

An Examination of the Impact of Education Practices for Sustainable Development on Students: A Systematic Review Study

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Article Info

ABSTRACT

Article History

Received: 28.07.2023

Accepted: 20.12.2023

Published: 30.06.2024

Keywords:

Sustainable development,
Sustainable education,
Systematic review.

This research aims to determine the trends of studies concerning the impact of education practices for sustainable development on students between 2016 and 2023. The research employs a systematic review method. The data for this study consist of 12 articles and seven doctoral theses, as well as five master's theses related to the impact of education practices for sustainable development on students, which were published as full-text between 2016 and 2023 and retrieved from TR Index, ERIC, and National Thesis Center databases. The included theses and articles were examined in terms of publication year, language of publication, country of researchers, type of research, sample group, country of the samples, sample size, type of sample, research model and design, data collection tool, data analysis method, type of application, study findings, and variables related to sustainable development objectives. The highest number of studies was observed to be published in 2021 and in the Turkish language. Türkiye was the country with the highest number of researchers, and the highest number of articles was determined as the type of research. In addition, it was determined that the sample group was generally secondary school students, the sample countries were mostly Türkiye, the sample size in most studies was less than 100, and the sample type was not specified in most studies. In addition, the mixed research method was the most frequently used research model, the pretest-postest quasi-experimental design was the most preferred research design, and the most common data collection tool was the scale. Content analysis was the preferred data analysis method, and application types such as sample event-supported station technique, interdisciplinary instructional planning, and project-based learning with active learning activities were found to be more frequently employed. According to the study, students' attitudes had the most positive impact. It has been determined that more emphasis is placed on responsible consumption and production targets among sustainable development goals. In studies to be carried out towards sustainable development goals, emphasis may be placed on preschool and primary school students.



Sürdürülebilir Kalkınma İçin Eğitim Uygulamalarının Öğrenciler Üzerindeki Etkisinin İncelenmesi: Sistematik Bir İnceleme Çalışması

Makale Bilgisi

ÖZET

Makale Geçmişi

Geliş Tarihi: 28.07.2023

Kabul Tarihi: 20.12.2023

Yayın Tarihi: 30.06.2024

Anahtar Kelimeler:

Sürdürülebilir kalkınma,
Sürdürülebilir eğitim,
Sistematik derleme.

Bu araştırmanın amacı, 2016 yılından 2023 yılı Nisan ayına kadar sürdürülebilir kalkınma için eğitim uygulamalarının öğrenciler üzerindeki etkisine ilişkin yapılan çalışmaların eğilimlerini belirlemektir. Araştırma, sistematik bir inceleme yöntemi kullanılmaktadır. Bu çalışmanın verileri, 2016 ile 2023 yılları arasında TR Index, ERIC ve Milli Tez Merkezi veritabanlarından tam metin olarak yayınlanmış ve sürdürülebilir kalkınma için eğitim uygulamalarının öğrenciler üzerindeki etkisi ile ilgili olan 12 makale ve 7 doktora tezi ile 5 yüksek lisans tezini kapsamaktadır. Dahil edilen tezler ve makaleler yayınlanma yılı, yayın dili, araştırmacıların ülkesi, araştırma türü, örneklem grubu, örneklem ülkeleri, örneklem büyüklüğü, örneklem türü, araştırma modeli ve deseni, veri toplama aracı, veri analiz yöntemi, uygulama türü, çalışma bulguları ve sürdürülebilir kalkınma hedefleri ile ilişkili değişkenler açısından incelenmiştir. En yüksek çalışma sayısı 2021 yılında ve Türkçe dilinde yayınlanan çalışmalarda gözlenmiştir. Araştırmacıların ülkesi en fazla Türkiye, araştırma türü olarak en fazla makale olduğu belirlenmiştir. Ayrıca, örneklem grubu genellikle ortaokul öğrencileri, örneklem ülkeleri en fazla Türkiye ve çoğu çalışmada örneklem büyüklüğü 100'den az ve çalışmaların büyük kısmının örneklem türünün belirtilmediği belirlenmiştir. Ayrıca, karma araştırma yöntemi en sık kullanılan araştırma modeli, ön test- son test yarı deneysel desen en çok tercih edilen araştırma deseni ve en yaygın veri toplama aracı ise ölçek olmuştur. İçerik analizi tercih edilen veri analiz yöntemi olmuş ve örnek olay destekli istasyon tekniği, disiplinler arası öğretim planlaması ve aktif öğrenme etkinlikleri ile desteklenmiş proje tabanlı öğrenme gibi uygulama türleri daha sık kullanılmıştır. Çalışmanın bulgularına göre, en olumlu etkinin öğrencilerin tutumlarında gözlemlendiği belirlenmiştir. Sürdürülebilir kalkınma hedeflerinden sorumlu tüketim ve üretim hedefine daha fazla yer verildiği belirlenmiştir. Sürdürülebilir kalkınma hedeflerine yönelik yapılacak çalışmalarda okul öncesi ve ilkököl öğrencilerine ağırlık verilebilir.

To cite this article:

Tecimer Altinel, Z., Hamalosmanoğlu, M., & Kızılay, E. (2024). An Examination of the Impact of Education Practices for Sustainable Development on Students: A Systematic Review Study. *Necmettin Erbakan University Ereğli Faculty Of Education* 6(1), 1-24. <https://doi.org/10.51119/ereegf.2024.69>

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Bu çalışma, birinci yazarın doktora çalışmasının bir kısmından üretilmiştir.

INTRODUCTION

In recent years, scientific and technological developments have been progressing rapidly. While these advancements have made our daily lives easier, they have also given rise to various environmental, social, cultural, and economic issues. Ecological problems such as drought, air and water pollution, climate change, depletion of natural resources, global warming, population growth, decreased biodiversity, increasing hunger, and rising poverty have become significant challenges today. The world has become uninhabitable. Future generations have the right to benefit from a clean world as much as we do.

Sustainable development was introduced to leave a clean world for future generations. The concept of sustainable development was first defined in the Brundtland Report of the World Commission on Environment and Development in 1987 as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development (WCED), 1987). The United Nations has undertaken various projects to integrate sustainable development into national policies. These projects include the 1972 Conference on the Human Environment and Sustainable Development, the 1987 Brundtland Report, the 1992 Rio Earth Summit, the 1995 Copenhagen Social Development Summit, the 1997 Kyoto Protocol, the 2000 Millennium Summit, the 2002 Johannesburg World Summit on Sustainable Development, the 2012 Brazil Sustainable Development Conference, and the 2015 Transforming Our World Report. As a result of these projects, 17 sustainable development goals have been established for a better living environment. These goals, also defined as the new agenda of the global community, are as follows (United Nations Development Programme, 2016):

- Goal 1: End poverty in all its forms everywhere.
- Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- Goal 3: Ensure healthy lives and promote well-being for all ages.
- Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- Goal 5: Achieve gender equality and empower all women and girls.
- Goal 6: Ensure availability and sustainable management of water and sanitation for all.
- Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all.
- Goal 8: Promote sustained, inclusive, sustainable economic growth, full and productive employment, and decent work.
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- Goal 10: Reduce inequality within and among countries.
- Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns.
- Goal 13: Take urgent action to combat climate change and its impacts.
- Goal 14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.

