

Fen Bilimleri Öğretmenlerinin SKA4 (Nitelikli Eğitim) Hakkındaki Görüşleri

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Öz

Bu çalışma, fen bilimleri öğretmenlerinin Sürdürülebilir Kalkınma Amacı (SKA) 4'e ilişkin bakış açılarını araştırmaktadır. Fen bilimleri öğretmenlerinin yaşam deneyimlerini anlamayı içeren fenomenolojik tasarıma dayalı nitel bir araştırma yöntemi kullanılmıştır. Bu çalışmada nitel araştırmalarda sıklıkla kullanılan amaçlı örnekleme stratejilerinden ölçüt ve kolay ulaşılabilir örnekleme birlikte kullanılarak çalışma grubu belirlenmiştir. Bu bağlamda çalışma Türkiye'nin Orta Anadolu bölgesinde bulunan bir ilde görev yapan altı fen bilgisi öğretmeni ile yürütülmüştür. Veri toplama aracı olarak yarı yapılandırılmış bir görüşme formu kullanılmış ve üç görüşme sorusu sorulmuştur. Araştırma analiz sürecinden önce katılımcıların izni alınarak yapılan sesli görüşme kayıtları yazılı metne dönüştürülmüştür. Daha sonra elde edilen veriler betimsel ve içerik analizi teknikleri kullanılarak analiz edilmiştir. Çalışmada ilk olarak fen bilimleri öğretmenlerinin eğitim kalitesine ilişkin bakış açıları analiz edilmiş ve eğitimde kalitenin amacı, süreci ve öğretmen yeterlilikleriyle bağlantılı olduğu bulunmuştur. Daha sonra, öğrenciler, eğitim ortamı, öğretmenlerin mesleki yeterlilikleri ve müfredat ile ilgili çeşitli faktörler göz önünde bulundurularak SKA4'e ulaşma kriterleri değerlendirilmiştir. Son olarak, öğretmenlerin eğitimde bilgi ve iletişim teknolojilerinin (BİT) kullanımına ilişkin görüşlerini incelemiş ve avantaj ve dezavantajları konusunda dengeli bir bakış açısı ortaya konmuştur. Çalışma ayrıca, gelecekteki araştırmaların daha kapsamlı bir anlayış için öğrenci, veli ve okul yöneticilerinin bakış açılarını içermesi gerektiğini önererek sınırlılıklarını ve önerilerini sunmuştur.

Anahtar Kelimeler: Sürdürülebilir kalkınma amaçları, sürdürülebilir eğitim, nitelikli eğitim

Makale Hakkında

Geliş Tarihi: 17.04.2025

Kabul Tarihi: 26.06.2025

Yayın Tarihi: 30.06.2025

Atıf için: Kızılay, E., Taş, V. (2025). Fen bilimleri öğretmenlerinin SKA4 (nitelikli eğitim) hakkındaki görüşleri. *İZÜ Eğitim Dergisi*, 7(1), 45-62. <https://doi.org/10.46423/izujed.1678572>

Etik Beyan

Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur (Esra KIZILAY).



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* Bu çalışmanın hazırlanma sürecinde yapay zekâ tabanlı herhangi bir araç veya uygulama kullanılmamıştır. Çalışmanın tüm içeriği, yazar(lar) tarafından bilimsel araştırma yöntemleri ve akademik etik ilkelere uygun şekilde üretilmiştir.

Science Teachers' Perspectives on SDG4

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Abstract

This study investigates the perspectives of science teachers on SDG4. A qualitative research method based on phenomenological design was used, which involved understanding the experiences of the science teachers. In this study, criterion and easily accessible sampling, which are purposeful sampling strategies frequently used in qualitative research, were used together to determine the study group. In this context, the study was conducted with six science teachers who work in a province in the Central Anatolia region of Türkiye. A semi-structured interview form was utilized as a data collection tool, and three interview questions were posed. Before the research analysis process, the audio interview recordings made with the participants' permission were converted into written text. Then, the obtained data were analyzed using descriptive and content analysis techniques. The study initially analyzed science teachers' perspectives on the quality education, finding that quality was linked to the purpose and process of education and teacher competencies. Subsequently, the criteria for achieving SDG4 were evaluated, considering various factors related to students, the educational environment, teachers' professional competence, and the curriculum. Finally, the study examined teachers' views on using information and communication technologies (ICT) in education, revealing a balanced perspective on the advantages and disadvantages. The study also presented its limitations and recommendations, suggesting that future research should include the perspectives of students, parents, and school administrators for a more comprehensive understanding.

Keywords: SDGs, sustainable education, quality education

About Article

Received Date: 17.04.2025

Accepted Date: 26.06.2025

Publication Date: 30.06.2025

To Cite: Kızılay, E., Tas, V. (2025). (2025). E-portfolio research in turkey: a systematic review. *IZU Journal of Education*, 3(1), 45-62. [https://doi.org/ 10.46423/izujed.1678572](https://doi.org/10.46423/izujed.1678572)

Ethical Statement

It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited. (Esra KIZILAY).



