kişilerin de sorumluluk üstlenmesi gerektiği vurgulanmıştır. Öne çıkan bir diğer tema “Sorumluluğun güçlendirilmesi” olup bu bağlamda eğitim verilmesi, sözleşme yapılması ve devlet kontrolü gibi önerilere yer verilmiştir. Bazı öğretmenler ise kimsenin sorumlu tutulamayacağını ifade etmiş, bir katılımcı ise bilgi eksikliği nedeniyle görüş bildirememiştir.

Sınıf öğretmenlerinin, sınıfta YZ kullanımına yönelik etik kuralların oluşturulması gerekliliği ve bu kuralların içeriği hakkındaki görüşleri incelendiğinde, öğretmenlerin büyük çoğunluğunun “Etik ilkelerin gerekliliği” teması altında görüş bildirdiği ve bu temayı “Etik ilkeler gerekli değil” temasının takip ettiği belirlenmiştir. Öğretmenlerin etik ilke olarak en çok vurguladığı konular arasında sırasıyla “İnsan kontrolü ve denetimi”, “Toplumsal ve çevresel refah”, “Ayrımcılık yapmama ve adalet”, “Teknik sağlamlık ve güvenlik” ile “Gizlilik ve veri yönetimi” yer almaktadır. Buna karşın bazı öğretmenler, öğretmenin yeterliliği, YZ'nin duygusal yön eksikliği ve kullanım bilgisine sahip olmanın yeterli olduğu gibi gerekçelerle etik ilkelerin oluşturulmasına gerek olmadığını belirtmiştir. Ayrıca konu hakkında bilgi sahibi olmadığını ifade eden bir öğretmen de bulunmaktadır. Sınıf öğretmenlerinin büyük çoğunluğunun, sınıf içinde YZ kullanımına yönelik etik ilkelerin belirlenmesinin gerekli olduğunu düşündüğünü göstermektedir.

Tartışma ve Sonuç

Araştırmanın ilk sorusundan elde edilen sonuçlar, sınıf öğretmenlerinin YZ'nin eğitimde kullanımına ilişkin çok boyutlu etik risk algılarına sahip olduğunu göstermektedir. Bu durum, YZ araçlarının eğitim alanına hızla entegre edilmesi sürecinde etik, hukuki ve pedagojik düzenlemelerin henüz netleşmemiş olmasının yarattığı belirsizlik ortamının öğretmenler üzerindeki etkisinden kaynaklanmış olabilir. Literatürde öğretmenlerin özellikle kişisel veri ihlalleri (Floridi vd., 2018; Jobin vd., 2019), öğrenme süreçlerinin zayıflaması (Araujo Sandoval, 2024; Ivanov, 2023), ayrımcılık riski (Binns, 2018) ve siber güvenlik tehditleri (Brundage vd., 2018) gibi konularda yoğun etik kaygılar taşıdığını göstermektedir. Ayrıca öğretmenlerin “mesleki rol kaybı”, “insan kontrolü” ve “hesap verilebilirlik” temaları altındaki görüşleri, YZ uygulamalarının öğretmenlik mesleğinin karar alma ve rehberlik işlevini gölgeleyebileceğine işaret etmektedir (Chisega-Negrilă, 2024; Williamson & Eynon,

2020). Pedagojik ve teknik altyapı eksikliklerine yapılan vurgu ise, uygulama sürecinde sistemsel hazırlığın yetersiz olduğunu ortaya koymaktadır (Zawacki-Richter vd., 2019).

Araştırmanın ikinci sorusundan elde edilen sonuçlar, öğretmenlerin YZ'nin eğitimde kontrol ve denetimi konusunda insan merkezli ve etkili denetim mekanizmalarının gerekliliğine inandıklarını göstermektedir. Bu bağlamda, öğretmenin pedagojik süreci yönetme sorumluluğunun devam etmesi gerektiği, YZ'nin ise bu süreci destekleyen bir araç olarak konumlandırılması gerektiği ifade edilmiştir. Bu durum, öğretmenlerin eğitim sürecinin karmaşıklığı ve öğrencilerin bireysel ihtiyaçlarının ancak insan kontrolü ve denetimiyle karşılanabileceğine dair inançlarının bir sonucu olarak değerlendirilebilir. Literatürde, öğretmenlerin, mesleki gelişimlerini güçlendirerek, insan-makine iş birliğini teşvik ederek ve YZ okuryazarlığını artırarak liderlik rollerini sürdürebilecekleri belirtilmektedir (Li & Dan, 2024). Bu da YZ çağında öğretmenin sadece teknoloji kullanan değil, onu yönlendiren ve eğitime entegre eden bir lider konumunda olması gerektiğini göstermektedir. Nitekim Albahijan vd. (2025), YZ'nin eğitimde entegrasyonunun çeşitli riskler barındırdığını ve bu nedenle etkili denetim mekanizmalarına ihtiyaç duyulduğunu vurgulamaktadır.

Araştırmanın üçüncü sorusundan elde edilen sonuçlar, sınıf öğretmenlerinin YZ araçlarında oluşabilecek teknik sorunlara karşı bilinçli olduklarını ve bu sorunların çözümüne yönelik pedagojik, teknik ve hizmet öncesi ile hizmet içi eğitim desteği gereksinimlerini benimsediklerini göstermektedir. Bu durum, sınıf öğretmenlerinin YZ teknolojilerinin eğitim ortamlarında etkin ve kesintisiz kullanılabilmesi için teknik sorunlara karşı hazırlıklı olmalarının yanı sıra, bu alandaki yeterliklerini artırmak amacıyla sürekli eğitim ve kurumsal destek mekanizmalarının önemini benimsediklerini göstermektedir. Bu bağlamda, Filiz vd., (2025), öğretmenlerin YZ entegrasyonunda karşılaştıkları zorluklar arasında teknik altyapı sorunlarının öncelikli yer aldığını ve öğretmenlerin bu sorunlara karşı yeterli destek ve eğitim beklentisi içinde olduklarını ortaya koymuştur. Benzer şekilde, Dimitriadou ve Lanitis (2023), akıllı sınıflarda YZ ve gelişen teknolojilerin kullanımı sırasında oluşabilecek teknik problemlere karşı öğretmenlerin yedek planlar hazırlaması, alternatif öğretim materyalleri buldurması ve teknolojik destek sistemlerinin etkin çalışmasının önemini vurgulamıştır. Ayrıca, Arranz-Garcia vd. (2025) tarafından yapılan çalışmada, öğretmenlerin teknik sorunlara karşı dijital becerilerini geliştirmek ve sürekli mesleki eğitimle bu alandaki yeterliliklerini artırmak için bilinçli adımlar attıkları belirtilmiştir. Bu durum, öğretmenlerin pedagojik yetkinliklerinin yanı sıra teknopedagojik becerilerinin de geliştirilmesi gerektiğine işaret etmektedir. Bununla birlikte öğretmenlere yönelik teknik destek mekanizmalarının güçlendirilmesi, mesleki gelişim programlarının yaygınlaştırılması ve okullarda kriz yönetimi planlarının oluşturulması önem arz etmektedir.

Araştırmanın dördüncü sorusundan elde edilen sonuçlar, sınıf öğretmenlerinin YZ uygulamalarının veri güvenliği, sistemsel riskleri ve buna yönelik alınabilecek önlemlere ilişkin bilgi ve farkındalığa sahip olduklarını ancak çok az sayıda öğretmenin bu konularda bilgi eksikliği yaşadığı ve güvenlik risklerini yeterince algılayamadığını göstermektedir. Bu durum öğretmenlerin YZ uygulamalarının veri gizliliği ihlalleri, siber saldırılar, yetkisiz erişim ve sistem kullanılabilirliği gibi çeşitli güvenlik açıklarının olabileceğinin bilincinde olduğunu göstermektedir. Bu risklerin dikkatli bir şekilde değerlendirilip yönetilmesi ve denetlenmesi

gerektiği üzerinde durmaktadırlar. Schaeffer vd. (2024), YZ araçlarının güvenlik açıklarının önyargı ve ayrımcılık gibi olumsuz sonuçlara yol açabileceğini belirtmektedir. Kamenskih (2022) ise, YZ sistemlerinin hassas öğrenci verilerine erişiminin, veri ihlali ve yetkisiz erişim risklerini artırdığına dikkat çekmektedir.

Araştırmanın beşinci sorusundan elde edilen sonuçlar, sınıf öğretmenlerinin YZ uygulamalarının gizlilik ve veri güvenliği konusunda ciddi kaygılar taşıdığını; ancak teknik önlemler, kullanıcı eğitimi ve bilinçlendirme yoluyla bu kaygıların azaltılabileceği ve etik sorumlulukların yerine getirilmesinin önemli olduğunu düşündüklerini göstermektedir. Bu durum, öğretmenlerin veri gizliliği ve güvenliği konusundaki risklere yönelik farkındalığını yansıtmakla birlikte, “Önlemler” teması altında dile getirilen teknik ve bilinçlendirme yaklaşımlarının önemini de ortaya koymaktadır. Bazı öğretmenlerin ise konu hakkında bilgi eksikliği yaşadığı dikkat çekmektedir. Literatürde de benzer sonuçlar yer almaktadır. Jose (2024), YZ teknolojilerinin eğitim deneyimlerini iyileştirebilse de öğrenci veri gizliliği ve güvenliği açısından önemli riskler oluşturduğunu vurgulamaktadır. Huang (2023) ise YZ'nin eğitimde yaygınlaşmasının, öğrenci mahremiyetini azalttığını ve veri güvenliğini karmaşık hale getirdiğini belirtmekte, bu nedenle eğitim kurumları, hükümetler ve YZ geliştiricilerinin iş birliği yaparak etkili veri koruma mekanizmaları oluşturması gerektiğini ifade etmektedir. Ismail ve Alosi (2025) çalışmalarında, YZ odaklı eğitimde mevcut düzenlemelerin yetersiz kaldığını ve artan gözetim endişelerinin öğrenci verilerinin gizliliği ve güvenliği konusunda kapsamlı veri yönetimi ve eğitmen eğitime olan ihtiyacı artırdığını belirtmektedir. Schleiss vd. (2022) ise, YZ'nin eğitimde yeni analitik fırsatlar sunsa da öğrenci verilerinin korunmasının teknik ve organizasyonel önlemlerle desteklenmesi gerektiğini vurgulamaktadır. Bu sonuçlar ışığında, öğretmenlerin veri gizliliği ve güvenliği konusundaki endişelerini gidermek için eğitim ortamlarında güçlü ve bütüncül veri koruma politikalarının uygulanması, öğretmenlerin bu konuda bilinçlendirilmesi ve teknolojik güvenlik altyapısının güçlendirilmesi büyük önem taşımaktadır.