- Goal 15: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.

- Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.

- Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

It is widely acknowledged that education plays a crucial role in achieving the goals of sustainable development (Bonnett, 1999; Foster, 2001; Jickling, 1992). Since sustainable development is directly related to people's way of life, developing education policies in this direction is essential to apply them worldwide. Sustainable development education aims to provide students with knowledge, skills, and attitudes in sustainability-related methods' affective and behavioral fields (Cebrián & Junyent, 2015). Therefore, this study aims to reveal the trends of studies regarding the impact of education practices for sustainable development on students through a systematic review.

Sustainable development is a subject that is present in every aspect of our lives. Conducting research on the impact of education practices for sustainable development on students, as a result of the literature review, is crucial to observe the progress in this field. In this regard, several studies have examined the awareness (Akgül, 2020; Çelik, 2019; Çobanoğlu & Türer, 2015; Kültz, 2007; Özsoy, 2021), opinions (Dal, 2020; Nguyen vd., 2020; Petersen ve Alkış, 2009; Svetina vd., 2011; Özsoy, 2019), perceptions (Burmeister & Eilks, 2013), and attitudes (Burmeister & Eilks, 2013; Çetin, 2015; Dursun, 2022; Gökmen et al., 2017; Şeker, 2018; Soysal Toprak, 2016) of individuals toward sustainable development in education. There is also a meta-synthesis study analyzing research on sustainability in education (Özertinç et al., 2022) and another study that thematically examines educational research on sustainability (Yıldırım, 2020). However, upon examining the literature, no systematic review study explicitly focusing on the impact of education practices for sustainable development on students was found. Therefore, it is believed that this study will contribute to the literature. With this aim, this research analyzes 24 articles containing the keywords "sustainable," "development," and "student" from the TR Index, ERIC, and National Thesis Center databases between 2016 and April 2023 using a systematic review method to determine the trends in studies regarding the impact of education practices for sustainable development on students. The reason for explicitly selecting studies within this timeframe is that in 2016, the United Nations Development Programme identified 17 sustainable development goals for a sustainable life. Additionally, after defining the sustainable development goals, the aim was to determine the trends of education practices for sustainable development. To achieve this goal, the following research questions were addressed:

1. What is the distribution of studies according to their publication years?
2. What is the distribution of studies according to the languages of publication?
3. What is the distribution of studies according to the countries of the researchers?
4. What is the distribution of studies according to their types?
5. What is the distribution of studies according to the sample groups?
6. What is the distribution of studies according to the countries of the samples?
7. What is the distribution of studies according to the sample sizes?
8. What is the distribution of studies according to the types of samples?
9. What is the distribution of studies according to the research models and designs?

10. What is the distribution of studies according to the data collection tools?
11. What is the distribution of studies according to the data analysis methods?
12. What is the distribution of studies according to the types of applications?
13. What is the distribution of studies according to their findings?
14. What is the distribution of studies according to the sustainable development objectives they address?

METHOD

Research Method

This study utilized a systematic review method. A systematic review involves a structured and comprehensive synthesis of multiple studies conducted similarly to determine the research trends of experts in a specific field. The method includes a thorough search of published research related to the topic, establishing inclusion and exclusion criteria, and evaluating the quality of studies to determine which ones will be included in the review (Karaçam, 2013). The systematic review method, widely used in various disciplines from health to education, has also been favored in educational research conducted by international organizations since the 1990s (Bearman et al., 2012)

Data Collection and Analysis

For this study, the TR Dizin, ERIC, and National Thesis Center databases were used as data collection tools to list studies containing the keywords "sustainable," "development," and "student" in their abstracts. The period selected for the study was from 2016 to April 2023. In this stage, a total of 1603 studies were listed.

In the TR Dizin database, a refined search was conducted using the keywords "sustainable," "development," and "student" from 2016 onwards. The search resulted in 9 studies. One study not related to education was excluded from the research. Five studies examining the curriculum for sustainable development and students' perceptions of sustainable development were excluded. These studies were not included in the research because they did not include educational practices for sustainable development. Thus, three studies were selected for analysis.

In the ERIC database, an advanced search was conducted using the keywords "sustainable," "development," and "student" with the publication year of 2016 and beyond. The search yielded 1517 studies. The studies were evaluated based on their titles, abstracts, and methods to determine whether they would be included in the research. Studies not related to education, studies conducted with teachers and administrators, studies examining textbooks and curricula related to sustainable development, and studies related to students' attitudes, perceptions, awareness, and behavior toward sustainable development were excluded, resulting in 9 studies that met the criteria for analysis.

In the YÖK National Thesis Center database, a search was conducted for studies containing the keywords "sustainable," "development," and "student" in the complete text, starting from 2016. The search yielded 77 studies. Among them, 22 studies not related to education were excluded. Additionally, 43 studies that examined students' awareness, attitudes, behaviors, views, and perceptions were excluded. Finally, 12 studies were selected for analysis.

After these selections, 24 studies were identified for the systematic review. The data collection process for this study was completed as of April 2023.

The 24 selected studies were downloaded in full text and categorized by year. Each study was

coded under various parameters in Excel. These parameters included "study information," "year of publication," "language of publication," "country of researchers," "type of study," "sample group," "countries of the samples," "sample size," "sampling type," "research model and design," "data collection tools," "data analysis method," "application type," "study results," and "sustainable development goals in the study." The studies included in the research were analyzed based on these parameters, and codes were created accordingly. The themes that brought together these codes also constituted the components of these parameters. The list of the obtained studies is provided in Appendix1.

Validity and Reliability

Validity and reliability are crucial in systematic review studies (Karaçam, 2013). The researcher detailed every step of the systematic review process to ensure the study's validity. One month later, the included studies were re-coded, and the compatibility percentage was calculated using the reliability formula suggested by Miles and Huberman (1994), resulting in 92%. Reliability calculations above 70% are considered reliable for research (Miles & Huberman, 1994). This value indicated a high reliability of the data analysis.

RESULTS

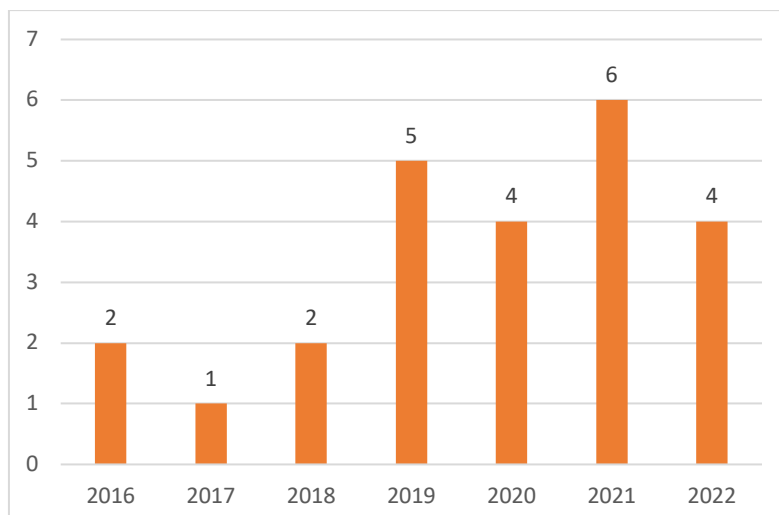
The studies obtained from the literature review on the impact of educational practices for sustainable development on students were analyzed in terms of their descriptive features. The categories of the research consist of information about the years in which the studies were published, the languages in which they were published, the countries of the researchers, the type of studies, the sample group, the countries of the samples, the number of samples, the type of sampling, the research model and design, the data analysis method, the type of application, the results of the studies and the purpose of sustainable development. The frequency was examined by presenting it in tables and figures within the scope of the codes created for each category.