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*No artificial intelligence-based tools or applications were utilized in the preparation of this manuscript. All content was generated solely by the author(s) in adherence to scientific research methodologies and academic ethical standards.

Introduction

Sustainable development is not just a short-term goal but a long-term vision. It is humanity's capacity to pursue development without jeopardizing the ability of future generations to meet their own needs while meeting the needs of the present. This concept includes the impacts of existing technology and social structures on environmental resources and the limitations of the biosphere's capacity to absorb human activities (WCED, 1987).

Various international conferences and events have shaped sustainable development over a long historical period. Some important events and documents that have been decisive in this process are as follows (United Nations, n.d.):

- The history of sustainable development goals goes back a long way. The Earth Summit in Rio de Janeiro in 1992 was the first central turning point. At this summit, more than 178 countries adopted Agenda 21, a comprehensive plan of action to build a global partnership to improve human life and protect the environment. Agenda 21 was the first significant international document on sustainable development and, taken as a basis, formed the origin of the sustainable development goals.
- Member states unanimously adopted the Millennium Declaration at the Millennium Summit in New York in September 2000. This summit set eight Millennium Development Goals (MDGs) to reduce extreme poverty by 2015. The MDGs contributed to further popularizing and adopting sustainable development goals.
- The World Summit on Sustainable Development in South Africa in 2002 represented another critical step forward with adopting the Johannesburg Declaration on Sustainable Development and Plan of Implementation. This document focused on poverty reduction and the global community's reaffirmation of environmental commitments. It further strengthened Agenda 21 and the Millennium Declaration, giving sustainable development a new dimension with a greater emphasis on multilateral partnerships.
- In 2012, the United Nations Conference on Sustainable Development (Rio+20) in Rio de Janeiro adopted an outcome document entitled 'The Future We Want'. This document envisaged the launch of a process to develop the Sustainable Development Goals and establish the UN High-Level Political Forum on Sustainable Development. The Rio+20 outcomes also included future work programs for financing and implementing sustainable development.
- In 2013, the UN General Assembly established a working group to develop a proposal on the Sustainable Development Goals. In 2015, this working group adopted the 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals, at the UN Summit on Sustainable

Development. This work was essential in further concretizing the Sustainable Development Goals and making them the focus of global development efforts throughout the 21st century.

- The Sustainable Development Goals (SDGs), adopted at the United Nations Headquarters on 25-27 September 2015, cover issues such as ending poverty and hunger, eliminating inequalities, protecting human rights, gender equality and protecting the environment. By 2030, the leaders committed to working towards these goals and pledged that no one would be left behind (United Nations, 2015).

Theoretical Framework

The fourth goal of sustainable development is ‘quality education’ (SDG4). This goal ensures inclusive and equitable SDG4 and promotes lifelong learning opportunities for all. SDG4 aims to ensure everyone has equal and equitable access to quality education by 2030. In this context, it should be ensured that girls and boys receive free and quality primary and secondary education, are prepared for primary education through pre-primary education, and that women and men have access to technical, vocational, and higher education. In addition, youth and adults should be encouraged to acquire the necessary skills for employment and entrepreneurship while eliminating gender inequalities and ensuring equal access to education for vulnerable groups. Increasing literacy and numeracy skills, providing the knowledge and skills necessary for sustainable development, creating safe and inclusive learning environments, increasing scholarship opportunities for developing countries, and training qualified teachers are among the main components of SDG4 (Figure 1) (United Nations Turkey, n.d.).