Araştırmanın altıncı sorusundan elde edilen sonuçlar, sınıf öğretmenlerinin YZ'nin karar alma süreçlerinde paydaşların aktif olarak bilgilendirilmesi ve katılımının sağlanmasının önemli olduğunu düşündüklerini göstermektedir. Ayrıca, dijital okuryazarlık eğitimi ve şeffaflık ile güven ortamının oluşturulmasının gerekliliğine inanmaktadırlar. Bu durum, öğretmenlerin YZ uygulamalarının şeffaf ve katılımcı bir şekilde yönetilmesinin, eğitimde güvenin ve etkin kullanımın sağlanması için önemli olduğunu düşündüklerini göstermektedir. Literatürde de benzer şekilde, YZ karar alma süreçlerinde paydaşların bilgilendirilmesi, şeffaflık ve açıklanabilirlik temel ilkeler olarak öne çıkmaktadır. Bhat (2024), uzman olmayan kullanıcılar arasında YZ okuryazarlığının artırılmasının, bu teknolojilerin eleştirel bir şekilde anlaşılmasına katkı sağladığını ve etik farkındalığı güçlendirdiğini vurgulamaktadır. Bu da öğretmenlerin özellikle kırsal kesimlerde dijital okuryazarlık eksikliği nedeniyle bilgiye erişimde yaşadıkları sorunlara değinmesini anlamlı kılmaktadır.

Araştırmanın yedinci ve sekizinci sorusundan elde edilen sonuçlar, sınıf öğretmenlerinin eğitimde YZ etiğine ilişkin özellikle ayrımcılık, yanlılık, fırsat eşitsizliği ve adalet gibi etik sorunlara yönelik ciddi endişeler taşıdıklarını göstermektedir. Bu durum, sınıf öğretmenlerinin YZ'nin eğitimde fırsat eşitliği, adalet ve ayrımcılık konularındaki etik

boyutlara duyarlı olduklarını, eğitimde YZ'nin etik risklerini bilinçli bir şekilde değerlendirdiklerini göstermektedir. Aynı zamanda, öğretmenlerin YZ uygulamalarının etkin, adil ve etik bir şekilde kullanılması için gerekli insan denetimi ve etik rehberlik ihtiyacını benimsediklerini ortaya koymaktadır. Bu sonuçlar, alan yazında yer alan eleştirel değerlendirmelerle örtüşmektedir. Örneğin, Williamson vd. (2023), YZ sistemlerinin kültürel önyargıları yeniden üretebileceğini ve sosyoekonomik eşitsizlikleri pekiştirebileceğini belirterek, bu bağlamda disiplinler arası ve etik odaklı yaklaşımların önemine dikkat çekmektedir. Araştırma sonuçlarına göre öğretmenler, YZ araçlarının öğrenci başarısını ve potansiyelini değerlendirirken tarafsız olamama riskine dikkat çekmiş, özellikle kırılgan grupların dışlanabileceği endişesini dile getirmiştir. Bu durum Ahmed vd. (2024) tarafından yapılan çalışmayla da örtüşmektedir. Söz konusu çalışma, öğretmenlerin teknolojiyi etik ve adil biçimde kullanabilmeleri için sürekli eğitim ve destek alması gerektiğini vurgulamaktadır.

Araştırmanın dokuzuncu sorusundan elde edilen sonuçlar, öğretmenlerin büyük çoğunluğunun YZ'nin eğitim süreçlerine katkı sağlayacak şekilde geliştirilmesini önemli ve gerekli olduğunu düşündüklerini göstermektedir. Öğretmenler, YZ'nin öğretim sürecini zenginleştirme, verimliliği artırma, sürece destek olma ve zaman-mekân açısından tasarruf sağlama gibi katkılar sunduğunu belirtmektedir. Bununla birlikte, bazı öğretmenlerin pedagojik etkiler konusunda eleştirel yaklaşımlar sergilediği, bazı katılımcıların ise gerekçesiz olumlu ifadelerle yüzeysel ya da netleşmemiş algılar ortaya koyduğu da dikkat çekmektedir. Bu durum, YZ uygulamalarının sınıf ortamında etkili kullanılabilmesi için hem bilinçli değerlendirmelere hem de öğretmen eğitimine ihtiyaç olduğunu göstermektedir. Bu sonuçlar Wangdi'nin (2024) YZ'nin eğitime entegre edilmesinin kişiselleştirilmiş öğrenmeyi teşvik ettiği, üretkenliği artırdığı ve paydaşlar arası iş birliğini desteklediği yönündeki tespitiyle örtüşmektedir. Özellikle öğretmenlerin YZ'yi "öğretimi destekleyen rehber bir araç" olarak görmeleri, YZ'nin stratejik kullanımıyla değerlendirme süreçlerinin optimize edilmesi ve okul yönetimi verimliliğinin artırılması potansiyelini yansıtmaktadır (Patrizi vd., 2025). Ayrıca öğretmenler bu katkının etkili biçimde gerçekleşebilmesi için öğretmenlerin ve öğrencilerin önceden bilgilendirilmesi, teknolojik yeterliklerin geliştirilmesi ve etik denetimlerin yapılması gerektiğine işaret etmektedir.

Araştırmanın onuncu sorusundan elde edilen sonuçlar, öğretmenlerin büyük çoğunluğunun, YZ araçlarının eğitimde hatalı sonuçlar üretmesi durumunda nihai sorumluluğun insana ait olması gerektiğini düşündüklerini göstermektedir. Bununla birlikte, katılımcılar yalnızca bireysel sorumlulukla yetinmemekte, yazılım geliştiriciler, hizmet sağlayıcı şirketler, karar vericiler ve denetleyici kurumlar gibi teknik ve yapısal aktörlerin de bu sistemlerde hesap verebilir olması gerektiğini vurgulamaktadır. Bu durum, öğretmenlerin YZ sistemlerinin karmaşık ve çok aktörlü yapısını anlamalarından ve eğitim sürecinde yaşanabilecek hataların sadece kullanıcıya değil, aynı zamanda teknolojiyi geliştiren ve yöneten taraflara da bağlı olduğunu fark etmelerinden kaynaklanmış olabilir. Bu çok katmanlı sorumluluk algısı, Zainuddin'in (2024) YZ'den kaynaklanan hatalı sonuçların öncelikle geliştirici şirketlerin sorumluluğunda olduğu, ancak eğitim kurumları ve politika yapımcılarla iş birliği içinde kolektif bir denetim mekanizması kurulması gerektiği yönündeki görüşüyle örtüşmektedir. Katılımcıların "çoklu paylaşılan sorumluluk" ve "duruma bağlı sorumluluk" kavramlarını vurgulaması da bu konuda esnek ve bağlama duyarlı bir yaklaşım gerektiğini

ortaya koymaktadır. Bu durum, Ninaus ve Sailer'in (2022) savunduğu hibrit sorumluluk anlayışına paralel olarak hem YZ'nin öngörülerinin hem de insan yargısının birlikte değerlendirilmesi gerekliliğini gündeme getirmektedir. Sorumluluğun yalnızca yazılıma ya da kullanıcıya yüklenmesinin, karmaşık eğitim süreçlerinde etik ve adil sonuçlar üretmeyeceği açıktır.

Araştırmanın on birinci sorusundan elde edilen sonuçlar, öğretmenlerin büyük çoğunluğunun, sınıf içinde YZ kullanımına yönelik etik ilkelerin belirlenmesinin gerekli olduğunu düşündüklerini göstermektedir. Bu sonuç eğitimde YZ uygulamalarının yaygınlaştığı bir dönemde, öğretmenlerin yalnızca teknolojik yeterliliği değil, ahlaki yönetim ihtiyacını da fark ettiklerine işaret etmektedir. Öğretmenler tarafından en çok vurgulanan etik ilkeler arasında ise “insan kontrolü ve denetimi”, “toplumsal ve çevresel refah” ve “ayrımcılık yapmama/adalet” öne çıkmıştır. Bu durum, Şenocak vd. (2024), çalışmalarında YZ uygulamalarında şeffaflık, çeşitlilik, hesap verebilirlik ve mahremiyet gibi çok boyutlu etik yapıların küresel ölçekte kabul görmeye başladığını göstermektedir. Etik ilkelere verilen önem, yalnızca bireysel öğretmen hassasiyetini değil, aynı zamanda YZ'nin toplumsal etkileri üzerine düşünme gerekliliğini de ortaya koymaktadır. Meylani (2024), YZ sistemlerinin sınıflarda önyargı üretme potansiyeli ve veri gizliliği ihlalleri gibi olası risklerine karşı, öğretmenlerin etik yönergeler çerçevesinde donatılması gerektiğini savunmaktadır. Araştırma sonuçlarında yer alan “gizlilik ve veri yönetimi” teması da bu endişelerin öğretmenler düzeyinde de paylaşıldığını desteklemektedir.

Öneriler

Araştırma bulgularına dayalı olarak, eğitimde YZ kullanımına yönelik açık ve bağlayıcı etik ilkelerin oluşturulması önerilmektedir. Öğretmenlere yönelik YZ okuryazarlığı ve etik farkındalık eğitimlerinin yaygınlaştırılması, bu teknolojilerin daha güvenli ve bilinçli kullanımını destekleyebilir. Ayrıca okullarda teknik altyapının güçlendirilmesi, veri güvenliği önlemlerinin artırılması ve YZ uygulamalarının düzenli olarak denetlenmesi önem taşımaktadır. Eğitim politikalarının, öğretmen görüşlerini merkeze alan ve insan denetimini esas alan bir YZ entegrasyonunu destekleyecek biçimde geliştirilmesi, etik ve sürdürülebilir bir eğitim ortamının oluşturulmasına katkı sağlayacaktır.