The Distribution of Studies According to Publication Years

The findings regarding the distribution of studies according to their publication years, which examine the impact of educational practices for sustainable development on students, are presented in Figure 1.

Figure 1

Distribution of Studies According to Publication Year



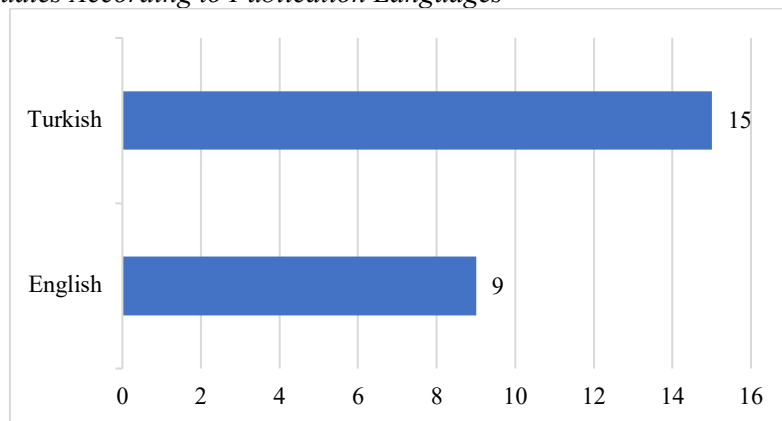
The distribution of 24 studies on the impact of educational practices for sustainable development on students, according to their publication years, is shown in Figure 1. Accordingly, it is observed that the number of studies was low in 2016 (f=2), decreased further in 2017 (f=1), and then increased in 2018 (f=2) and 2019 (f=5). However, in 2020, the number of studies decreased again (f=4). The year 2021 stands out with the highest number of studies published (f=6). In 2022, the number of studies decreased once more (f=4)].

The Distribution of Studies According to Publication Languages

The findings regarding the distribution of studies according to their publication languages, which examine the impact of educational practices for sustainable development on students, are presented in Figure 2.

Figure 2

Distribution of Studies According to Publication Languages



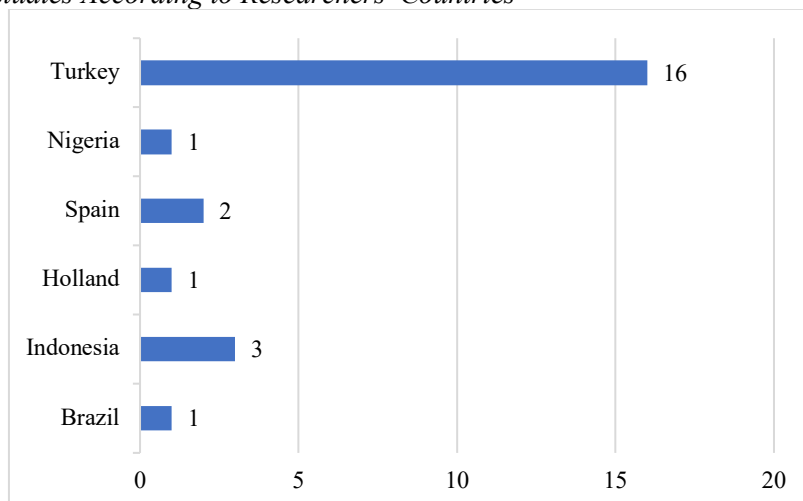
The distribution of 24 studies on the impact of educational practices for sustainable development on students, according to their publication languages, is shown in Figure 2. It is observed that the number of studies published in Turkish (f=15) is higher than those published in English (f=9).

Distribution of Studies According to Countries of Research

By examining the studies on the impact of sustainable development education practices on students, the findings related to the sub-problem "How are the studies distributed according to researchers' countries?" are presented in Figure 3.

Figure 3

Distribution of Studies According to Researchers' Countries



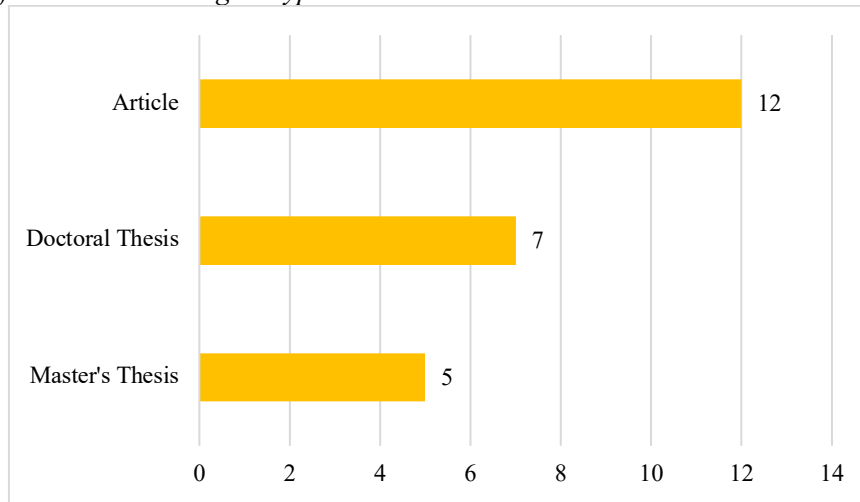
The distribution of 24 studies on the impact of sustainable development education practices on students according to researchers' countries is shown in Figure 3. It is observed that Türkiye has the highest number of researchers, with 16 studies. The researchers from Spain have ($f=2$) studies and those from Indonesia have ($f=3$). On the other hand, the countries with the least number of studies ($f=1$) are Nigeria, the Netherlands, and Brazil.

Distribution of Studies According to Type

By examining the studies on the impact of sustainable development education practices on students, the findings related to the sub-problem "How are the studies distributed according to their types?" are presented in

Figure 4

Distribution of Studies According to Type



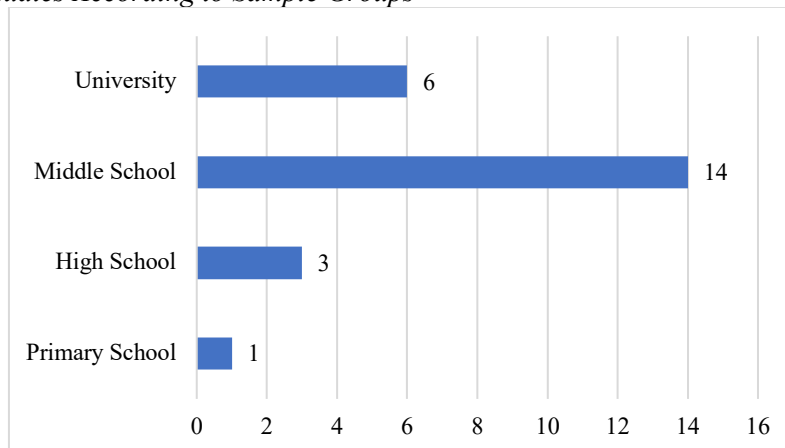
The distribution of 24 studies on the impact of sustainable development education practices on students according to their types is shown in Figure 4. It is determined that there are 12 articles, which is the highest number of studies by type. Additionally, there are seven doctoral theses, and the least number of studies ($f=5$) is related to master's theses.

