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A Review On The Most Downloaded Articles On The Dergipark Platform In 2021

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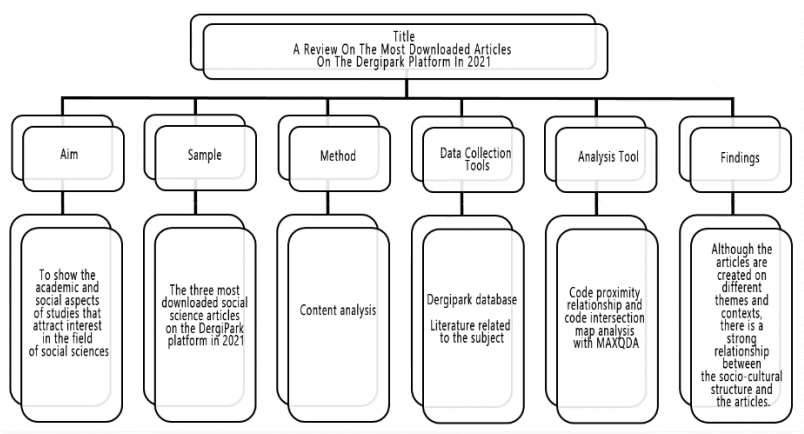
Graphical Abstract



Abstract

DergiPark is an important database for academic studies in Türkiye. The titles of the topmost downloaded articles in 2021 in DergiPark are; "The Aspects of Family Myth in the Films Korkuyorum Anne and Vavien", "Comparison with the Management Thought and the Guild Organization Structure at the Ottoman Government" and "Evaluation of Ghazwas and Seriyyas in the Light of Sunen-i Ibn Mâja" respectively. These articles have been written in three different subject areas and are not related to each other. The fact that the analyzed articles are "trending" reveals the importance of the study. The first aim of the study is to determine the quality of the articles in question and to show their commonalities and/or differences in this context. The second aim is to draw meaningful conclusions about the quality of both the studies and the readership by making rational inferences about the reasons for the high popularity of the articles. In this way, data can be obtained both about an online academic platform and the profile information of the articles which are in demand. For this purpose, the abstracts of the top three most downloaded articles in 2021 were analyzed through content analysis. The content analysis was evaluated based on different social science phenomena. In the evaluation phase, coding technique was applied to the abstract texts of the articles with the MAXQDA program and inferences were made by analyzing the code maps. As a result of the analysis, it was concluded which the three most downloaded articles do not have much in common except that they are social science studies, but that they largely reflect the society we live in in terms of socio-cultural and socio-political aspects.

Key words: Literature, Social Sciences, Academy.

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Introduction

The impact of social structures, cultural norms and ideological beliefs on individuals has always been an important research topic in social sciences. Social structure is all of the regular and reciprocal relations between the constituent components of society. Areas such as economy, politics, art, religion, law and education interact with each other in the social structure. Social structure can be considered as an active a dynamic interaction network in which all components can affect and change each other in the process (Topses, 2013, p. 2). Norms are behavioral standards and criteria developed by society based on its cultural values and accepted by a large number of its members. These norms determine the attitudes of individuals within the society, how they will establish their relationships and how they will interact with other people (Kırel, 1989, p. 354). Values of people by cultural values and ideological norms in the social context in which they live, and understanding how these structures direct individuals' perceptions, intellectual processes and behaviors constitute one of the main research areas of social sciences. Especially in modern societies, the interaction between social structures and the individual has become more complex, and social transformation processes have deeply affected the intellectual and cultural world of individuals.

This study examines through content analysis three important articles on topics ranging from representations of the family in Turkish cinema to the structure of the guild organization in the Ottoman Empire, from the principles of warfare in Islamic society to the traditional values of Arab society. These articles, each offering an in-depth understanding of social structures and individual-society relations in its own context, reveal how traditional and modern values reflect and interact with each other while addressing cultural and ideological structures. The first article, which deals with family images in a cinematic context, examines the role of family structure in social perception and provides important data on how cinema, as a mass media, shapes social perceptions (Oktan, 2018). While family representations open a window into how cinema interacts with social values and norms, they also analyze the reflection of the family structure in cinema in modern Türkiye. This article questions how family images in Turkish cinema have evolved and how they shape social perception. Through cinematic examples such

as "Korkuyorum Anne"[1] and "Vavien"[2] , Oktan analyzes deeply the ways in which family structure and social perceptions are represented in cinema and shows how their cultural meanings are transformed. Furthermore, by providing clues on how family images in Turkish cinema are related to social transformation processes, this study addresses the ideological contradictions and transformation in the modernization process of society.