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An Investigation of Pre-service Mathematics Teachers' Understanding of the Concept of the Logarithmic Function*

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Abstract

Exponential and logarithmic functions occupy an important place in both real-world modelling and mathematics curricula, as they are used to represent processes such as growth, decay, change, and scaling. Although the concept of the logarithmic function is a fundamental topic in secondary and undergraduate programmes, it is frequently reported as an area in which students and pre-service teachers experience conceptual difficulties. Given that pre-service teachers will eventually assume responsibility for teaching this topic, examining their understanding of the concept of the logarithmic function is particularly important. This qualitative study aims to investigate pre-service mathematics teachers' understanding of the concept of the logarithmic function. The participants were five pre-service secondary mathematics teachers enrolled at a public university during the spring semester of the 2024-2025 academic year. The study was conducted as a case study. Data were collected through a researcher-developed interview form consisting of four open-ended questions under three categories: (i) the definition and properties of logarithmic functions, (ii) graphs of logarithmic functions and related features, and (iii) connections between logarithmic functions and real-world contexts. Semi-structured interviews were conducted, and the data were analysed using content analysis by coding participants' statements into subcategories. The findings indicated that participants had difficulty expressing the defining conditions of logarithmic functions accurately and consistently, tended to interpret logarithmic graphs mainly as increasing, and associated real-world contexts largely with the earthquake magnitude scale. In line with these findings, learning environments should be designed to enhance pre-service teachers' understanding of the concept of the logarithmic function.

Keywords: Mathematics education, logarithmic functions, conceptual understanding, pre-service mathematics teachers.

Introduction

Function is a central concept in mathematics and is regarded as one of the fundamental components of algebra curricula. It has been stated that students' having a narrow perspective on the concept of function may adversely affect their problem-solving processes (Vinner, 1983). Understanding the function concept encompasses a range of learning outcomes that enable this concept to be used both in various contexts within mathematics and in disciplines beyond mathematics. Many mathematics educators emphasize that the concept of function is a central concept in mathematics and is essential for a deep understanding of the subject (Leinhardt et al., 1990; Trujillo et al., 2023).

When research on the concept of function is reviewed, a general picture emerges: Students often perceive the function concept as abstract and complex; therefore, they experience various difficulties and misconceptions in making sense of functions and in using their function knowledge effectively in problem solving (Aydın, 2000; Dreyfus, 1990; Kieran, 1990; Leinhardt et al., 1990; Selden & Selden, 1992; Tall & Vinner, 1981; Parhizgar et al., 2022). Focusing specifically on logarithmic functions among function types, the literature reports that students experience difficulties when solving problems related to exponential and logarithmic topics, largely because they have not sufficiently constructed the fundamental content of these topics (Gunawan & Fitra, 2021).

Exponential and logarithmic functions play a fundamental role in many university-level courses, such as analysis, differential equations, and complex analysis. The literature

emphasizes that students experience various difficulties when learning these concepts; therefore, there is a need to improve the teaching of exponential and logarithmic functions (Confrey & Smith, 1995; Forster, 1998; Rahn & Berndes, 1994). It has been observed that students' work with exponential and logarithmic functions often remains at a predominantly procedural level. Studies have reported that students' conceptual meanings related to these functions are insufficient and that they frequently make errors in procedural steps as well (Confrey & Smith, 1995; Weber, 2002).

In recent years, expectations regarding mathematics education have broadened to include not only the learning of concepts and principles but also the development of problem-solving skills. Accordingly, mathematics instruction has increasingly emphasized practices grounded in learning by doing and experiencing, which activate students' cognitive and affective domains (Gafoor & Kurukkan, 2015; Laurens et al., 2018; Özreçberoğlu & Çağanağa, 2018). To enable students to move beyond merely applying procedural steps and to become effective problem solvers with strong conceptual understanding, it is necessary to provide activities and learning environments that offer opportunities for inquiry and for exploring mathematical relationships (Ministry of National Education [MoNE], 2013).

In the Republic of Türkiye, the mathematics curriculum has been restructured to adapt to changing social and technological conditions. Updated in 2024, it has been introduced as the Türkiye Century Education Model (Türkiye Yüzyılı Maarif Modeli [TYMM]) and has been implemented gradually starting from the 2024-2025 academic year. Within this model, five core skill domains are emphasized for mathematics: mathematical reasoning, mathematical problem solving, mathematical representation, data-driven thinking and decision making (working with data), and the effective use of mathematical tools and technologies (MoNE, 2024). These skills require not only the acquisition of mathematical content knowledge, but also the interpretation and questioning of this knowledge and its connection to real-life situations. Accordingly, TYMM aims for students to view mathematics not merely as a school subject, but as a fundamental component of everyday life and scientific thinking processes (Göçer & Kuzu, 2025). Within the TYMM framework, under the theme "Quantities and Changes," various function types are addressed from Grade 9 to Grade 12; within this continuity, the logarithmic function is covered at the Grade 11 level.

In Türkiye, learning outcomes related to exponential and logarithmic functions were addressed at the Grade 12 level in the 2018 Secondary School Mathematics Curriculum (MoNE, 2018). In this context, particularly during the university entrance examination preparation process, students tend to approach these topics predominantly at a procedural level without sufficiently focusing on the essence of the concepts and their underlying meanings, leaving the conceptual dimension in the background; this observation is consistent with studies reporting difficulties related to exponential and logarithmic functions (Confrey & Smith, 1995; Özer, 2023; Weber, 2002). Identifying students' learning gaps in a given mathematical topic and taking the necessary measures to remedy them is primarily the teacher's responsibility. One of the key factors influencing how effectively a teacher can fulfil this responsibility is the knowledge base they possess (Shulman, 1986; Fennema & Franke, 1992). Although subject-matter knowledge alone is not sufficient to create an effective

teaching–learning environment, it is regarded as an indispensable component in designing and sustaining such an environment (Bütün, 2012; Çelik & Baki, 2007; Fennema & Franke, 1992; Lloyd & Wilson, 1998; Stein et al., 1990; Van Dooren et al., 2002). Within this framework, the present study focuses on pre-service mathematics teachers' understanding of the concept of logarithmic function as future educators.

Although logarithmic functions are among the fundamental concepts in both undergraduate mathematics teacher education programs and the secondary school mathematics curriculum, they are considered conceptually challenging for students and pre-service teachers. This makes it important to reveal how pre-service mathematics teachers think about and explain this concept, as they will be responsible for teaching logarithmic functions in classroom settings. The aim of this study is to examine secondary mathematics pre-service teachers' understanding of the concept of logarithmic function. Accordingly, the study seeks to identify how pre-service teachers (i) articulate the definition of the logarithmic function and its basic defining conditions, (ii) interpret the graphical properties of logarithmic functions, and (iii) establish connections between logarithmic functions and real-life situations. Moreover, while logarithmic functions were addressed at the Grade 12 level in the 2018 secondary school mathematics curriculum, they were moved to the Grade 11 level in the 2024 TYMM secondary school mathematics curriculum. This shift suggests that the concept has maintained its importance within the curriculum and that it is intended to be introduced at an earlier grade level. Given the central place of logarithmic functions in curricula and the fact that they are frequently reported in the literature as conceptually challenging for students and pre-service teachers, determining pre-service teachers' understanding of this concept is particularly important. In this respect, the study offers an original contribution to the literature by addressing pre-service teachers' understanding of the concept of logarithmic function not only in terms of how they define logarithmic functions, but also in terms of their understanding of the graphs of logarithmic functions and the relationships they establish with real-life situations. In the relevant literature, studies conducted in the context of pre-service teachers that address the concept of logarithmic function through these dimensions together appear to be limited.

Within this framework, the study seeks to answer the following research question: "What is the nature of pre-service mathematics teachers' understanding of the logarithmic function concept?" In line with this research question, the following sub-questions are addressed:

1. What is the nature of pre-service mathematics teachers' understanding of the definition and properties of the logarithmic function concept?
2. What is the nature of pre-service mathematics teachers' understanding of the graphs of logarithmic functions?
3. What is the nature of pre-service mathematics teachers' understanding of the relationship between logarithmic functions and real-life situations?

Method

Research Design

This study was conducted using a case study design, one of the qualitative research approaches. A case study is used to explain what occurs within a bounded system—defined in terms of time and place—and to describe and interpret the case in depth (Merriam, 1998). In this research, the case under investigation is the in-depth examination of pre-service mathematics teachers' understanding of the concept of logarithmic function.

Participants

Pre-service mathematics teachers were selected through purposive sampling, specifically criterion sampling and convenience sampling. First, in line with convenience sampling, the participants were recruited from among pre-service mathematics teachers enrolled in the undergraduate mathematics teacher education program at a public university in Ankara.

Within the framework of criterion sampling, the inclusion criteria were that the participants had successfully completed Analysis I, Analysis II, and Analysis III in the mathematics teacher education program and had volunteered to participate in the study. Analysis I, is offered in the first year of the program, and exponential and logarithmic functions are addressed within the scope of this course. In order to ensure that a certain period of time had elapsed after instruction on these topics, second-year pre-service teachers were not included in the study. Fourth-year pre-service teachers were also excluded due to such factors as the intensive workload of the Teaching Practicum course and their heightened concerns regarding post-graduation issues.

As the research required an in-depth analysis process, the number of participants was kept below ten (Yıldırım & Şimşek, 2016). Accordingly, the study was conducted with five third-year pre-service teachers enrolled in the mathematics teacher education program at a public university. Four of the participants were female and one was male. To ensure confidentiality, the participants were coded as PT1, PT2, PT3, PT4, and PT5.

Data Collection Tool

In developing the data collection tool, the relevant literature on the concept of logarithmic function was first reviewed, and a draft interview form was prepared in line with the sub-questions of the study. The questions included in the draft form were designed to reveal pre-service teachers' knowledge of the definition of logarithmic function, their understanding of its graphical properties, and the connections they established with real-life examples. The draft questions were submitted to two experts in mathematics education for evaluation in terms of content validity and clarity. In line with the expert feedback, some of the question statements were revised in terms of wording and scope, and the interview form was finalized. The finalized form consisted of four open-ended questions, which are presented below:

1. What conditions are required for a logarithmic function to be defined?
2. How would you explain a logarithmic function beyond its formal definition?

3. What can you say about the graphs of logarithmic functions? What do you pay attention to when drawing the graph of a logarithmic function?

4. Can you give an example of a logarithmic function encountered in real life?

The first two questions aim to elicit the pre-service teachers' knowledge of the definition and fundamental properties of the logarithmic function and their understanding of how they explain and/or apply this knowledge. The third question focuses on their understanding of the graphs of logarithmic functions by examining how they describe key graphical properties and what aspects they consider when sketching the graph of a logarithmic function. The fourth question aims to examine their understanding of providing examples and making connections regarding when and how logarithmic functions are used in real-life contexts.