Distribution of Studies According to Sample Groups

The findings related to the sub-problem "How are the distributions of studies according to the sample groups in terms of the impact of educational practices on students for sustainable development?" were examined by analyzing studies. The results are presented in Figure 5.

Figure 5

Distribution of Studies According to Sample Groups



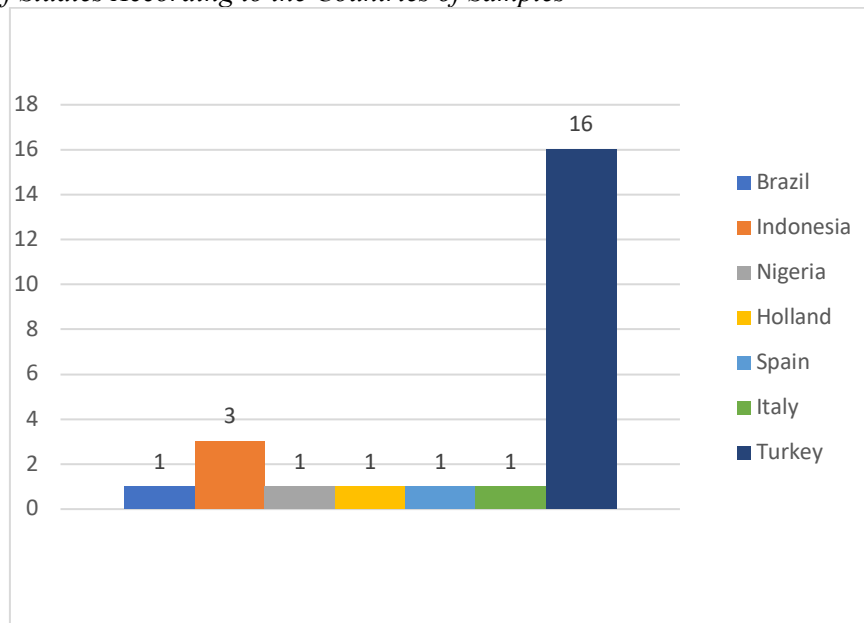
The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 5 according to their sample groups. Upon examination of the studies based on their sample groups, it is observed that most studies were conducted with middle school students. Following middle school students, the second most studied group was university students. On the other hand, the least number of studies were conducted with primary school students.

Distribution of Studies According to the Countries of Samples

The findings related to the sub-problem "How are the distributions of studies according to the countries of samples in terms of the impact of educational practices on students for sustainable development?" were obtained by analyzing studies and are presented in Figure 6.

Figure 6

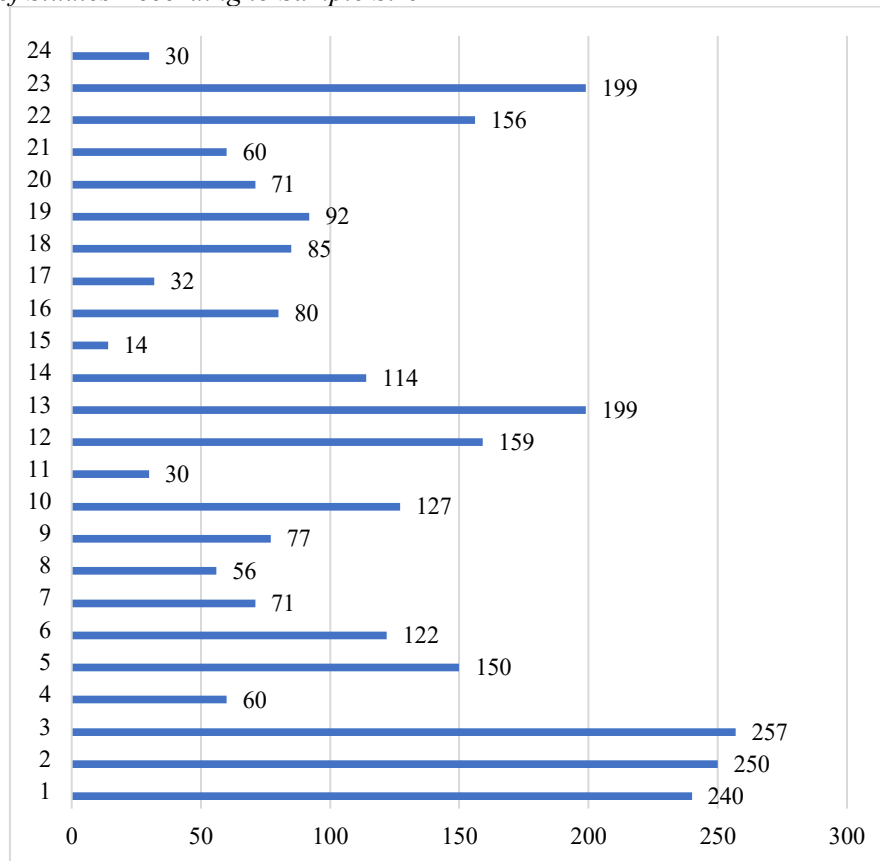
Distribution of Studies According to the Countries of Samples



The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 6 according to the countries of the samples. Upon examination of the distribution based on the countries of samples, it is evident that the highest number of studies were conducted with participants from Türkiye. Following Türkiye, the country with the second highest number of studies was found to be Indonesia. On the other hand, the countries with the least number of studies were identified as Spain, Brazil, Nigeria, Italy, and the Netherlands.

Distribution of Studies According to the Sample Size

The findings related to the sub-problem "How are the distributions of studies according to the sample size in terms of the impact of educational practices for sustainable development on students?" were examined by analyzing studies, and the results are presented in Figure 7.