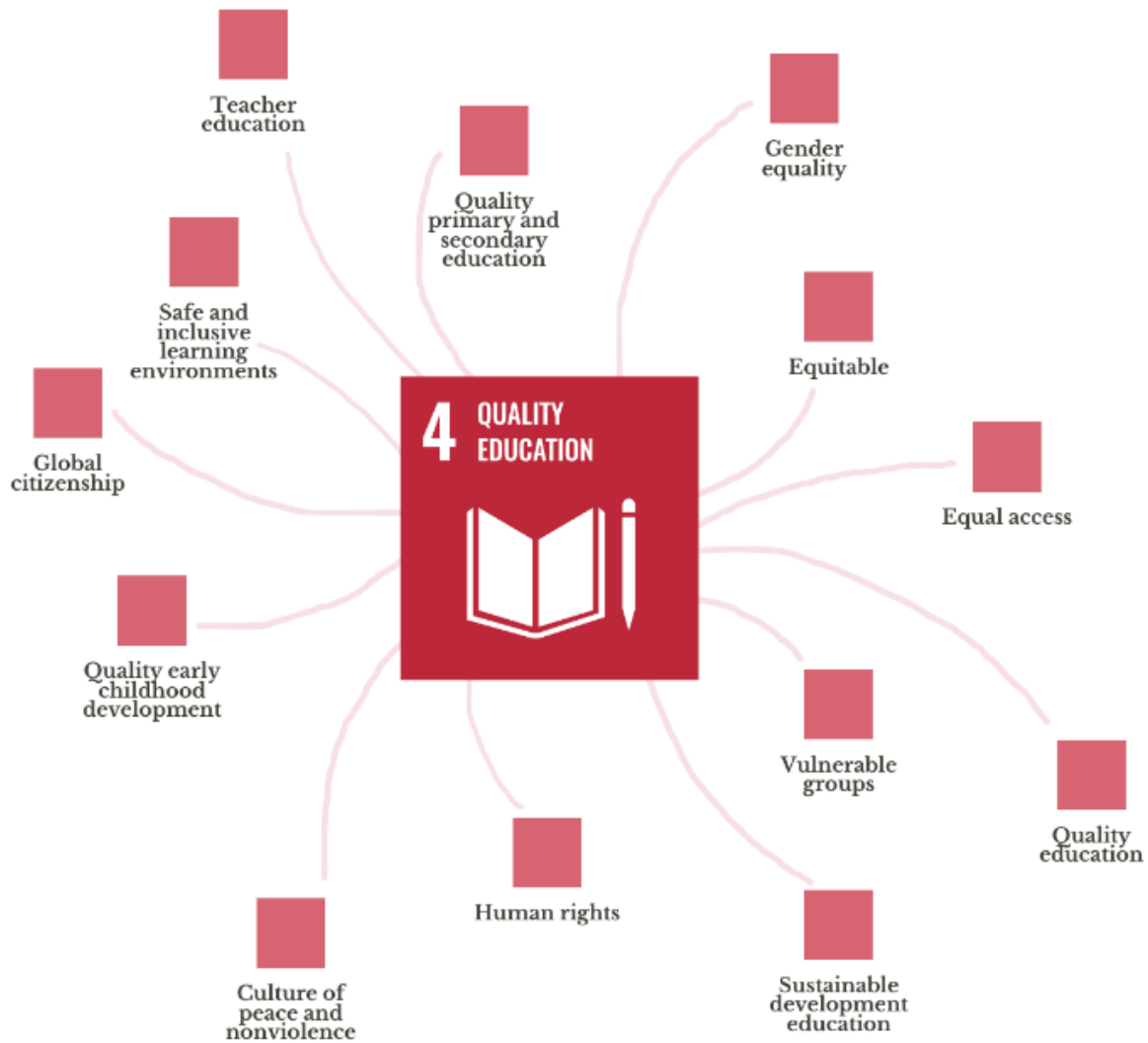
The most influential trends affecting education policies and SDG4 within the sustainable development framework are environmental sustainability, digitalization, equality, inclusion, and diversity. These trends need to be addressed in harmony with each other. Based on OECD data, three priorities have been identified in SDG4 for 2024: turning students' environmental awareness into action, providing all students with experiences that will help them shape the green economy, positioning education as a strategic sector for the transition to greener societies (OECD, 2023). To achieve these three priorities and thus for SDG4 (OECD, 2023);

- The effects of digitalization and artificial intelligence technologies should be considered in education.
- Equal access should be ensured through the use of digital technologies.
- Equality, inclusion, and diversity in education systems should be strengthened.
- The role of education in green transformation should be emphasized, and sectoral collaborations should be encouraged.
- Environmental awareness and sustainability issues should be integrated into curricula.

- Education systems should also emphasize transitioning to a green economy and taking action on the environment.
- Education policymakers should intensify their efforts to ensure they are sensitive to long-term trends and resilient to future contingencies.

Figure 1

The Components of SDG4



The realization of the recommendations and sub-targets to achieve SDG4 depends on teachers' competencies and views on SDG4. Teachers' views on SDG4 play a critical role in achieving the SDGs. The knowledge and values teachers transmit directly to students in the classroom are essential for adopting and implementing the SDGs. Teachers' views provide essential feedback on how current education policies work in the field, in which areas improvements are needed, and which skills are prioritized for students to acquire to achieve SDG4. Teachers are crucial in ensuring that fundamental principles such as equity and inclusion in education are reflected in practice. In addition, science teachers' experiences and recommendations on

environmental awareness, digitalization, and transition to a green economy can guide the shaping of education policies and updating curricula. Therefore, a detailed examination of teachers' views on SDG4 is indispensable for developing effective strategies to achieve sustainable development goals. In this context, some studies have been conducted in prior works.