Data Collection Process

After obtaining the necessary official permissions, the participants met with the researcher in a quiet classroom, and semi-structured interviews were conducted individually with each participant. Each interview lasted approximately fifteen minutes. The interviews were carried out with the participants' knowledge and consent and were audio-recorded using a voice recorder.

Data Analysis

The data collected in this study were analyzed using content analysis. In this process, the pre-service teachers' responses to the four questions were examined repeatedly for each question and each participant. The codes were derived from the data through repeated examination of the participants' responses. No predetermined code list was used; rather, the responses were grouped according to similarities and differences in content, and the codes were generated based on these groupings. The codes were labeled with statements that represented the pre-service teachers' solution and explanation processes. The codes were reviewed again, and the final code list was established through the researchers' joint evaluation.

During the analysis process, the researchers examined each participant's response to each question individually and matched the responses with the most appropriate codes. An inter-coder reliability coefficient of 92% was calculated, which is above the 70% threshold recommended by Miles and Huberman (1994), indicating that the coding was reliable. After the coding process, responses were classified according to the codes, and the findings were presented in tables using descriptive statistics (frequencies and percentages). In interpreting the findings, direct quotations from the participants' responses were also included where necessary.

Limitations

This study is limited to five pre-service mathematics teachers studying at a public university during the spring semester of the 2024–2025 academic year. The study is limited to the topic of logarithmic functions. The data of the study are limited to those obtained through the interview form developed by the researcher.

Ethical Permits of Research:

In this study, all the rules specified to be followed within the scope of “Higher Education Institutions Scientific Research and Publication Ethics Directive” were complied with. None of the actions specified under the heading “Actions Contrary to Scientific Research and Publication Ethics”, which is the second part of the directive, have been taken.

Ethics Committee Permission Information:

Name of the committee that made the ethical evaluation = Hacettepe University Institute of Educational Sciences Research Ethics Committee

Date of ethical review decision= 5 February 2025

Ethics assessment document issue number= E-82474949-050-00004035972

Findings

The findings derived from the analysis of the data obtained through the interviews conducted to examine pre-service mathematics teachers’ understanding of the logarithmic function concept in depth are presented below in relation to the research questions.

Findings Related to the Question “What Conditions Are Required for a Logarithmic Function to Be Defined?”

The prominent aspects reflected in the pre-service mathematics teachers’ definitions regarding their understanding of the definition and fundamental properties of the logarithmic function were grouped into five subcategories: the base condition of the logarithmic function, the independent variable (x), establishing a connection with the exponential function, function properties, and no response/uncertainty. Table 1 presents the codes for the pre-service teachers and the subcategories associated with these codes.

$\log_a x = y$ therefore, the following table was prepared;

Table 1.

Pre-service Mathematics Teachers’ Statements Regarding the Definition and Properties of the Logarithmic Function

Subcategory	Code	Pre-service teachers	f	%
Base condition (a)	Positive base (a > 0)	PT2, PT4, PT5	3	38
	a > 1	PT1, PT4	2	
	a ≠ 1	PT2	1	
	Positive integer base (a is a positive integer)	PT1, PT4	2	
Independent variable of the logarithmic function (x)	Magnitude condition of x (x > 0 or x > 1)	PT1, PT2, PT4, PT5	4	28
	Non-equality condition of x (x ≠ 0 or x ≠ 1)	PT4, PT5	2	
Relating to the exponential function	Symbolic representation (x = a ^y)	PT1	1	10
	Emphasis on the inverse function	PT2	1	
Function properties	Emphasis on injectivity and surjectivity	PT2	1	10
	Emphasis on continuity	PT3	1	
No response / Uncertainty	Awareness of lack of knowledge	PT1, PT3, PT5	3	14

Under the subcategory “base condition (a),” the pre-service teachers used different statements. Within the code “emphasis on a positive base (a>0),” they stated that the base must be positive. In this regard, PT2, PT4, and PT5 indicated that the base should be a positive

number or a positive real number. Under the code “ $a > 1$,” there were explanations suggesting that the base must be greater than 1. Accordingly, PT1 and PT4 stated that the base of the logarithmic function should be a number greater than 1. Under the code “ $a \neq 1$,” participants expressed that the base of a logarithmic function cannot be equal to 1. Finally, under the code “integer,” there were explanations in which the base was considered as an integer. The pre-service teachers’ statements are presented below:

“Let $\log_a x = y$; among these given numbers, a needs to be greater than... I couldn’t really remember...” (PT1).

“The exponent goes from one to infinity. And I think the base is a positive integer...” (PT4).

The codes under the subcategory “independent variable (x) of the logarithmic function” are explained as follows.

Under the code “magnitude condition of x ,” there were statements indicating that x must satisfy a certain magnitude condition. In this context, PT1, PT2, PT4, and PT5 stated that $x > 0$ or $x > 1$ is required.

Under the code “non-equality condition of x ,” PT4 and PT5 stated that $x \neq 0$ or $x \neq 1$ is required.

The participants’ statements from which these codes were derived are given below:

“If I say $\log_a x = y$, then x has to be greater than zero...” (PT2).

“For a logarithmic function to be defined, the inside part shouldn’t be zero... In $\log_a x = y$ here, what I mean, professor, is that x shouldn’t be zero. That’s it; I can’t remember anything else at the moment.” (PT5).

The codes under the subcategory “relating to the exponential function” are as follows.

Under the code “symbolic representation,” participants provided explanations indicating that a logarithmic expression can be written symbolically in exponential form.

Under the code “emphasis on the inverse function,” participants made statements in which the logarithmic function was considered in an inverse relationship with the exponential function. In this regard, PT2 described the logarithmic function as the inverse of the exponential function. The participants’ statements are presented below:

“We should be able to write this expression as $x = a^y$; maybe that could be, characteristically, the definition of the logarithm...” (PT1).

“Because the logarithmic function is the inverse of the exponential function...” (PT2).

The codes under the subcategory “function properties” were expressed as follows.

Under the code “emphasis on injectivity and surjectivity,” participants made statements associating the logarithmic function with being one-to-one and onto. In this context, PT2 stated that a logarithmic function should be one-to-one and onto.

Under the code “emphasis on continuity,” there were statements referring to the continuity of the logarithmic function. In this regard, PT3 characterized the logarithmic function as a continuous function.

Finally, under the subtheme “no response/uncertainty,” the code “awareness of lack of knowledge” includes statements indicating that the pre-service teachers did not consider their knowledge about logarithmic functions sufficient or could not recall certain points. In this context, PT1, PT3, and PT5 stated that they could not remember some aspects related to the definition or defining conditions of the logarithmic function, or that they were aware of their lack of knowledge in this regard.

Findings Related to the Question “How Would You Explain a Logarithmic Function Beyond Its Formal Definition?”

The prominent aspects reflected in the pre-service mathematics teachers’ explanations of the logarithmic function beyond its formal definition were grouped into three subcategories: the exponential–logarithmic relationship, logarithmic scaling and representation, and symbolic representation. Table 2 presents the codes for the pre-service teachers and the subcategories associated with these codes.

Table 2.

Pre-service Mathematics Teachers’ Statements Regarding the Non-formal Definitions of the Logarithmic Function

Subcategory	Code	Pre-service teachers	<i>f</i>	%
Exponential–logarithmic relationship	Logarithm as an exponent	PT1	1	17
Logarithmic scaling and representation	Intensity of increase	PT2	1	33
	Representing large numbers	PT5	1	
Symbolic representation	Association with the “log” symbol	PT3	1	50
	Association with the “ln” symbol	PT3, PT4	2	

When the pre-service teachers’ statements regarding how they made sense of the logarithmic function concept beyond its formal definition were examined, it was found that, under the code “logarithm as an exponent,” there were explanations linking the logarithmic function concept to an exponential expression. In this context, PT1 stated:

“If the given number is a certain power of the number aaa , then the value of x here will correspond to that. In other words, we can reach a conclusion such as which number is the n th power of which number.” (PT1).

Within the subcategory “logarithmic scaling and representation,” under the code “intensity of increase,” there were statements in which the logarithmic function was discussed in relation to the magnitude of increases. In this context, PT2 stated:

“I know that the logarithmic function is used to explain not certain increases—for example, not increases by tens—but larger increases. For instance, in the earthquake example, the difference between 6.5 and 7.5 is not just 1; there is an increase of thousands.” (PT2).

Under the code “representing large numbers,” PT5 stated:

“It feels like a representation that helps us express large numbers. With a logarithmic base, we can write large numbers more easily.” (PT5).

Finally, within the subtheme “symbolic representation,” under the code “association with the ‘log’ symbol,” there were explanations indicating that the concept of logarithm was directly associated with the expression “log.” Under the code “association with the ‘ln’ symbol,” there were explanations in which the logarithmic function was specifically associated with the symbol “ln.” In this context, PT4 stated:

“When I think of the logarithmic function, it mostly comes to mind in the form with ‘ln.’ Questions are always in the ‘ln’ form.” (PT4).

Findings Related to the Question “What Can You Say About the Graphs of Logarithmic Functions? What Do You Pay Attention to When Drawing the Graph of a Logarithmic Function?”

The pre-service mathematics teachers’ explanations regarding their understanding of the graphs of logarithmic functions were coded under the following subcategories: graph construction strategies, increasing/decreasing function, asymptote, and no response. In this section, the codes under each subcategory and the corresponding participant statements are presented descriptively. Table 3 presents the codes for the pre-service teachers and the subcategories associated with these codes.

Table 3.

Pre-service Mathematics Teachers’ Statements Regarding the Graphs of Logarithmic Functions

Subcategory	Code	Pre-service teachers	<i>f</i>	%
Graph construction strategies	Focusing on the domain/range	PT3, PT5	2	14
Increasing/decreasing function	General perception of increasing behavior	PT1, PT5	2	58
	Continuous but non-linear	PT2	1	
	Domain/range-focused approach	PT3, PT5	2	
	Dependent on the base	PT2, PT4	2	
	Sign of the logarithmic expression	PT5	1	
Asymptote	Approaching but not reaching	PT4	1	21
	Horizontal asymptote	PT1	1	
	Approaching the line ($y=1$)	PT1	1	
No response	Awareness of lack of knowledge	PT3	1	7

Within the subcategory “graph construction strategies,” under the code “focusing on the domain/range,” there were statements indicating that, when constructing the graph of a logarithmic function, participants relied on the domain and range. In this context, PT3 and PT5 stated that they proceeded by considering the domain and the range while drawing the graph.