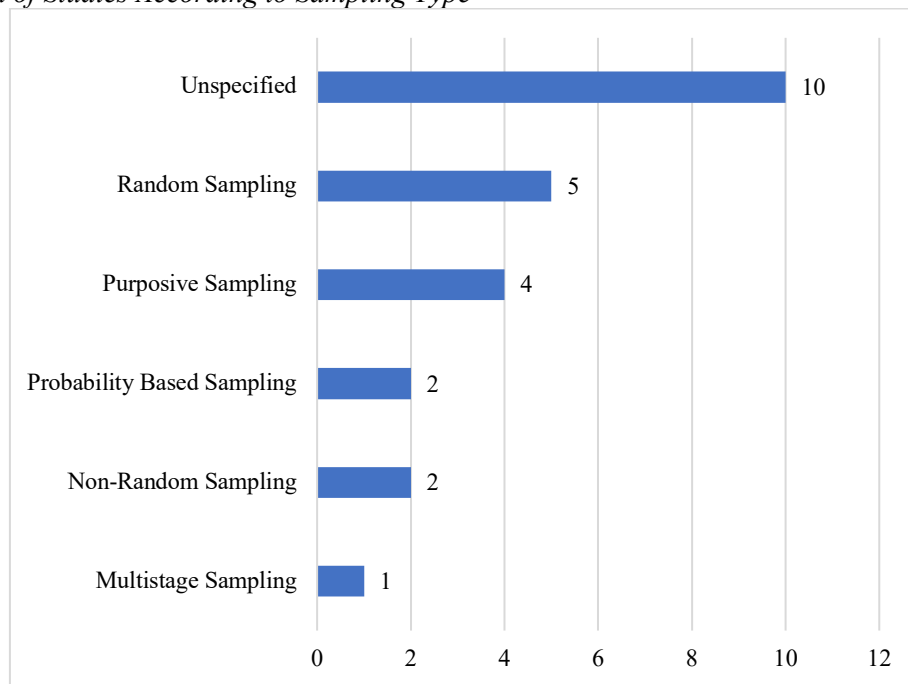
Figure 7*Distribution of Studies According to Sample Size*

The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 7 according to their sample sizes. Upon examination of the distribution based on the sample size, it is observed that there are 14 studies with a sample size below 100. Additionally, there are three studies with a sample size above 200. The study with a sample size of 257 was found to have the highest number of participants, whereas the study with a sample size of 14 had the least number of participants.

Distribution of Studies According to Sampling Type

The findings related to the sub-problem "How are the distributions of studies according to the sampling type in terms of the impact of educational practices for sustainable development on students?" were obtained by analyzing studies and are presented in Figure 8.

Figure 8
Distribution of Studies According to Sampling Type

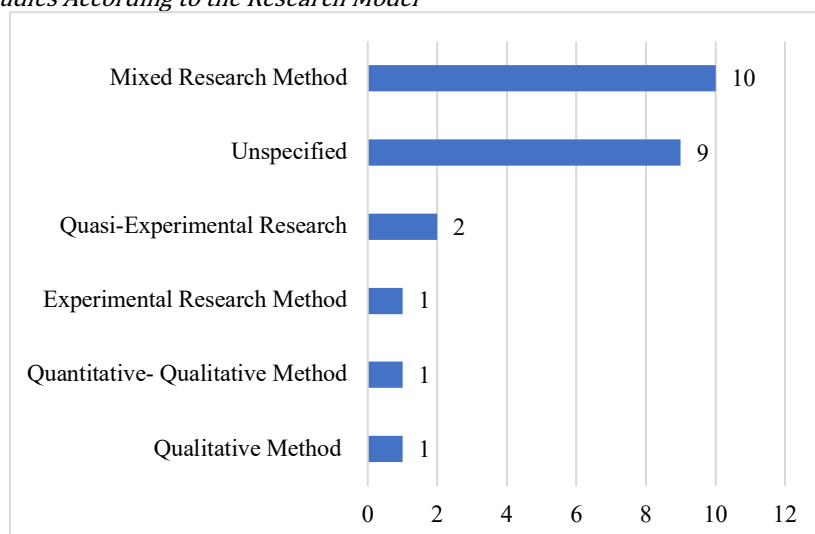


The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 8 according to their sampling types. Upon examination of the distribution based on the sampling type, it is determined that ten studies did not specify their sampling type. Among the specified sampling types, four studies used purposive sampling, five used random sampling, two used non-random sampling, and two used probability-based sampling. There was also 1 study, multistage sampling.

Distribution of Studies According to Research Model and Design

The findings related to the sub-problem "How are the distributions of studies according to the research model and design in terms of the impact of educational practices for sustainable development on students?" were examined by analyzing studies, and the results are presented in Figure 9 and Figure 10.

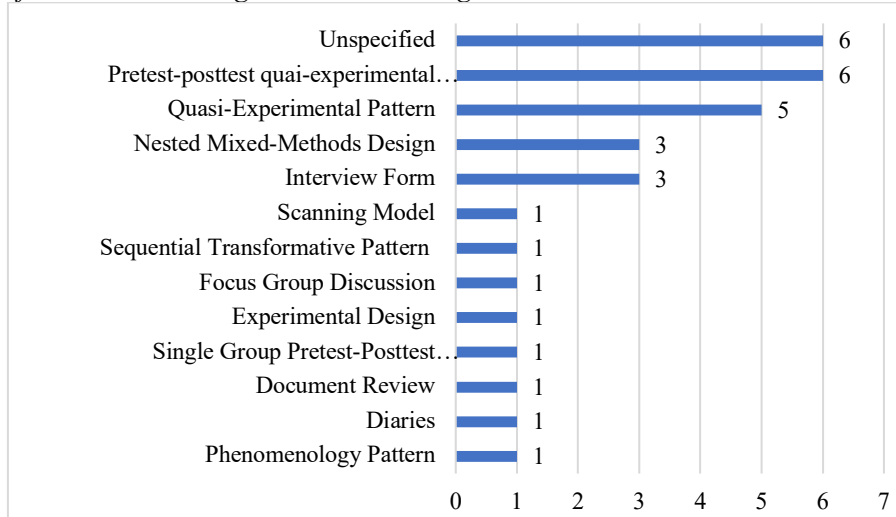
Figure 9
Distribution of Studies According to the Research Model



The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 9 according to their research models. Upon examination of the studies based on their research models, it was determined that the most preferred research model was mixed-methods research with ten studies. Nine studies did not specify their research model. One study utilized quantitative research, one used a quantitative-qualitative approach, two employed quasi-experimental research, and one opted for an experimental research method.

Figure 10

Distribution of Studies According to Research Design



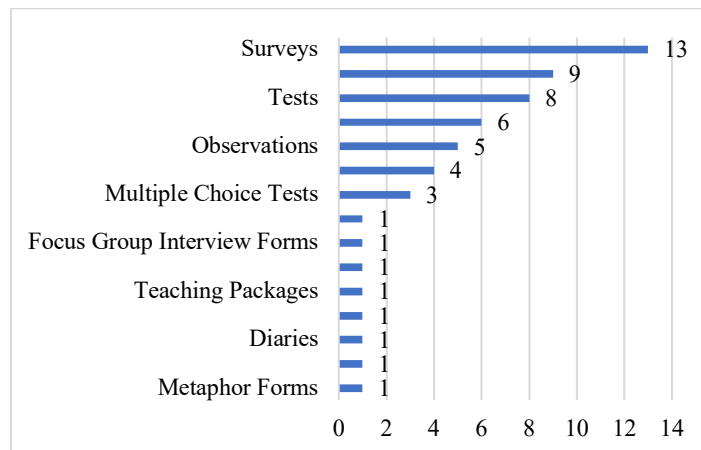
According to their research designs, the distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 10. Upon examination of the studies based on their research designs, it was found that six studies did not specify their research design. Six studies utilized a pre-test-post-test control group quasi-experimental design; five studies used a quasi-experimental design; three employed a nested mixed-methods design, and three used an interview form.