Studies in the literature reveal that the quality of teachers, effectiveness of education policies, inclusion, and equality principles are essential for SDG4 in the context of teachers' views. Abazaoğlu, Yıldırım, and Yıldızhan (2016) argued that qualified education is possible with qualified teachers and stated that Turkey has accumulated experience in teacher education. They emphasized that teachers should be able to adapt to the age and that the education faculties should be specialized. Bülbül and Sakız (2020) emphasized that education programs should be inclusive and that every student should be given equal education without discrimination of religion, language, race and gender. Cesur (2020) stated that teachers' motivation and performance increase school success, and teacher competence affects academic achievement. He emphasized the adverse effects of constantly changing programs on quality education. Cıvış (2021) compared the education expenditures of OECD countries and Turkey and stated that Turkey's education expenditures are low. He emphasized that income inequality creates inequality of opportunity in education. Karatay and Emini (2022) criticized that inter-regional and inter-student differences in education are problems and that education is teacher-centered and rote learning. They stated that education policies need to be revised to solve existing problems. Ömür (2016) argued that the definition of quality education varies according to the context, and quantitative measurements should not standardize the determinants of quality education. He stated that education should encourage personal knowledge production. Kaynak et al. (2023) examined quality education among sustainable development goals and stated that Turkey should increase national and international cooperation. They emphasized the importance of equality, lifelong learning, and inclusion in education. When these studies are analyzed, teachers' views on different aspects of quality education are included. There is no research in the literature on SDG4 conducted with teachers. This study was structured as a step to eliminate the deficiency in the literature.

The study aimed to examine the views of science teachers about SDG4. The research questions were:

- What are science teachers' views on quality education?
- According to science teachers, what are the criteria that should be taken into consideration for SDG4?
- What do science teachers think about using information and communication technologies (ICT) in education in Türkiye?

Method

Research Model

This study is structured according to phenomenology, one of the qualitative research designs. Phenomenology is a research approach that aims to reveal how individuals experience a particular phenomenon, how they give meaning to these experiences, and the essence of these experiences (Creswell, 2021; Patton, 2018). In this context, the phenomenology design was preferred in the study because the research aims to reveal in depth the views, experiences, and individual meanings of science teachers on Quality Education (SDG4), one of the SDGs. How science teachers grasp the concepts of education and sustainability in the context of SDG4, the common themes in their views on these concepts, and personal approaches can be analyzed most appropriately through the phenomenological approach. Therefore, this design epistemologically overlaps with the study's purpose and the data type.

Working Group

In this study, criterion and easily accessible sampling, which are purposeful sampling strategies frequently used in qualitative research, were used together to determine the study group.

Criterion sampling aims to select participants who have the experience and competence to make sense of a particular phenomenon. In this direction, the basic criteria were determined as the science teachers who will take part in the study working in public schools affiliated with the Ministry of National Education, having at least three years of professional experience, and having previously participated in a professional development activity (seminar, in-service training, project, etc.) related to sustainable development education. In addition, easily accessible sampling was also used because the geographical location of the institution where the researcher worked facilitated access to science teachers with these characteristics (Şahan & Uyangör, 2021; Yıldırım & Şimşek, 2021). Therefore, the two sampling methods were used together to reach participants who met specific criteria and ensure efficiency in the data collection process. In this context, the study was conducted with six science teachers who work in a province in Kayseri of Türkiye and meet the above-mentioned criteria.

The "in-depth knowledge acquisition" approach, the basis of qualitative research, was considered in determining the number of participants. Qualitative research aims to reveal the participants' experiences, thoughts and perceptions in a detailed and meaningful way rather than a quantitative representation. In this context, the data collection process was carried out until the data saturation principle was reached, and similar themes and patterns were observed in the data obtained from six participants.

This situation shows that the number of participants in the study was sufficient to allow qualitative data analysis and served the purpose of the research. Similarly,

Patton (2018) states that small but in-depth analysis samples can provide meaningful results in qualitative research. In addition, data were collected from 4-10 participants in studies conducted in education

Procedure and Data Collection

The study used a semi-structured interview form as a data collection tool. Interview is an important data collection method used to collect information about the individual's experiences (Yıldırım & Şimşek, 2021). Since phenomenology is a study based on the experiences of the individual, the interview was preferred as a data collection tool.

The researchers prepared the interview questions, and the opinions of two experts who specialize in science education and have studies on sustainable development were taken. The questions were restructured with the first expert. Final evaluations were made on the questions with the second expert. The question 'What are your views on gender inequality education?', structured with the first expert, was turned into the probe of the main question with the second expert opinion. In total, three interview questions were prepared. The interview questions are given in Table 1

Table 1

Interview Questions

Questions
1) What are your views on quality education?
2) What do you think are the criteria that should be considered for SDG4?
<ul style="list-style-type: none"> • In terms of gender • In terms of special needs • In terms of the safety of learning environments • In terms of infrastructure • In terms of teaching programs • In terms of teacher education • Other
3) What are your views on using information and communication technologies (ICT) in education in our country?

Procedure and Data Collection

Before the research analysis process, the audio interview recordings made with the participants' permission were converted into written text. Then, the obtained data were analyzed using descriptive and content analysis techniques.