Under the subcategory “increasing/decreasing function,” different types of statements regarding whether the function increases or decreases were coded. Under the code “general perception of increasing behavior,” there were explanations suggesting that a logarithmic function is generally an increasing function. Under the code “continuous but non-linear,” PT2 stated that the increase occurs continuously but in a non-linear manner. Under the code “domain/range-focused approach,” there were statements indicating that the domain and range were consulted to determine whether the function is increasing or decreasing. Under the

code “dependent on the base,” participants stated that whether the function is increasing or decreasing is determined by the base. In this regard, PT2 and PT4 noted that the function is decreasing when the base is between 0 and 1, and increasing when the base is greater than 1. Under the code “sign of the logarithmic expression,” PT5 stated that whether the function is increasing or decreasing is determined by the sign in front of the logarithmic expression. Examples of the participants’ statements are provided below:

“Whether it is increasing or decreasing is determined by the base. If the base is between zero and one, it is decreasing; if it is greater than one, it is increasing...” (PT2).

“When drawing the graph, we look at the domain; it cannot be negative. Whether it is increasing or decreasing is determined by the sign in front of the logarithm. Generally, it is increasing...” (PT5).

Under the subcategory “asymptote,” statements regarding the asymptotic behavior of logarithmic functions were coded. Under the code “approaching but not reaching,” there were explanations indicating that the graph approaches a certain value but does not reach it. Under the code “horizontal asymptote,” there were statements suggesting that the logarithmic function has a horizontal asymptote. Under the code “approaching the line $y=1$,” there were explanations indicating that the graph approaches the line $y=1$. The participants’ statements are presented below:

“I remember that it generally approaches some value but cannot reach it...” (PT4).

“I think it has a horizontal asymptote. It should be an increasing function that approaches 1 as you move to the right.” (PT1).

Finally, under the subcategory “no response,” statements reflecting uncertainty regarding participants’ own knowledge level were coded. Under the code “awareness of lack of knowledge,” there were statements indicating that some properties of the graph of the logarithmic function could not be recalled. In this context, PT3 stated that they “*could not remember very well*” some details related to the graph.

Findings Related to the Question “Can You Give an Example of a Logarithmic Function Encountered in Real Life?”

Pre-service mathematics teachers’ understanding of the real-life uses of logarithmic functions was coded under the following subcategories: scale-based examples, emphasis on the logarithmic base, and the exponential-function context. Table 4 presents the codes for the pre-service teachers and the subcategories associated with these codes.

Table 4.

Pre-service Mathematics Teachers’ Statements Regarding the Real-life Uses of the Logarithmic Function

Subcategory	Code	Pre-service teachers	f	%
Scale-based examples	Earthquake magnitude scale	PT2, PT4, PT5	3	50
Emphasis on the logarithmic base	Base-10 logarithm	PT1	1	17
Exponential-function context	Biology / bacterial growth	PT3, PT4	2	33

Under the code “earthquake magnitude scale,” there were statements referring to the use of logarithms in scales related to earthquakes. In this context, PT2, PT4, and PT5 stated that logarithms are used in earthquake applications and in the earthquake magnitude scale, and that a logarithmic structure is employed to measure earthquakes or to express earthquake magnitudes. The participants’ statements are presented below:

“...For example, in the earthquake case, the difference between 6.5 and 7.5 is not just 1; there is an increase of thousands.” (PT2).

“We used it in earthquake applications to measure it.” (PT5).

Under the code “base-10 logarithm,” PT1 made statements specifically emphasizing base 10. PT1 noted that base-10 logarithms are widely used and stated that, when giving an example, one could proceed by considering logarithms with base 10.

Within the subcategory “exponential-function context,” under the code “biology/bacterial growth,” there were statements indicating that logarithmic and exponential structures were discussed in a biological context. PT4 stated:

“It is used in the earthquake scale and in the rate of bacterial growth...” (PT4).

Discussion and Conclusion

In this study, pre-service mathematics teachers’ understanding of the concept of logarithmic function was examined in depth. To this end, three sub-questions were addressed. The first sub-question focused on the participants’ understanding of the definition of the logarithmic function. The prominent aspects in the definitions provided by the pre-service teachers were grouped into five subcategories: the base condition of the logarithmic function, the independent variable (x), relating the logarithmic function to the exponential function, function properties, and no response/uncertainty. An examination of the distribution of codes indicates that the highest proportion clustered under the base condition (aaa) subcategory (38%), followed by the independent variable (x) subcategory (28%). In contrast, the subcategories of relating to the exponential function and function properties were represented at lower rates (10% and 10%, respectively), and codes reflecting no response/uncertainty also appeared at a non-negligible level (14%).

The findings regarding the base condition of the logarithmic function indicate that the pre-service teachers had difficulty expressing the conditions that determine the base of a logarithmic function in a complete and general form. They tended to reduce the base conditions to specific cases and articulated them in a limited manner. One group of participants emphasized that the base must be positive ($a > 0$), demonstrating a basic awareness that the base cannot be negative (PT2, PT4, PT5). Some participants restricted the base with respect to 1, stating that the base must be greater than 1 ($a > 1$) or cannot be equal to 1 ($a \neq 1$) (PT1, PT2, PT4). In addition to these findings, the fact that some participants described the base as an “integer” or a “positive integer” (PT1, PT4) suggests that situations in which the base can be a real number were overlooked, and that the base condition was generally represented in their thinking as “positive,” “greater than one,” and “mostly an integer.”

The findings regarding the independent variable of the logarithmic function indicate that a considerable proportion of the pre-service teachers referred to the condition $x > 0$ and emphasized that “the expression inside must be positive” (PT1, PT2, PT4). In addition, some participants expressed the condition for the independent variable in terms of “non-equality” ($x \neq 0$, $x \neq 1$) and, particularly through statements such as “the inside part should not be zero,” treated the condition $x > 0$ in a narrowed form as $x \neq 0$ (PT4, PT5). This suggests that the participants could not fully differentiate, at a cognitive level, between the conditions $a \neq 1$ and $x > 0$ in the definition of the logarithmic function; although they recalled that there are “certain values that cannot be equal,” they had difficulty clarifying which variable each condition corresponds to. In the subcategory “no response/uncertainty,” the coding of three participants (PT1, PT3, PT5) as “awareness of lack of knowledge” indicates that some pre-service teachers recognized their insufficiencies regarding the definition and properties of logarithmic functions and did not feel confident about this topic. The conclusions drawn from the findings of the present study are consistent with studies reporting that students experience difficulties in defining logarithmic functions accurately and consistently (Akkuş, 2004; Campo-Meneses et al., 2021).

The prominent aspects in the pre-service mathematics teachers’ explanations reflecting their understanding of the logarithmic function concept beyond its formal definition were identified under three subcategories: the exponential–logarithmic relationship, logarithmic scaling/representation, and symbolic representation. The fact that the codes “intensity of increase” (PT2) and “representing large numbers” (PT5), both under the subcategory “logarithmic scaling and representation,” together accounted for 33% indicates that some pre-service teachers made sense of the logarithmic function particularly in terms of explaining large increases and representing large numbers in a more compact form. For these participants, the logarithmic function is positioned not only as an algebraic expression but also as a tool that rescale magnitudes. The highest proportion in the table, however, was observed in the subcategory “symbolic representation” (50%). The statements grouped under the codes “association with the ‘log’ symbol” and “association with the ‘ln’ symbol” suggest that, for a substantial portion of the participants, the symbols log and ln were the first associations that came to mind when thinking about logarithmic functions (PT3, PT4). This indicates that, within the group, the logarithmic function was predominantly evoked through symbolic notation. This result is consistent with Kastberg’s (2002) study, which reported that students often view the concept of logarithmic function primarily as a symbolic representation or as a procedure to be carried out.

The second sub-question of the study focused on how the pre-service teachers interpreted the graphs of logarithmic functions and their understanding of these graphs. The pre-service mathematics teachers’ explanations regarding the graph of the logarithmic function were coded under the subcategories of graph construction strategies, increasing/decreasing function, asymptote, and no response. Overall, the participants tended to focus primarily on increasing/decreasing behavior (58%) and asymptotic behavior (21%) when making sense of the graph of a logarithmic function. However, in both areas, accurate criteria (e.g., base-dependent behavior and the idea of approaching but not reaching) co-occurred with confused or incomplete representations (e.g., determining

increasing/decreasing behavior based on the sign, referring to a horizontal asymptote, or claiming that the graph approaches the line $y=1$). While some participants addressed the graph more systematically through the domain/range and the base condition, others confused the behavior of logarithmic functions with the graph of the exponential function or interpreted it based on superficial cues such as coefficients and the sign of the logarithmic expression. These results are consistent with the findings of Quinio and Cuarto (2023), who reported that students experience difficulties in making sense of the behavior of logarithmic function graphs and in constructing accurate graphical representations.

The third sub-question of the study focused on the pre-service teachers' understanding of providing examples and making connections regarding when and how logarithmic functions are used in real-life contexts. Three of the five participants (PT2, PT4, PT5) explained the relationship between logarithmic functions and real life through the earthquake scale; this indicates that more than half of the participants primarily associated logarithmic functions with Richter-type scales. This preference may be related to the fact that the earthquake scale is frequently used as an example in applications of logarithmic functions at the secondary school level. This finding is consistent with the 2018 secondary school mathematics curriculum, which presents contexts such as earthquake magnitude (Richter scale), pH value, and sound intensity (decibel) as examples of real-life situations modeled by exponential and logarithmic functions (MoNE, 2018). Gol Tabaghi (2007) also refers to logarithmic scales such as Richter, pH, and decibel as examples of applications of the logarithmic function in different fields. In addition, Budinski and Takači (2013) discuss the Richter scale as one of the real-life contexts used in the teaching of logarithms. In addition, two participants (PT3, PT4; 33%) referred to biological, exponential processes such as bacterial growth when providing an example of a logarithmic function. Taken together, these findings suggest that pre-service teachers tended to make sense of logarithmic functions in real life mainly through familiar examples such as the earthquake scale, while some participants also invoked exponential growth processes in their explanations, at times addressing logarithmic and exponential relationships in an intertwined manner. The fact that participants referred to exponential processes such as bacterial growth while explaining logarithmic functions is consistent with studies showing that exponential and logarithmic models are often taught around the same real-life contexts and that students have difficulty distinguishing between these two concepts (Borji et al., 2023; Engbersen, 2009).