Distribution of Studies According to Data Collection Instruments

The findings related to the sub-problem "How are the distributions of studies according to the data collection instruments in terms of the impact of educational practices for sustainable development on students?" were examined by analyzing studies, and the results are presented in Figure 11.

Figure 11

Distribution of Studies According to Data Collection Instruments



The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 11 according to their data collection instruments. Upon examination of the studies on educational practices for sustainable development, it was found that 13 studies used surveys, nine studies used interview forms, eight studies used tests, six studies used document analysis, five studies used observations, four studies used questionnaires, 1 study utilized a simulation game, 1 study used teaching packages, 1 study used metaphor forms, 1 study employed concept maps, 1 study utilized journals, 31 studies used multiple-choice tests, 1 study used diaries, and 1 study opted for open-ended questions. One study did not specify its data collection instrument.

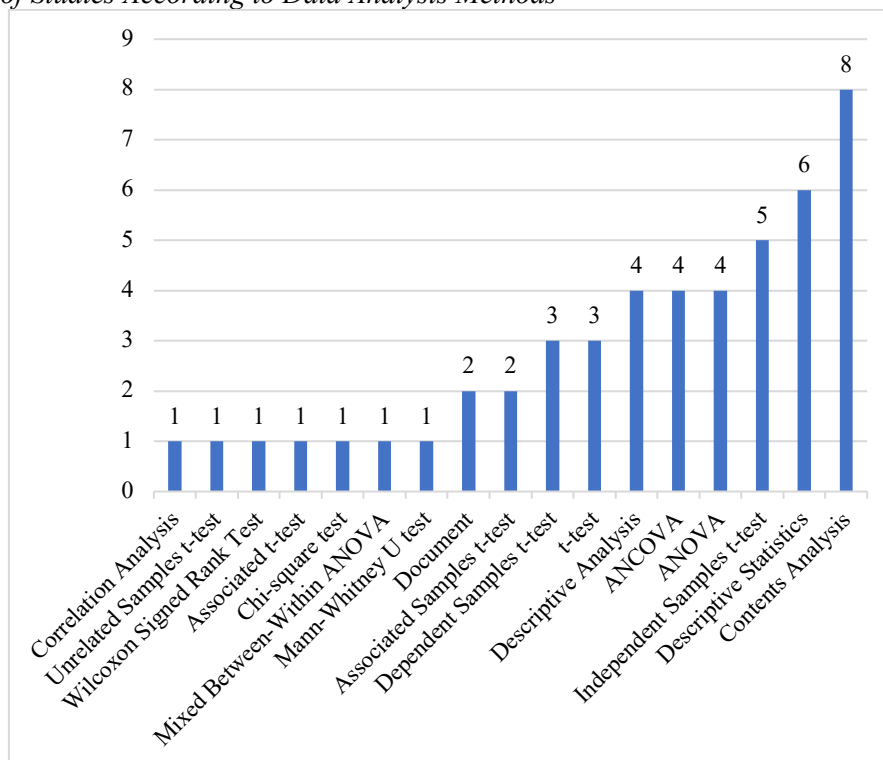
Distribution of Studies According to Data Analysis Methods

The findings related to the sub-problem "How are the distributions of studies according to the data analysis methods in terms of the impact of educational practices for sustainable development on students?" were obtained by analyzing studies and are presented in Figure 12.

The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 12 according to their data analysis methods. Upon examination of the studies on educational practices for sustainable development, it was determined that the most frequently used data analysis method was content analysis with 8 studies. Following content analysis, the second most preferred data analysis method was descriptive statistics with 6 studies. Independent samples t test was used in 5 studies. Four studies each utilized ANCOVA, ANOVA, and descriptive analysis as their data analysis methods. There were also studies that used different data analysis methods.

Figure 12

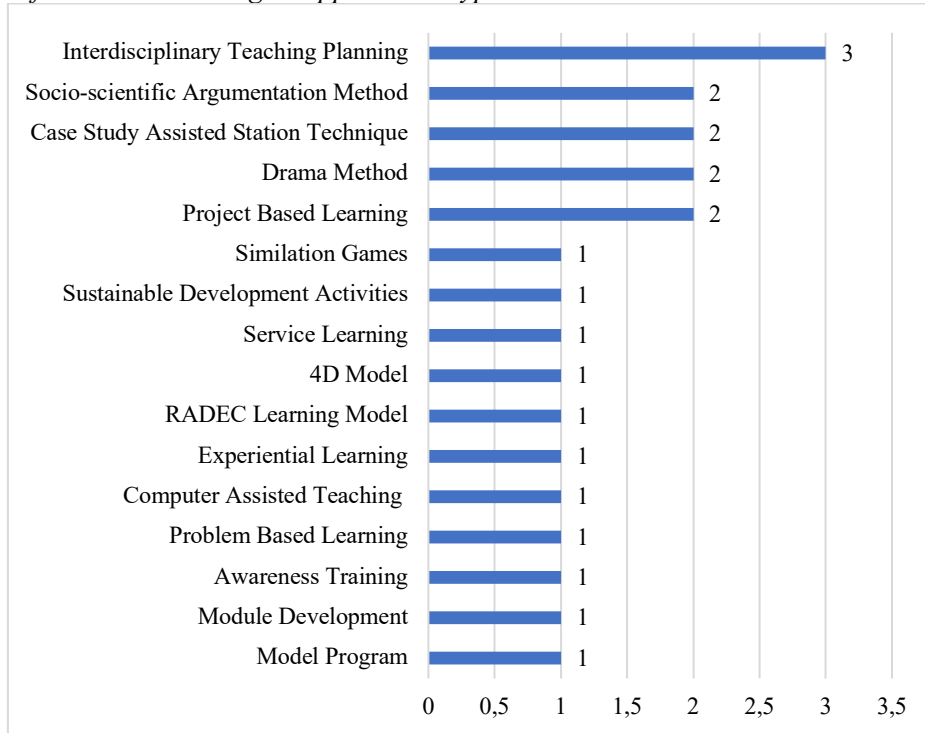
Distribution of Studies According to Data Analysis Methods



Distribution of Studies According to Application Type

The findings related to the sub-problem "How are the distributions of studies according to the application type in terms of the impact of educational practices for sustainable development on students?" were examined by analyzing studies, and the results are presented in Figure 13.