Descriptive analysis was used to organize the data according to the themes determined in advance in line with the research questions and to present them supported by direct quotes. In this context, the teachers' opinions were summarized descriptively and presented under the themes in a way that would create a meaningful whole.

Content analysis was applied to examine the data more deeply and reveal the recurring meaning patterns, concepts and themes in the participants' statements. The data were systematically coded at this stage, and categories and themes were created based on these codes. The coding process was conducted with an inductive approach based on the research questions. The findings obtained from the coding process were presented in tables, and the relevant direct quotes were included in each theme.

In order to adhere to ethical principles, the participating teachers were given codes such as T1, T2, T3, T4, T5, and T6; thus, their real names were hidden. In the data analysis and interpretation process, the integrity of meaning was maintained, and the findings were presented clearly and understandably.

Credibility and Confirmability

In qualitative research, criteria such as credibility, transferability, consistency and confirmability are used instead of validity and reliability. In this context, the following measures were taken in order to ensure the scientific adequacy of qualitative data analysis in the research (Yıldırım & Şimşek, 2021):

Credibility: To increase the research's credibility, the semi-structured interview form used in the data collection process was developed in line with the opinions of two academicians who are experts in the field. In this way, the suitability of the questions for the research was evaluated, and content validity was ensured. During the interviews, participants were encouraged to express their thoughts in their own words, and direct quotes from the obtained data supported the findings.

Confirmability: To avoid researcher bias and show that the data were analyzed objectively, all coding decisions obtained during the analysis process were documented, and the data were systematically interpreted. In addition, independent coding was done with a second researcher to ensure inter-coder agreement, and the inter-coder agreement was calculated at 95% according to the formula suggested by Miles and Huberman (1994). This rate supports the confirmability of the analyses.

Transferability: The findings are presented thematically so readers can adapt to similar situations.

Dependability: The research process (data collection, analysis and interpretation stages) is explained in detail, and transparent reporting is provided. In this way, the researchers attempted to ensure that different researchers can conduct the research similarly.

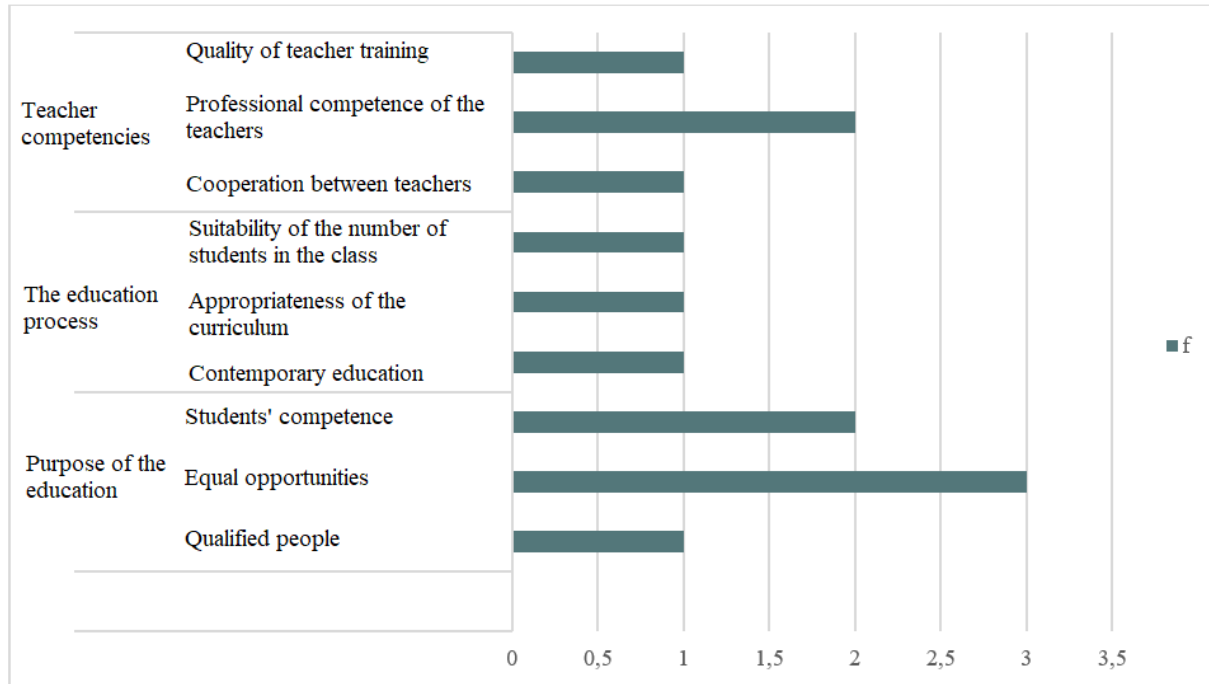
Findings

Theme 1: Opinions on Quality education

Science teachers' views on quality education were analyzed. Codes and categories were created and given in Figure 2.