This study presents pre-service mathematics teachers' understanding of the concept of logarithmic function in terms of definition, graph, and giving real-life examples. The findings show that pre-service teachers were able to express some fundamental elements related to logarithmic functions; however, in some cases, they articulated the defining conditions incompletely or incorrectly, experienced uncertainties in their knowledge of graphical properties, and explained real-life examples mostly through limited contexts. This suggests that not only procedural knowledge but also conceptual understanding is important in the teaching of the concept of logarithmic function. Indeed, the literature emphasizes that exponential and logarithmic concepts involve difficulties for students, that understanding the idea of logarithm requires more than simply presenting the definition and having students carry out procedural applications, and that real-life contexts can support the understanding of

these concepts (Borji et al., 2023; Kuper & Carlson, 2020; Weber, 2002). In this respect, the study contributes to the literature by addressing pre-service mathematics teachers' understanding of the concept of logarithmic function through multiple dimensions.

Recommendations

This study is based on in-depth interviews conducted with a limited number of pre-service teachers. For future research, it is recommended to work with larger samples; to include different participant groups (e.g., high school students and teachers); and to support and examine understandings of the logarithmic function concept through quantitative data in a comparative manner.

Based on the findings of the study, it is important that the teaching of logarithmic functions should not be limited to the procedural aspect of the concept, but should also address its definition, graphical properties, and real-life examples together. In order to support pre-service mathematics teachers' understanding of the concept of logarithmic function, it may be useful to include instructional processes that center conceptual learning. In this respect, it may be recommended to increase graph-based activities, to address different representations of logarithmic functions together, and to integrate technology-supported applications into the teaching process.

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Contribution Rate of Researchers

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Conceptualization: SÖ, NT; Methodology: SÖ, NT; Validation: SÖ, NT; Data Collection: SÖ; Data Analysis: SÖ, NT; Investigation: SÖ; Resources: SÖ, NT; Data Curation: SÖ; Writing-Original Draft Preparation: SÖ; Writing-Review & Editing: SÖ, NT; Supervision: NT. The authors reviewed the results and approved the final version of the article.

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The authors did not use any artificial intelligence tools in the research, authorship, or publication of this article

Matematik Öğretmeni Adaylarının Logaritmik Fonksiyon Kavramına Yönelik Anlayışlarının İncelenmesi



Özet

Günümüzde üstel ve logaritmik fonksiyonlar; büyüme, azalma, değişim ve ölçeklendirme süreçlerinin modellenmesi açısından hem gerçek yaşamda hem de matematik öğretim programlarında önemli bir yere sahiptir. Logaritmik fonksiyon, ortaöğretim ve lisans düzeyindeki programlarda temel kavramlar arasında bulunmasına rağmen öğrenciler ve öğretmen adayları tarafından kavramsal açıdan güçlük yaşanan konular arasında gösterilmektedir. Öğretmen adaylarının ileride bu konuyu sınıf ortamında öğretme sorumluluğunu üstlenecek olmaları, logaritmik fonksiyona ilişkin anlayışlarının incelenmesini önemli kılmaktadır. Çalışmanın amacı, matematik öğretmeni adaylarının logaritmik fonksiyon kavramına yönelik anlayışlarını incelemektir. Araştırmanın katılımcılarını, 2024-2025 eğitim öğretim yılı bahar döneminde bir devlet üniversitesinde öğrenim gören beş ortaöğretim matematik öğretmeni adayı oluşturmaktadır. Çalışma, nitel araştırma yöntemlerinden durum çalışması deseniyle yürütülmüştür. Veri toplama aracı olarak araştırmacı tarafından geliştirilen ve dört açık uçlu sorudan oluşan bir görüşme formu kullanılmıştır. Sorular, “logaritmik fonksiyonun tanımı ve özellikleri”, “logaritmik fonksiyonun grafikleri ve özellikleri” ve “logaritmik fonksiyon ile gerçek yaşam ilişkisi” olmak üzere üç kategori altında toplanmıştır. Veriler yarı yapılandırılmış görüşmeler yoluyla toplanmış, içerik analiziyle çözümlenmiş ve öğretmen adaylarının ifadeleri alt kategoriler ve kodlar altında sınıflandırılmıştır. Bulgular, öğretmen adaylarının logaritmik fonksiyonun tanım koşullarını doğru ve tutarlı biçimde ifade etmekte zorlandıklarını, logaritmik fonksiyonların grafiklerini genellikle artan bir yapı olarak yorumladıklarını ve gerçek yaşam bağlamlarını ağırlıklı olarak deprem ölçeği örneğiyle sınırlı tuttuklarını göstermektedir. Elde edilen bulgular doğrultusunda, öğretmen adaylarının logaritmik fonksiyon kavramına ilişkin anlayışlarını geliştirmeye yönelik öğrenme ortamlarının tasarlanması önerilmektedir.

Anahtar Kelimeler: Matematik eğitimi, logaritmik fonksiyonlar, kavramsal anlayış, matematik öğretmeni adayları.

Giriş

Fonksiyon kavramına ilişkin araştırmalar incelendiğinde genel olarak şu tablo ortaya çıkmaktadır: Öğrenciler fonksiyon kavramını çoğu zaman soyut ve karmaşık olarak algılamakta; bu nedenle, fonksiyonları anlamlandırmada ve fonksiyonlara ilişkin bilgilerini problem çözmede etkili bir şekilde kullanmada çeşitli güçlükler ve kavram yanılgıları yaşamaktadırlar (Aydın, 2000; Dreyfus, 1990; Kieran, 1990; Leinhardt vd., 1990; Selden & Selden, 1992; Tall & Vinner, 1981; Parhizgar vd., 2022). Fonksiyon türleri içerisinde logaritmik fonksiyona odaklanıldığında ise alan yazınında öğrencilerin üstel ve logaritma konularının temel içeriklerini yeterince yapılandıramadıkları için bu konularla ilgili soruları çözerken güçlükler yaşadıkları gözlemlenmiştir (Gunawan & Fitra, 2021). Literatür incelendiğinde üstel ve logaritmik fonksiyonların daha çok işlemsel düzeyde kaldığı gözlemlenmektedir. Öğrencilerin bu kavramlara ilişkin anlamlarının kavramsal açıdan yetersiz kaldığı ve işlem basamaklarında da sıkça hatalar yaptıkları rapor edilmiştir (Confrey & Smith, 1995; Weber, 2002).

Son yıllarda matematik eğitimine ilişkin beklentiler; kavram ve ilke öğrenimi ile problem çözme becerisinin geliştirilmesini de kapsayacak biçimde genişlemiştir. Bu nedenle matematik öğretiminde, öğrencilerin bilişsel ve duyuşsal yönlerini etkinleştiren, yaparak-yaşayarak öğrenmeye dayalı uygulamalara ağırlık verildiği görülmektedir (Gafoor & Kurukkan 2015; Laurens vd., 2018; Özreçberoglu & Çağanağa, 2018).

Türkiye Cumhuriyeti'nde matematik dersi öğretim programı, değişen toplumsal ve teknolojik koşullara uyum sağlamak amacıyla yeniden yapılandırılmış ve 2024 yılında güncellenerek Türkiye Yüzyılı Maarif Modeli [TYMM] adıyla 2024-2025 eğitim-öğretim yılından itibaren kademeli olarak uygulamaya konulmuştur. TYMM, öğrencilerin matematiği yalnızca ders kapsamında değil, gündelik yaşamın ve bilimsel düşünme süreçlerinin temel unsurlarından biri olarak görmelerini hedeflemektedir (Göçer & Kuzu, 2025). TYMM çerçevesinde “Nicelikler ve Değişimler” teması altında 9. sınıftan 12. sınıfa kadar farklı fonksiyon türlerine yer verilmekte; logaritmik fonksiyon ise bu bütünlük içerisinde 11. sınıf düzeyinde ele alınmaktadır. Logaritmik fonksiyonlar, 2018 ortaöğretim matematik dersi öğretim programında 12. sınıf düzeyinde ele alınırken, 2024 TYMM ortaöğretim matematik dersi öğretim programında 11. sınıf düzeyine taşınmış ve böylece kavramın öğretim programlarındaki önemini korumaya devam ettiği gibi daha erken sınıf düzeyinde ele alınmasının hedeflendiği görülmüştür. Logaritmik fonksiyonun öğretim programlarında temel bir yer tutması ve alan yazınında öğrenciler ile öğretmen adayları için kavramsal açıdan zorlayıcı bir kavram olarak gösterilmesi, geleceğin öğrencileri olan öğretmen adaylarının bu kavrama ilişkin anlayışlarının belirlenmesini özellikle önemli kılmaktadır.

Bu doğrultuda araştırmanın amacı, ortaöğretim matematik öğretmeni adaylarının logaritmik fonksiyon kavramına yönelik anlayışlarını incelemektir. Bu amaç doğrultusunda “Matematik öğretmeni adaylarının logaritmik fonksiyon kavramına yönelik anlayışları nasıldır?” sorusuna yanıt aranmıştır. Bu problem doğrultusunda ise aşağıdaki alt problemlere yanıt aranmıştır.

1. Matematik öğretmeni adaylarının logaritmik fonksiyon kavramının tanımı ve özelliklerine yönelik anlayışları nasıldır?
2. Matematik öğretmeni adaylarının logaritmik fonksiyonların grafiklerine yönelik anlayışları nasıldır?
3. Matematik öğretmeni adaylarının logaritmik fonksiyon kavramı ile gerçek yaşam durumları arasındaki ilişkiye yönelik anlayışları nasıldır?

Yöntem

Araştırma Deseni

Bu araştırma, nitel araştırma yaklaşımlarından durum çalışması deseniyle yürütülmüştür. Durum çalışması, zaman ve mekân bakımından sınırları belirlenmiş bir sistemde ele alınan olgunun ayrıntılı biçimde betimlenmesi ve yorumlanmasını amaçlamaktadır (Merriam, 1998). Bu çalışmada incelenen durum, matematik öğretmeni adaylarının logaritmik fonksiyon kavramına yönelik anlayışlarının derinlemesine ortaya konulmasıdır.