Figure 13
Distribution of Studies According to Application Type

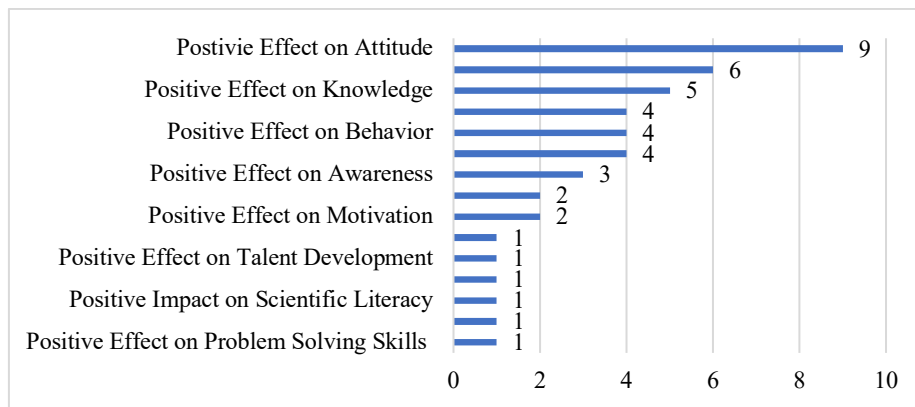


The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 13 according to their application types. Upon examination of the studies on educational practices for sustainable development, it is observed that 3 studies used interdisciplinary teaching planning, 2 studies were socio-scientific argumentation method and 2 studies were based on project-based learning. Other application types included sustainable development activities, simulation games, RADEC learning model, problem-based learning, module development, model program, service learning, awareness education, experiential learning, computer-assisted instruction, and 4D model, each used in 1 study.

Distribution of Studies According to Results

The findings related to the sub-problem "How are the distributions of studies according to the results in terms of the impact of educational practices for sustainable development on students?" were obtained by analyzing studies and are presented in Figure 14.

Figure 14
Distribution of Studies According to Results

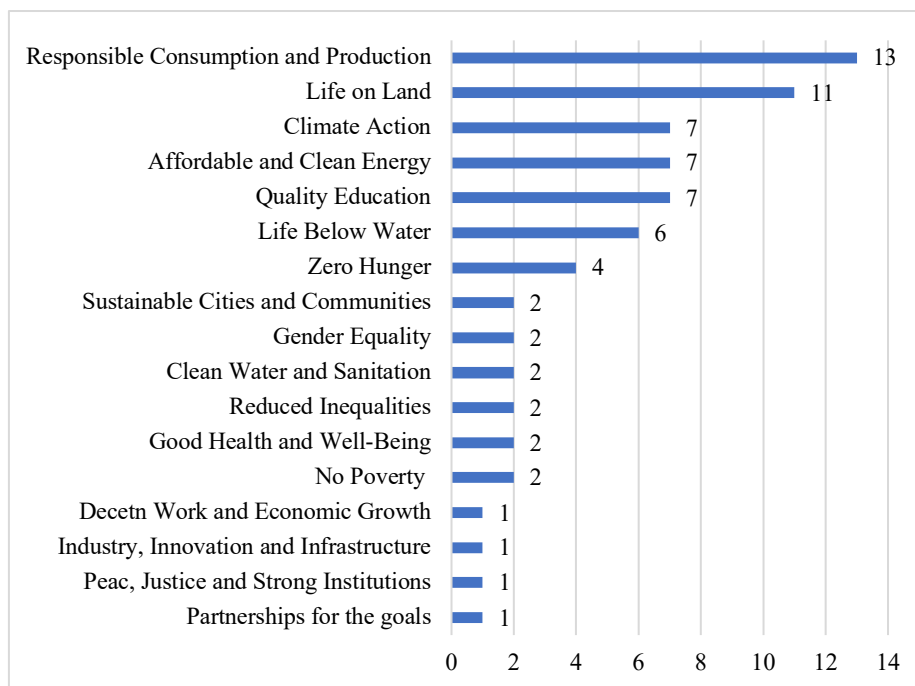


The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 14 according to their results. Upon examination of the studies, it was found that the most frequent result (in 9 studies) was the positive effect of educational practices for sustainable development on attitudes. Following that, 6 studies reported a positive effect on achievement, 5 studies reported a positive effect on knowledge, 4 studies each reported a positive impact on conceptual understanding, behavior, opinion. In 3 studies, positive effects were observed on awareness. Additionally, 2 studies each reported positive effects on skills and motivation.

Distribution of Studies According to Sustainable Development Goals

The findings related to the sub-problem "How are the distributions of studies according to the sustainable development goals in terms of the impact of educational practices for sustainable development on students?" were examined by analyzing studies, and the results are presented in Figure 15.

Figure 15
Distribution of Studies According to Sustainable Development Goals



The distribution of 24 studies on the impact of educational practices for sustainable development on students is shown in Figure 15 according to the sustainable development goals. Upon examination of the studies based on the sustainable development goals, it is observed that the twelfth goal of sustainable development, responsible consumption and production, was addressed in 13 studies. The fifteenth goal of sustainable development, life on land, was addressed in 11 studies. The seventh goal of sustainable development, affordable and clean energy, the fourth goal of quality education, and the thirteenth goal of climate action were addressed in 7 studies each. It is noteworthy that all 17 goals of sustainable development were addressed in the studies.

DISCUSSION, CONCLUSION AND RECOMMENDATION

In this study, research on the impact of educational practices for sustainable development on students was examined, and trends regarding educational practices were identified. A total of 24 studies were included in the analysis. When the distribution of studies according to their publication years was examined, it was observed that the number of studies on the impact of educational practices for sustainable development on students increased after 2018. This increase is speculated to be related to the inclusion of the concept of sustainable development in the science curriculum in 2018 (MEB, 2018). Özerdinç et al. (2022), in their meta-synthesis study analyzing research on sustainable development in education, also found that studies on sustainable development in education have been increasing since 2016, with the highest number of studies conducted in 2019.

When the studies were examined according to the languages of publication, it was found that there were more Turkish studies than English ones. Out of the 24 studies, 15 were published in Turkish, and 9 were published in English. Additionally, when the studies were analyzed according to the researchers' countries, a majority of the studies were from Türkiye. Indonesia ranked second with 3 studies conducted by researchers from that country. Moreover, when the studies were examined according to the countries of the sample participants, it was observed that most of the studies were conducted with participants from Türkiye.

In terms of the research type, 12 articles, 7 doctoral theses, and 5 master's theses were found. The higher number of articles might be attributed to their broader dissemination and reach to a larger audience compared to theses.

According to the examination of the studies based on the sample groups, it is seen that a significant portion of the studies preferred middle school students, followed by university students as the second most chosen group. The higher number of middle school students might be attributed to the desire to investigate the concepts in students after the changes made to the science curriculum. Arık (2019), who examined the trends of the theses on sustainable environmental education, also stated that the majority of the samples in the studies were secondary school students, which is consistent with the findings of this study. Çakırlar Altuntaş and Turan (2016), who analyzed studies on environmental education, also mentioned that students were the most preferred sample group in their study.

Regarding the number of participants, it was found that there were 3 studies with sample sizes exceeding 200, and 14 studies with sample sizes exceeding 100. One study with a sample size of 14 had the fewest participants. The number of participants in the studies varied. Arık (2013) stated that the sample sizes of the theses on sustainable environmental education ranged from 15 to 1515.

When examining the studies based on the sample type, it is observed that a significant portion of the studies did not specify their sample type. Following that, purposive sampling and random sampling were the most preferred sampling types. The high prevalence of unspecified sampling types might be attributed to some researchers' oversight in reporting the specific sampling method used in their studies.

Additionally, purposive sampling and random sampling are commonly used in educational research to target specific groups or achieve representative samples, respectively.