Figure 2

Categories and Codes Related to Teachers' Views on Quality Education



When Figure 2 is analyzed, it is seen that science teachers associate quality education with the purpose of education, educational process, and teacher competencies. Teachers generally stated that education quality is related to education's aims. Three out of six teachers stated that quality education is to provide equal opportunities. Sample views of teachers about quality education are given below.

T3: 'Quality education is equal opportunity for children, that comes to my mind. It seems that it is about providing the same materials to all students in the same way in the whole country, providing the same educational environment, and using the same educational methods...' (Equality opportunity)

This statement shows that the teacher evaluates quality education more in terms of access and equality of resources. The teacher emphasizes that all students should have the same opportunities throughout the country and draws attention to the importance of standardization in physical equipment and teaching practices. This also reveals that the teacher evaluates the quality education in the context of a social justice principle based on equality.

In another view, the same teacher touches on the importance of communication between teachers:

T3: '... I think it would be more beneficial all over Turkey for the education we will give to children to be of better quality and for it to be better if teachers are in constant communication with each other to provide education to children.' (Cooperation between teachers)

From this view, it is understood that the teacher associates quality education with equality of content and environment and professional cooperation between teachers. This situation shows that the teacher embraces the importance of collective professional learning processes in increasing the quality education.

Theme 2: Views on the Criteria to be Considered for SDG4

Science teachers' views on the criteria that should be considered for a qualified education were analyzed. Codes and categories were created and presented in Table 2.

Table 2

Teachers' views on the criteria to be considered for SDG4

Categories	Codes	f
Criteria for the student	Gender equality	5
	Student motivation	1
	Equality between students	1
	The student likes the educational environment	1
	Guidance for career choice	1
Criteria for the educational environment	Suitability of the number of students in the class	1
	Suitability of the learning environment for the student	3
	Internet Infrastructure	2
	Emphasis on special education	5
	Safety of the educational environment	3
	Equal opportunities	2
Criteria for the professional competence of teachers	Infrastructure of the learning environment	2
	Qualified teachers	3
	Self-development of the teacher	3
Criteria related to the curriculum	Quality undergraduate education of the teacher	1
	Appropriateness of the curriculum	5
	Technology training	1
	Current information	1
	Suitability to student-level	2

When Table 2 is examined, it is seen that science teachers stated that criteria related to students, educational environment, professional competence of teachers, and curriculum should be considered for SDG4. In the teachers' statements, it is

generally observed that the criteria related to the educational environment should be considered for SDG4. Sample opinions of the teachers are given below.

T2: 'First of all, for example, I would like the teacher to appeal to students more constructively; that is, I would like the teacher to motivate the students initially. This is one of the biggest factors that the teacher can do for quality education...' (Student motivation)

This view shows that the teacher evaluates quality education through cognitive outcomes and as a process of establishing emotional and relational connections. The teacher draws attention to the decisive effect of motivation on the learning process and emphasizes that student-teacher interaction is the basis of quality education.

T3's statement indicates that the realities of the country should structure education:

T3: '...for quality education, I think we should aim to educate students according to the resources of our country and according to the needs.' (Guidance for career choice)

This approach shows that the teacher associates quality education with sustainable development; that is, students need to be educated in a way suitable for academic, social, and economic conditions. This statement indicates that SDG4 should be qualified not only in terms of access but also in terms of content and guidance.

T6 emphasizes the importance of planning education by student levels:

T6: '...for a qualified education, I can also add this, teacher, I mean, the readiness levels of children or the levels of children should be paid attention at first. We can create everything for education: the best teacher, the best program, the best learning environment, and the best infrastructure. However, it is necessary to know the level of the students who will take that course or receive that education at first. It is necessary to start and progress according to their level...' (Suitability to student level)

This statement reveals that the teacher adopts an individualized and level-based learning approach to increase education quality. Emphasizing that if student levels are ignored, the effect of all provided resources will decrease, the teacher points out that differences should be considered in implementing SDG4.