Katılımcılar

Çalışma grubundaki öğretmen adayları amaçlı örnekleme kapsamında ölçüt örnekleme ve kolay ulaşılabilir örnekleme ile belirlenmiştir. Katılımcılar, Ankara'da bir devlet üniversitesinin matematik öğretmenliği lisans programında öğrenim gören öğretmen adaylarından seçilmiştir. Ölçüt olarak Analiz I, Analiz II ve Analiz III derslerini başarıyla tamamlamış olma ve araştırmaya gönüllü katılım esas alınmıştır. Derinlemesine analiz gerektiren yapı nedeniyle çalışma grubu 10'u geçmeyecek şekilde sınırlandırılmış (Yıldırım & Şimşek, 2016) ve araştırma üçüncü sınıfta öğrenimine devam eden beş öğretmen adayıyla (dördü kadın, biri erkek) yürütülmüştür. Gizlilik ilkesi doğrultusunda katılımcılar Ö1-Ö5 şeklinde kodlanmıştır.

Veri Toplama Aracı

Araştırmanın verileri, araştırmacı tarafından geliştirilen ve dört problem durumundan oluşan görüşme formu aracılığıyla toplanmıştır. Formda yer alan problem durumları aşağıda verilmiştir:

1. Logaritmik fonksiyonun tanımlı olması için gereken koşullar nelerdir?
2. Logaritmik fonksiyonu formal tanımı dışında nasıl açıklarsınız?
3. Logaritmik fonksiyonların grafiklerine ilişkin neler söyleyebilirsiniz? Logaritmik fonksiyonun grafiğini çizerken nelere dikkat edersiniz?
4. Gerçek yaşamda karşımıza çıkan bir logaritmik fonksiyon örneği verir misiniz?

İlk iki problem, öğretmen adaylarının logaritmik fonksiyonun tanımı ve temel özelliklerine ilişkin bilgilerini ve bu bilgileri açıklama/uygulama biçimlerine yönelik anlayışlarını ortaya çıkarmayı, üçüncü problem adayların logaritmik fonksiyonların grafiklerine ilişkin anlayışlarını; grafiklerin temel özelliklerini nasıl ifade ettiklerini ve bir logaritmik fonksiyonun grafiğini çizerken hangi noktalara dikkat ettiklerini ve dördüncü problem logaritmik fonksiyonun gerçek yaşamda hangi durumlarda ve nasıl kullanıldığına dair örnek verme ve ilişkilendirme becerilere yönelik anlayışlarını incelemeyi hedeflemektedir.

Veri Toplama Süreci

Gerekli yasal izinlerin alınmasının ardından, katılımcılarla sessiz bir sınıfta bir araya gelinmiş ve her bir katılımcı ile bireysel olarak yaklaşık on beş dakika süren yarı yapılandırılmış görüşmeler gerçekleştirilmiştir. Yapılan görüşmeler, öğretmen adaylarının bilgisi ve onayı dâhilinde yürütülmüş ve ses kayıt cihazı aracılığıyla kaydedilmiştir.

Veri Analizi

Bu çalışmada toplanan veriler içerik analizi kullanılarak çözümlenmiştir. Bu süreçte, öğretmen adaylarının dört soruya verdikleri yanıtlar, her bir soru ve her bir katılımcı için tekrar tekrar incelenmiştir. Kodlar, öğretmen adaylarının yanıtlarının yinelemeli biçimde incelenmesi sonucunda veriden türetilmiştir. Önceden belirlenmiş bir kod listesi kullanılmamış; bunun yerine yanıtlar, içerik bakımından benzerlik ve farklılıklarına göre gruplandırılmış ve kodlar bu gruplamalar temel alınarak oluşturulmuştur. Kodlar, öğretmen adaylarının çözüm ve açıklama süreçlerini yansıtan ifadelerle etiketlenmiştir. Kodlar yeniden

gözden geçirilmiş ve araştırmacıların ortak değerlendirmesi sonucunda nihai kod listesi oluşturulmuştur. Veri analiz sürecinde, araştırmacılar her bir öğretmen adayının her bir probleme verdiği yanıtları tek tek incelemiş ve bu yanıtları en uygun kodlarla eşleştirmiştir. Kodlayıcılar arası güvenilirlik oranının %92 olarak hesaplanması ve bu oranın Miles ve Huberman'ın (1994) önerdiği %70 sınırının üzerinde olması, yapılan kodlamaların güvenilir olduğunu göstermektedir. Kodlama sürecinin ardından yanıtlar kodlara göre sınıflandırılmış ve elde edilen bulgular betimsel istatistikler (frekans ve yüzde) aracılığıyla tablo hâlinde sunulmuştur. Bulguların yorumlanmasında, gerektiği yerlerde öğretmen adaylarının yanıtlarından doğrudan alıntılara da yer verilmiştir.

Sınırlılıklar

Araştırma, 2024–2025 akademik yılının bahar döneminde bir devlet üniversitesinde öğrenim görmekte olan beş matematik öğretmeni adayı ile sınırlandırılmıştır. Çalışma kapsam bakımından logaritmik fonksiyon konusu ile sınırlıdır. Ayrıca araştırmanın verileri, araştırmacılar tarafından geliştirilen görüşme formundan elde edilen verilerle sınırlıdır.

Araştırmanın Etik İzinleri:

Bu çalışmada “Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi” kapsamında uyulması gerektiği belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan “Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler” başlığı altında belirtilen eylemlerin hiçbiri gerçekleştirilmemiştir.

Etik Kurul İzin Bilgileri:

Etik değerlendirmeyi yapan kurulun adı = Hacettepe Üniversitesi Eğitim Bilimleri Enstitüsü Araştırma Etik Kurulu

Etik Kurul Etik inceleme karar tarihi = 5 Şubat 2025

Etik değerlendirme belgesi konu numarası = E-82474949-050-00004035972

Bulgular

Görüşmelerden elde edilen veriler, araştırma soruları doğrultusunda betimsel olarak çözümlenmiş ve bulgular dört başlık altında sunulmuştur.

Logaritmik Fonksiyonun Tanımlı Olması İçin Gereken Koşullar Nelerdir? Sorusuna İlişkin Bulgular

Öğretmen adaylarının logaritmik fonksiyonun tanımı/temel koşullarına ilişkin açıklamaları beş alt kategoride toplanmıştır: taban koşulu (a), bağımsız değişken koşulu (x), üstel fonksiyonla ilişki kurma, fonksiyon özellikleri ve cevap yok/belirsizlik.

$\log_a x = y$ olacak şekilde aşağıdaki tablo düzenlenmiştir.

Tablo 1.

Matematik Öğretmeni Adaylarının Logaritmik Fonksiyonun Tanımına ve Özelliklerine Yönelik İfadeleri

Alt kategori	Kod	Öğretmen adayları	f	%
Taban koşulu(a)	Pozitif taban	Ö2, Ö4, Ö5	3	38
	$a > 1$	Ö1, Ö4	2	
	$a \neq 1$	Ö2	1	
	Tam sayı	Ö1, Ö4	2	
Logaritmik fonksiyonun bağımsız değişkeni (x)	x'in büyüklük koşulu	Ö1, Ö2, Ö4, Ö5	4	28
	x'in eşit olmama kosulu	Ö4, Ö5	2	
Üstel fonksiyon ile ilişki kurma	Sembolik gösterim	Ö1	1	10
	Ters fonksiyon vurgusu	Ö2	1	
Fonksiyon özellikleri	Birebir ve örtenlik	Ö2	1	10
	Süreklilik vurgusu	Ö3	1	
Cevap yok / Belirsizlik	Bilgi eksikliğini farkında olma	Ö1, Ö3, Ö5	3	14

Tablo 1’de yer alan dağılım, ifadelerin en çok taban koşulu (%38) ve bağımsız değişken koşulu (%28) üzerinde yoğunlaştığını göstermektedir. Taban koşulu kapsamında adayların bir kısmı “tabanın pozitif olması ($a > 0$)” vurgusu yaparken (Ö2, Ö4, Ö5), bazıları tabanı “ $a > 1$ ” ile sınırlamış (Ö1, Ö4) ya da “ $a \neq 1$ ” koşulunu belirtmiştir (Ö2). Bazı adayların tabanı “tamsayı/pozitif tam sayı” olarak ele alması, taban koşulunun genellenmesinde güçlük yaşandığına işaret etmiştir. Bağımsız değişken koşulunda ise $x > 0$ ifadesi yaygın olmakla birlikte, bazı adayların bu koşulu “ $x \neq 0/x \neq 1$ ” biçiminde daralttığı ve $a \neq 1$ ile $x > 0$ koşullarını net bir biçimde ayırtmadığı görülmüştür.

Logaritmik Fonksiyonun Formal Tanımı Dışında Nasıl Açıklarsınız? Sorusuna İlişkin Bulgular

Formal tanım dışındaki anlamlandırmalar üç alt kategoride toplanmıştır: üstel–logaritmik ilişki, logaritmik ölçekleme/temsil ve sembolik temsil.

Tablo 2.

Matematik Öğretmeni Adaylarının Logaritmik Fonksiyonun Formal Olmayan Tanımlarına Yönelik İfadeleri

Alt kategori	Kod	Öğretmen adayları	f	%
Üstel-logaritmik ilişkisi	Üs olarak logaritma	Ö1	1	17
Logaritmik ölçekleme ve temsil	Artış şiddeti	Ö2	1	33
	Büyük sayıları ifade etmek	Ö5	1	
Sembolik temsil	Log sembolü imgesi	Ö3	1	50
	Ln sembolik imgesi	Ö3, Ö4	2	

Formal tanım dışındaki anlayışlarda üç eğilim öne çıkmıştır: üstel–logaritmik ilişki, logaritmik ölçekleme/temsil ve sembolik temsil. “Artış şiddeti” ve “büyük sayıları ifade etmek” kodlarının birlikte %33 oranında görülmesi, bazı adayların logaritmik fonksiyonu büyüklükleri ölçeklendiren bir araç olarak anlamlandırabildiğini göstermektedir. Ancak en yüksek yoğunluk “sembolik temsil”dedir (%50): Adayların önemli bir kısmı logaritmik fonksiyon denildiğinde öncelikle log ve özellikle ln sembollerini çağrıştıran bir anlayış oluşturmuştur (Ö3, Ö4).

Logaritmik Fonksiyonların Grafiklerine İlişkin Neler Söyleyebilirsiniz? Logaritmik Fonksiyonun Grafiğini Çizerken Nelere Dikkat Edersiniz? Sorusuna İlişkin Bulgular

Grafiklere ilişkin açıklamalar; grafik oluşturma stratejileri, artan/azalanlık, asimptot ve cevap yok kategorilerinde toplanmıştır.

Tablo 3.