Regarding the research model and design, the most frequently chosen method was the mixed research model. This preference might be due to the complementary nature of combining quantitative and qualitative data to gain a more comprehensive understanding of the impact of educational practices on sustainable development. Similar to the findings of this study, Akkaş (2019) analyzed postgraduate theses related to sustainable development in Türkiye and reported that the most commonly used research model was the mixed research method, incorporating both quantitative and qualitative approaches.

In terms of data collection tools, it was observed that surveys were the most commonly used tool (13 times). Some studies utilized multiple data collection tools, interview forms (9 times), with tests (8 times), document analysis (6 times), and observations (5 times) contributing to the field. The prevalence of using scales as data collection tools might be attributed to their practicality, cost-effectiveness, and ease of implementation in the research process. This finding aligns with the study conducted by Özerdinç et al. (2022), which reported that scales were the most frequently used data collection tool in research related to sustainable development in education. Similarly, Kahyaoğlu (2019) analyzed theses related to environmental education in Türkiye and found that scales/questionnaires and tests were the most commonly used data collection tools. The popularity of scales might be due to their convenience and ease of administration.

Regarding data analysis methods, content analysis was the most frequently chosen technique. Özerdinç et al. (2022) also reported that content analysis was the most preferred data analysis method in research on sustainable development in education. Similarly, Arık (2019) analyzed the trends of theses on sustainable environmental education and found that parametric tests, descriptive analysis, and content analysis were commonly used for data analysis. The prominence of content analysis might be due to its applicability to qualitative data and its ability to provide a deeper understanding of the textual content in educational research.

When examining the application types in educational practices for sustainable development, it is observed that interdisciplinary teaching planning, socio-scientific argumentation method, case study assisted station technique, and project-based learning activities are more commonly used. Additionally, techniques such as sustainable development activities, simulation games, RADEC learning model, problem-based learning, module development, model programs, service learning, different teaching activities, awareness-raising education, experiential learning, computer-assisted instruction, and 4D model have also been employed. It has been concluded that using life-related, student-centered, and awareness-raising methods and techniques for sustainability education has been effective across all age groups of students.

Examining the results of the studies, it was found that educational practices for sustainable development have the most positive impact on students' attitudes (Aydın, 2019; Boncukçu, 2020; Dursun, 2022; Erkol, 2019; Karahan Aydın, 2019; Sumarmi, Wahyuningtyas, Sahrina, & Aliman, 2022; Vasconcelos & Seingyai, 2022; Yiğit, 2019). Kahyaoğlu (2016), in their analysis of the theses related to environmental education in Türkiye, also found that environmental education had a positive impact on attitudes, which is consistent with the results of this study.

Regarding the sustainable development goals addressed in the studies, it was determined that the eleventh goal, responsible consumption and production, was the most frequently emphasized. Additionally, all seventeen goals of sustainable development were found to be important for sustainable living in the studies.

In this study, the general trends of the impact of educational practices for sustainable development

on students have been attempted to be determined. Based on the results of this study, some recommendations are presented: It was observed that middle school and university students were more prevalent in the examined studies. Sustainable development behaviors should be instilled at a young age. Therefore, more emphasis can be placed on conducting studies with preschool and elementary school students. It was noted that scales were the most commonly used data collection tool in the examined research. Using multiple data collection tools can provide diversity in the data and offer a more comprehensive understanding of the impact of educational practices. It was found that more emphasis was given to the 11th goal of sustainable development in the examined research. In-depth research can be conducted on the other goals of sustainable development to gain deeper insights. It was found that articles were the most common type of research in the examined studies. More master's theses and doctoral dissertations can be conducted in various fields related to the effects of educational practices for sustainable development. This can contribute to a more comprehensive understanding of the topic.

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EXTENDED ABSTRACT

Introduction: The introduction section serves as the entry point to the research, providing a comprehensive overview of the study's context, rationale, and objectives. It begins by contextualizing the research topic within existing literature and identifying gaps, controversies, or areas that require further exploration. By reviewing prior studies and establishing the significance of the research problem, the introduction sets the stage for the current investigation. Furthermore, it outlines the specific aims, objectives, or research questions addressed in the study, thereby guiding the reader's understanding of its scope and purpose. Through a well-crafted introduction, researchers can effectively engage readers, justify the need for their study, and lay the groundwork for subsequent sections.

Method: The method section provides a detailed account of the research design, methodology, and procedures employed to address the study's objectives. It elucidates key aspects such as the study's design (e.g., experimental, correlational, qualitative), sampling procedures, participant characteristics, data collection methods (including instrumentation and materials), and data analysis techniques. By transparently documenting these methodological details, researchers enable readers to evaluate the validity, reliability, and generalizability of their findings. Moreover, the method section ensures research replicability by furnishing sufficient information for other scholars to replicate or build upon the study. Clear and systematic reporting of the methodological framework enhances the credibility and rigor of the research endeavor.

Findings: In the findings section, researchers present the empirical data collected during the study and report the outcomes of their analyses. This section typically begins with a descriptive summary of the data, including relevant statistics, frequencies, or distributions. Subsequently, researchers present the results of inferential statistical analyses, hypothesis testing, or thematic analysis, depending on the study's design and objectives. Data may be organized into tables, figures, or textual descriptions to facilitate comprehension and interpretation. Through the systematic presentation of findings, researchers enable readers to discern patterns, trends, or associations within the data, thereby supporting the study's conclusions and implications. It is essential to maintain clarity, accuracy, and objectivity in reporting findings, avoiding unwarranted interpretations or exaggerations.

Discussion: The discussion section offers a critical analysis and interpretation of the study's findings within the broader context of existing knowledge and theoretical frameworks. Researchers engage in a reflective dialogue, examining the implications, significance, and limitations of their findings. They contextualize their results by comparing them with prior research, identifying consistencies, discrepancies, or novel insights. Additionally, researchers explore potential explanations for observed patterns or phenomena, considering alternative interpretations or confounding factors. It is crucial to acknowledge and address any limitations or constraints inherent in the study, such as methodological shortcomings, sample biases, or data constraints. Furthermore, researchers speculate on the practical implications of their findings, offering recommendations for future research directions or practical interventions. The discussion section serves as the intellectual culmination of the research endeavor, synthesizing empirical evidence with theoretical insights and advancing scholarly discourse within the field.

Conclusion: The conclusion section encapsulates the key findings, contributions, and implications of the study, providing a concise summary and synthesis of the research journey. Researchers reiterate the main findings and underscore their significance in addressing the research problem or fulfilling the study's objectives. They reflect on the broader implications of their work, highlighting its theoretical, practical, or societal relevance. Moreover, researchers articulate the study's contributions to knowledge, identifying novel insights, methodological advancements, or theoretical refinements. Concluding remarks may also address unresolved questions, lingering uncertainties, or avenues for future inquiry. By offering closure and perspective, the conclusion section affirms the study's significance, invites scholarly dialogue, and inspires further exploration of the research topic.

Recommendation: The recommendations section offers actionable suggestions or proposals based on the study's findings and insights. Drawing upon the implications identified in the discussion section, researchers provide guidance for practitioners, policymakers, or other stakeholders. These recommendations may pertain to practical interventions, policy changes, or future research initiatives aimed at addressing the identified issues or capitalizing on opportunities identified by the study.