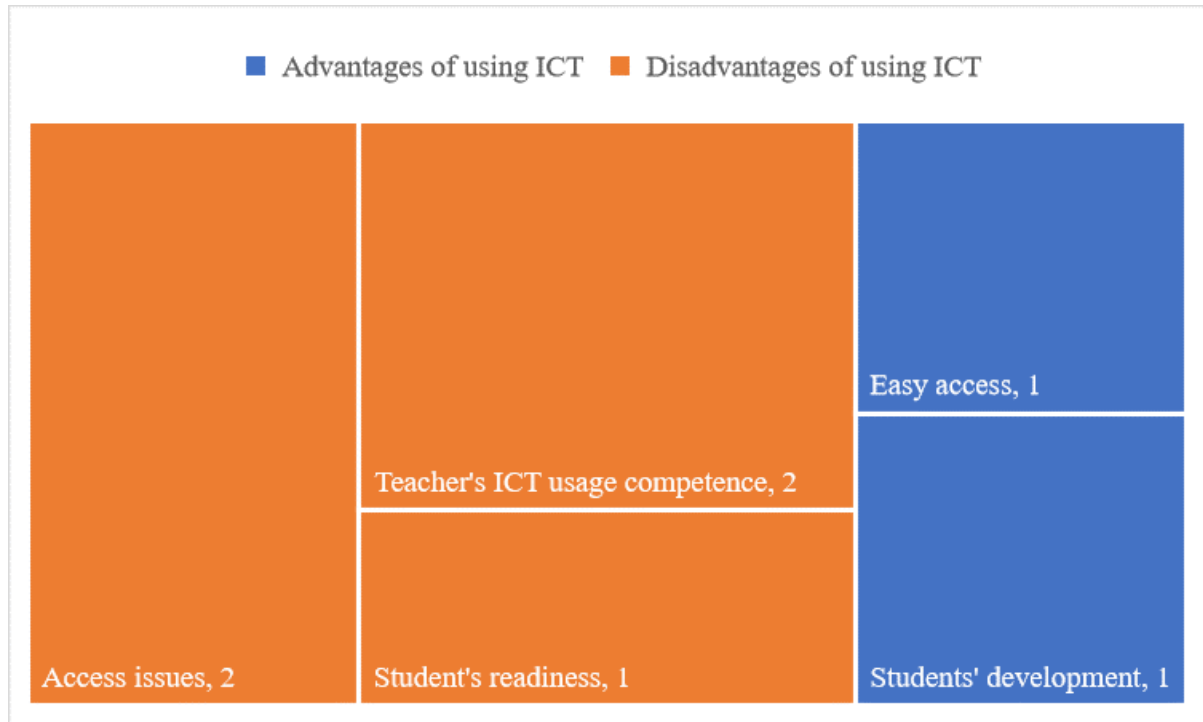
Theme 3: Opinions on the Use of ICT in Education

Science teachers' views on the use of ICT in education were analyzed. Codes and categories were created and given in Figure 3.

When Figure 3 is analyzed, it is seen that teachers mentioned the advantages and disadvantages of ICT use. In their statements, teachers mentioned ease of access and positive effects on student development among the advantages of using ICT in education. Some teachers also mentioned access problems, insufficient student readiness, and teacher competence in ICT use as disadvantages of ICT use.

Figure 3

Teachers' views on the use of ICT in education



Sample opinions of the teachers are given below.

T1: '...In education, this was very much before, but with the development of technologies, we can reach much information instantly, accessibility is very high...' (Easy access)

This statement shows that the teacher sees technology more as a tool for accessing information. The effect of the integration of ICT into education in accelerating learning and democratizing access to information is emphasized. In this context, the teacher indirectly states that SDG4 should be supported and disseminated through digital tools.

On the other hand, teacher T3 criticized the inadequacy of teachers in the use of ICT and the ineffective use of technology:

T3: 'They have been using it only recently for five years. Because there were not many before, smart boards entered the classrooms with these Fatih projects, but no teachers could use them. Yes, their trainings were given. Some said they could not use it and left it; some asked what the point was. They just opened a video, or now we only have EBA teachers, you know, they open it, they click on whatever is on EBA from the board, the children watch it, the teacher does not explain anything...' (Teacher's ICT usage competence)

This statement shows that the teacher states that it is not enough to integrate technology physically into the classroom alone and that failure to ensure effective pedagogical use reduces quality. This situation reveals that providing technological infrastructure in education is insufficient and that teachers' digital pedagogical competencies should also be developed. Therefore, the teacher emphasizes that teacher competencies are fundamental in supporting SDG4 with technology.

Conclusion and Discussion

Firstly, science teachers' views on quality education were analyzed. It was observed that science teachers associated quality education with the purpose of education, educational process, and teacher competencies. In particular, it was revealed that the teachers thought that the purpose of education was the most critical factor determining the quality education. In addition, many teachers emphasized equality of opportunity in education as a fundamental element of quality education. This finding is consistent with contemporary approaches that relate quality education to academic outcomes and principles of socio-economic justice (Wangenge-Ouma et al., 2024).

It was seen that science teachers expressed various criteria for students, educational environment, teachers' professional competence, and curriculum in terms of the criteria that should be taken into consideration for quality education. These findings support the views of Tabroni et al. (2022) that inputs, processes, and outputs should measure the quality education. In addition, the fact that teachers especially stated that the educational environment plays a critical role in quality education is in line with the findings of Laurie et al. (2016), which reveal the positive effects of education for sustainable development on improving curriculum and increasing student engagement. The findings of a study conducted by Nakidien et al. (2021) also show that criteria such as inclusion, equity, access to resources, safe learning environments, continuous professional development for teachers, effective use of pedagogical methods, and strong management support should be taken into consideration to ensure quality education.