The second article, in which Akbaş, Bozkurt and Yazıcı examine the economic and managerial functioning of the guild[3] (lonca) organization in Ottoman Empire, makes an important contribution to understanding social structures in a historical perspective (Akbaş et al., 2018). While addressing the economic and social functioning of the guild organization in the Ottoman Empire, this study on how this structure can be compared with modern business management approaches analyzes traditional social structures in terms of their functionality in the modern world. By examining how the guild organization functioned as an important institution regulating the social structure of Ottoman society, this article also discusses its similarities and differences with today's business world. By comparing the financial structure, administrative order and social functions of the Ottoman guild organization with modern administrative and economic structures, the authors provide an in-depth analysis of the legacy of this traditional structure. To find out how the guild organization shaped the ideological framework of Ottoman society on issues such as labor, trade and work ethics constitutes one of the most significant aims of this study.

In the third article by Pişkin, the analysis of the war ethics and social norms of Arab society through the Prophet Muhammad's ghazwa[4] and seriyyas[5] clearly reveals the interaction of religious and cultural principles between the individual and society (Pişkin, 2019). This analysis of Ibn Mâjah's (AD 824-887/Hijri 209-273) hadith[6] corpus examines how war, morality and

[1] The 2006 film "Korkuyorum Anne" (I'm scared, Mom) is about a character named Ali who loses his memory as a result of an accident and the efforts of his family and people around him to help him remember his past (Erdem, 2006).

[2] The 2009 movie "Vavien" is about the family problems of a character named Celal who is going through psychological and economic hard times (Taylan & Taylan, 2009). "Vavien" derived from the French expression "va et vient", "go and come", means "a kind of electrical equipment" (Nişanyan, 2022, p. 936). Celal, the protagonist of the movie, is an electrician.

[3] Guilt: "Association, corporation that includes masters, journeymen and apprentices in a certain line of work." (TDK, 2005, p. 1471).

[4] "Military expeditions personally led and directed by Prophet Muhammad" is called ghazwa (Algül, 2020, p. 488).

[5] "The military expeditions that Prophet Muhammad did not personally participate in but led and directed by the commanders he appointed" is called seriyya (Özdemir, 2009, p. 565).

[6] "The author of al-Sunan, which is accepted as the sixth book of the Qutb al-Sitta, hadith hafiz" (Kandemir, 2017). Kütüb-i Sitte, "Six books of hadith that contain most of the hadiths and generally reliable ones" (Kandemir, 2003, p.

social norms were intertwined in early Islamic society. Pişkin provides a detailed examination of how the traditional values and principles of warfare in Arab society, particularly the Prophet Muhammad's conduct of war, were shaped by social norms. This study is not only based on a religious perspective, but also discusses how the values of Arab society regarding warfare shape the behaviors of individuals and the impact of these norms on society. Furthermore, this study considers how Islam's teachings on warfare influenced the social structure of the period and the overall moral fiber of Arab society.

The common theme of the articles examined within the scope of the research is how social structures and ideological forms are shaped over time and the determining role of these structures on the perceptions and behaviors of individuals. Each of them examines how social structures and ideological forms permeate the world of individuals and how the individual-society relationship is shaped in its own period and cultural context. This study is an attempt to explore how the social and cultural themes in these articles are reflected in digital academic processes. It is also expected to provide an insight into how traditional and modern values interact with each other and the stages of social transformation.

Digital transformation has caused a great change in political, economic, social and cultural fields (Öztunç & Soğukdere, 2020, p. 61). This change has also been reflected in academic studies and has facilitated both the increase in these studies and their reach to the crowds, especially by expanding the sphere of influence of online research platforms. DergiPark, the centre of academic publishing in Türkiye, is an important platform which aims to increase the accessibility of scientific articles. The aim of this study is to analyze the most downloaded articles on DergiPark in 2021 and to investigate how academic research and interests are shaped, which topics attract more attention, their popularity, and how these trends relate to both social and academic developments. It is also expected to provide data on the impact of these articles on academic communities and possible clues for future research trends. Thus, the research aims to reflect the social sensitivity and academic interest in both historical and contemporary issues in Turkish social sciences, and to contribute to the identification of future research areas. Different programs have been utilized in researches conducted with content analysis. One of these programs is MAXQDA. In 2024, in one of the studies conducted using MAXQDA, the mission and vision statements of higher education institutions with

6) Hadith, "The term that expresses the words, deeds and approvals of the Prophet; the science of determining, transmitting and understanding hadiths" (Kandemir, 1997, p. 27).

communication faculties among the universities providing formal education in Türkiye were analyzed through content analysis (Altıntop & Altıntop, 2024).

In the literature review, a lot of studies analyzing the articles published on the DergiPark platform were observed. In a study conducted in 2022, 80 articles focused on Smart City on the Dergipark portal were analyzed by content analysis (Göçoğlu, 2022). In a study conducted in 2024, articles related to the field of accounting science on the DergiPark platform were subjected to bibliometric analysis in terms of various variables (Atabay, 2024). However, as a result of the literature review, no study was found in which the articles in the "trends" section of the DergiPark platform were analyzed. One of the aims of the study is to contribute to the literature on this subject.