Matematik Öğretmeni Adaylarının Logaritmik Fonksiyonun Grafiklerine Yönelik İfadeleri

Alt kategori	Kod	Öğretmen adayları	f	%
Grafik oluşturma stratejileri	Tanım/ değer kümesine odaklanmak	Ö3, Ö5	2	14
Artan/azalan fonksiyon	Genel artanlık algısı	Ö1, Ö5	2	58
	Sürekli ama doğrusal olmayan	Ö2	1	
	Tanım/değer kümesine odaklı	Ö3, Ö5	2	
	Tabana bağlı	Ö2, Ö4	2	
	Logaritmik fonksiyon işareti	Ö5	1	
Asimptot	Yaklaşma-ulaşamama	Ö4	1	21
	Yatay asimptot	Ö1	1	
	y=1 doğrusuna yaklaşma	Ö1	1	
Cevap yok	Bilgi eksikliğini farkında olma	Ö3	1	7

Bu dağılıma göre en yüksek yoğunluk artan/azalanlık kategorisindedir (%58). Bazı adaylar artanlık/azalanlığı tabanla ilişkilendirmiş ($0 < a < 1$ ise azalan; $a > 1$ ise artan) (Ö2, Ö4); bazıları ise “genel artanlık” gibi genelleyici söylemler kullanmıştır (Ö1, Ö5). Grafiklere ilişkin bulgularda adaylar çoğunlukla artanlık-azalanlık ve asimptotik davranış üzerinde durmuş; bazı adayların artanlık-azalanlığı tabana bağlı doğru ölçütle gerekçelendirdiği, bazılarının ise işaret gibi yüzeysel ipuçlarına dayalı yorum yaptığı görülmüştür.

Gerçek Yaşamda Karşımıza Çıkan Bir Logaritmik Fonksiyon Örneği Verir Misiniz? Sorusuna İlişkin Bulgular

Gerçek yaşam örnekleri üç alt kategoride toplanmıştır: ölçek temelli örnekleme, logaritmanın tabanına ilişkin vurgu ve üstel fonksiyon bağlamı.

Tablo 4.

Matematik Öğretmeni Adaylarının Logaritmik Fonksiyonun Gerçek Yaşamda Kullanım Alanlarına İlişkin İfadeleri

Alt kategori	Kod	Öğretmen adayları	f	%
Ölçek temelli örnekleme	Deprem ölçeği	Ö2, Ö4, Ö5	3	50
Logaritma tabanına ilişkin vurgu	Logaritma on tabanı	Ö1	1	17
Üstel fonksiyon bağlamı	Biyoloji/ bakteri çoğalması	Ö3, Ö4	2	33

Gerçek yaşamla ilişkilendirmede en yaygın örnek deprem ölçeği olmuş; daha sınırlı düzeyde pH/ses şiddeti türü ölçek mantığına atıf ve biyoloji/bakteri çoğalması gibi üstel süreçlere yönelen açıklamalar da gözlenmiştir.

Tartışma ve Sonuç

Bu çalışmada matematik öğretmeni adaylarının logaritmik fonksiyon kavramına yönelik anlayışları üç alt problem doğrultusunda incelenmiştir. Birinci alt problem kapsamında adayların logaritmik fonksiyonun tanımına yönelik açıklamaları; taban koşulu, bağımsız değişken (x), üstel fonksiyon ile ilişki kurma, fonksiyon özellikleri ve cevap yok/belirsizlik olmak üzere beş alt kategoride toplanmıştır. Taban koşuluna ilişkin bulgular,

adayların tabanı belirleyen koşulları genel ve tam biçimiyle ifade etmekte zorlandıklarını göstermektedir. Adayların bir bölümü tabanın pozitif olması gerektiğini ($a > 0$) vurgulamış (Ö2, Ö4, Ö5); bazıları tabanı $a > 1$ ile sınırlandırmış veya $a \neq 1$ koşulunu belirtmiştir (Ö1, Ö2, Ö4). Bunun yanı sıra tabanı “tamsayı/pozitif tam sayı” olarak ifade eden açıklamalar da görülmüştür (Ö1, Ö4). Bağımsız değişken koşulunda adayların önemli bir kısmı $x > 0$ koşuluna atıf yapmış (Ö1, Ö2, Ö4); bazı adaylar ise “eşit olmama” biçiminde ($x \neq 0$, $x \neq 1$) ifade ederek $x > 0$ koşulunu daraltmıştır (Ö4, Ö5). Bu bulgular, adayların $a \neq 1$ ve $x > 0$ koşullarını net olarak ayırtamadıklarını göstermektedir. Elde edilen sonuçlar, öğrencilerin logaritmik fonksiyonu doğru ve tutarlı biçimde tanımlamakta zorlandıklarını raporlayan çalışmalarla paralellik göstermektedir (Akkuş, 2004; Campo-Meneses vd., 2021).

Formal tanım dışındaki anlayışlar üç alt kategoride toplanmıştır: üstel–logaritmik ilişkisi, logaritmik ölçekleme/temsil ve sembolik temsil. Logaritmik ölçekleme/temsil kapsamında “artış şiddeti” (Ö2) ve “büyük sayıları ifade etmek” (Ö5) kodları birlikte %33 düzeyinde yer alırken, en yüksek oran “sembolik temsil” alt kategorisinde görülmüştür (%50). “Log sembolü imgesi” ve “ln sembolik imgesi” ifadeleri, logaritmik fonksiyon denildiğinde adayların önemli bir kısmının öncelikle log ve ln sembollerini çağrıştırdığını göstermektedir (Ö3, Ö4). Bu bulgu, öğrencilerin logaritmik fonksiyon kavramını çoğunlukla sembolik bir gösterim ya da yapılacak bir işlem olarak gördüklerini belirten sonuçlarla örtüşmektedir (Kastberg, 2002).

İkinci alt problemde logaritmik fonksiyonların grafiklerine ilişkin anlayışlar incelenmiştir. Adayların açıklamaları; grafik oluşturma stratejileri, artan/azalan fonksiyon, asimptot ve cevap yok alt kategorileri altında kodlanmıştır. Genel olarak adaylar grafiği yorumlarken artanlık (%58) ve asimptotik davranış (%21) üzerinde yoğunlaşmıştır; ancak bu iki boyutta hem doğru ölçütlerin (tabana bağlı artış/azalış; yaklaşma–ulaşamama fikri) hem de karışık/eksik temsillerin (işarete dayalı artanlık) birlikte bulunduğu görülmüştür. Bu sonuç, öğrencilerin logaritmik fonksiyon grafiğini anlamlandırmada ve doğru grafik temsili oluşturmada zorlandıklarını belirten çalışmalarla benzerlik göstermektedir (Quinio & Cuarto, 2023).

Üçüncü alt problem kapsamında adayların logaritmik fonksiyonu gerçek yaşamla ilişkilendirme biçimleri incelenmiştir. Beş katılımcıdan üçü (Ö2, Ö4, Ö5), logaritmik fonksiyonlarla gerçek yaşam arasındaki ilişkiyi deprem ölçeği üzerinden açıklamış; bu durum, katılımcıların yarısından fazlasının logaritmik fonksiyonları öncelikle Richter türü ölçeklerle ilişkilendirdiğini göstermiştir. Bu tercih, deprem ölçeğinin ortaöğretim düzeyindeki logaritmik fonksiyon uygulamalarında sıklıkla kullanılan bir örnek olmasıyla açıklanabilir. Bu bulgu, deprem büyüklüğü (Richter ölçeği), pH değeri ve ses şiddeti (desibel) gibi bağlamları üstel ve logaritmik fonksiyonlarla modellenen gerçek yaşam durumlarına örnek olarak sunan 2018 Ortaöğretim Matematik Dersi Öğretim Programı ile de tutarlıdır (Millî Eğitim Bakanlığı [MEB], 2018). Gol Tabaghi (2007) de Richter, pH ve desibel gibi logaritmik ölçekleri, logaritmik fonksiyonun farklı alanlardaki uygulamalarına örnek olarak göstermektedir. Ayrıca Budinski ve Takaçi (2013), Richter ölçeğini logaritmaların öğretiminde kullanılan gerçek yaşam bağlamlarından biri olarak ele almaktadır. Bunun yanında iki katılımcı (Ö3, Ö4; %33), logaritmik fonksiyona örnek verirken bakteri çoğalması gibi üstel örneklere de değinmiştir. Bu

bulgu, bazı öğretmen adaylarının logaritmik ve üstel fonksiyonlar arasındaki ayrımı net biçimde kuramadıklarını göstermekte ve öğrencilerin bu kavramları ayırt etmekte zorlanabildiğini ortaya koyan çalışmalarla örtüşmektedir (Borji vd., 2023; Engbersen, 2009).

Bu çalışma, matematik öğretmeni adaylarının logaritmik fonksiyon kavramına ilişkin anlayışlarını tanım, grafik ve gerçek yaşam örnekleri boyutlarında incelemiştir. Elde edilen bulgular, öğretmen adaylarının logaritmik fonksiyonlara ilişkin bazı temel unsurları ifade edebildiklerini; ancak tanımlayıcı koşulları eksik ya da yanlış ifade etme, grafik özelliklerine ilişkin belirsizlik yaşama ve gerçek yaşam örneklerini sınırlı bağlamlar üzerinden açıklama gibi güçlüklerle karşılaştıklarını göstermiştir. Bu durum, logaritmik fonksiyon kavramının öğretiminde yalnızca işlemsel bilgiye değil, kavramsal anlamaya da odaklanılması gerektiğine işaret etmektedir.

Öneriler

Bu çalışma, sınırlı sayıda öğretmen adayı ile yürütülen derinlemesine görüşmelere dayanmaktadır. Gelecek araştırmalarda daha geniş örneklerle çalışılması; farklı katılımcı gruplarının (lise öğrencileri ve öğretmenler) sürece dâhil edilerek logaritmik fonksiyon kavramına ilişkin anlayışların nicel verilerle desteklenmesi ve karşılaştırmalı biçimde incelenmesi önerilmektedir.

Matematik öğretmeni adaylarının logaritmik fonksiyon kavramına ilişkin anlayışlarını desteklemek amacıyla, kavramsal öğrenmeyi merkeze alan öğretim süreçlerine yer verilmesi önerilmektedir. Bu doğrultuda, grafik temelli etkinliklerin artırılması, logaritmik fonksiyonların farklı temsillerinin birlikte ele alınması ve teknoloji destekli uygulamaların öğretim sürecine entegre edilmesi önemli görülmektedir.