The findings regarding the use of ICT in education show that teachers have a balanced view of the advantages and disadvantages of ICT use. Teachers emphasized the ease of access and positive effects of ICT use on student development. However, at the same time, they stated that access problems, inadequate student readiness, and teachers' lack of competence in ICT use are disadvantages. Similarly, the studies of Çelik (2019) and Canbay (2020) stated that although teachers have high technology literacy in ICT use, lack of access and differences between social strata constitute an essential obstacle.

Within the framework of these findings, the study contributes to the existing body of relevant work, especially in qualitatively examining science teachers'

perceptions of SDG4 in the context of sustainable development goals (SDGs). It provides original data on how quality education is defined from the teachers' perspective, which components it is associated with, and what kind of implementation problems are prominent. In addition, the relationship between ICT use and teacher competencies and quality education provides important clues for restructuring teacher education programs and developing sustainable development-based education policies.

The study can potentially produce policy implications, especially in revealing how science teachers make sense of SDG4 in the context of Turkey. In addition, teachers' evaluations of the educational environment, equal opportunities, and technology use can be the primary data source for future applied studies and intervention programs.

Limitations and Future Research

The study's limitation is that the sample is small and limited to science teachers in only one province. In future research, it is recommended that a larger group of science teachers from different regions should be included in the study. Thus, considering the diversity of teachers' situations in different regions can increase the generalisability of the results and provide a more comprehensive understanding.

Using a semi-structured interview form as a data collection tool in the study may limit the participants' responses and prevent in-depth understanding. In future research, different data collection techniques can be used. For example, focus group interviews or questionnaire forms with open-ended questions can be used. Participants may provide a broader perspective and reflect more deeply on the issues.

In the study, only teachers' opinions were analyzed, and the opinions of students and other stakeholders were not considered. In future research, a comprehensive study that includes the views of students, parents, and school administrators can be conducted. Such a study could provide a more comprehensive understanding of SDG4, quality education, and ICT use in the context of sustainable development and better reflect the needs and expectations of all stakeholders.

Science teachers were found to associate quality education with SDG4, the purpose and process of education, and teacher competencies. Future research could examine these factors in more depth to understand how quality education is determined and measured. It is also important to investigate teachers' perceptions in determining the quality education.

The research shows that teachers emphasize equal opportunity as a critical element of SDG4. Future studies can examine in more detail how equality of opportunity in education can be achieved, how existing inequalities can be eliminated, and the effects of equality of opportunity on student achievement.

Teachers were found to have a balanced view of the advantages and disadvantages of ICT use. Future research could focus on examining teachers' competencies in ICT use.

The research shows that the educational environment plays a critical role in SDG4. Future studies can provide more insights into how the educational environment can be improved and enhanced, increasing students' learning experiences.

Conclusions

In conclusion, this study revealed science teachers' views on quality education, the criteria that should be considered for SDG4 and ICT use in the context of SDG4. Teachers' associations of quality education with the purpose and processes of education and teacher competencies were in line with other studies in the literature. Moreover, balanced views on the educational environment's critical role in SDG4 and the advantages and disadvantages of ICT use reflect teachers' informed approaches to these issues.

Etik

Bu araştırma için Helsinki Deklarasyonu Prensipleri'ne uygun davranılarak; Erciyes Üniversitesi Sosyal ve Beşeri Bilimler Etik Kurulu'nun 26/03/2024 tarihli ve 141 sayılı değerlendirme kapsamında etik onay alınmıştır. Bu araştırma ile ilgili etik sorularınız için lütfen izued@izu.edu.tr adresine başvurun.

Katkı Oranı Beyanı

Bu çalışmada yazarlar eşit katkıda bulunmuşlardır.

Destek ve Teşekkür Beyanı

Çalışma herhangi bir destek almamıştır. Makale, Turnitin yazılımı kullanılarak intihal açısından incelenmiştir. Bu çalışmanın hazırlanma sürecinde yapay zekâ tabanlı herhangi bir araç veya uygulama kullanılmamıştır. Çalışmanın tüm içeriği, yazar(lar) tarafından bilimsel araştırma yöntemleri ve akademik etik ilkelere uygun şekilde üretilmiştir.

Çatışma Beyanı

Yazarlar bu araştırma makalesinin araştırma, yazma ve/veya yayınlanmasına ilişkin herhangi bir kurum ve/veya kişi ile potansiyel çıkar çatışması beyan etmemiştir

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Social and Human Sciences at Erciyes University, within the scope of the evaluation dated

26/03/2024 and numbered 141. For ethical inquiries regarding this research, please contact: izued@izu.edu.tr

Author Contributions

All authors made equal contributions to the research and the preparation of this manuscript.

Funding and Acknowledgments

This study did not receive any financial support. The manuscript was screened for plagiarism using Turnitin software. No artificial intelligence-based tools or applications were utilized in the preparation of this manuscript. All content was generated solely by the author(s) in adherence to scientific research methodologies and academic ethical standard

Conflict of Interest

The authors have no conflicts of interest to declare related to the research, writing, or publication of this manuscript.

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