Research Methodology

In this study, the statistics of the most downloaded articles from the DergiPark database in 2021 were analyzed. The topics, research areas and contents of the articles were analyzed in detail. In addition, the differences between academic publications on DergiPark were evaluated, taking into account the journals, authors and general academic trends in which these articles were published. This analysis, supported by statistical data, was carried out using the content analysis method. "Content analysis is a research technique that enables the systematic realization of communication content within the framework of predetermined classifications (categories)" (Geray, 2011, p. 151). For the content analysis in the study, coding was done through the MAXQDA program, relationships between texts were revealed, texts were digitized and visualized.

On October 10, 2024, by logging into the Dergipark platform, the most downloaded articles in 2021 were accessed under the "trends" tab (Dergipark Academic, 2024). There are 10 articles in the most downloaded articles. Looking at the screenshot of the information of the top 3 ranked articles among these articles; it is noticeable that the first ranked article was downloaded 96,317 times and the third ranked article was downloaded 81,520 times (Figure 1). Within the scope of the research, only these three articles were included in the sampling. In the research, the abstracts of the three most downloaded articles in 2021 were coded and subjected to content analysis.

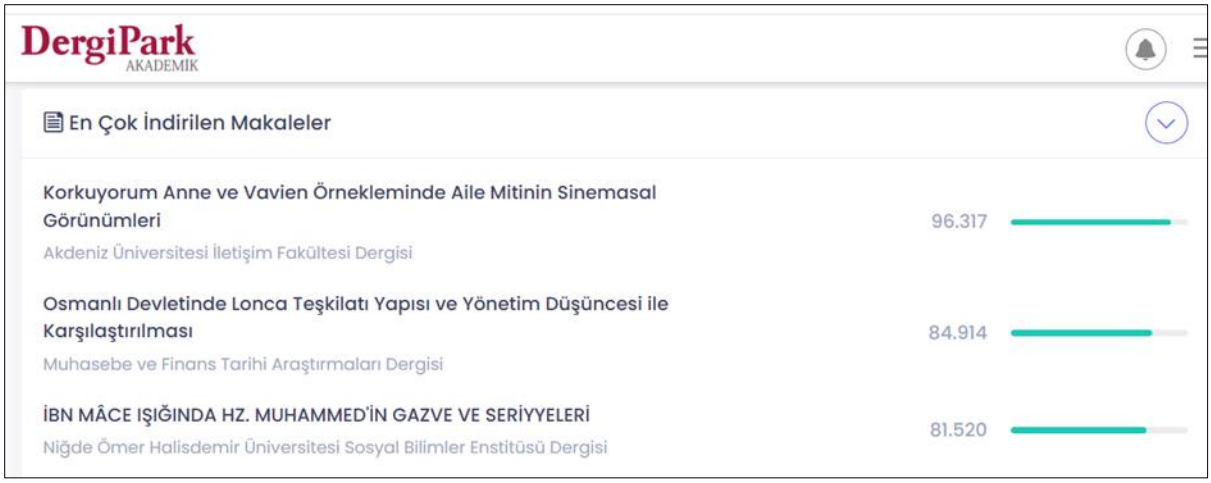

Figure 1. Screenshot of the Most Downloaded Articles According to Dergipark 2021 Statistics (Top Three Articles)

The information about the articles included in the research is given in Table 1. According to the table, it was seen that the first two most downloaded articles were published in 2018. In Oktan's study in 2018, family representations in the films "Korkuyorum Anne" (I'm Afraid, Mother) and "Vavien" were examined using a sociological analysis method. In this review, it was investigated how social thoughts about family representations were reflected in both movies. In the study conducted by Oktan in 2018, the family representations in the films and "Vavien" were analyzed by sociological analysis method, considering that social thoughts are reflected in cinematic works (Oktan, 2018). In the other academic study published in 2018, the financial and managerial structure of the guild organization, which is considered as a continuation of the Ahi community, was evaluated and its importance was emphasized, and comparisons were made on today's management perceptives and business management scope (Akbaş et al., 2018). In the 2019 study, Prophet Muhammad's war principles and the lives of the Arab society and their knowledge on medicine and other sciences were discussed within the framework of Ibn Mâja's hadith corpus named al-Sunan (Pişkin, 2019).

Table 1. Information on the Most Downloaded Articles According to Dergipark 2021 Statistics (Top 3 Articles)

Publication Date	Author Information	Article Information	Number of Downloads
2018	Ahmet Oktan	The Aspects of Family Myth in the Films, *Akdeniz University Journal of Faculty of Communication*, 29, 11-34.	96.317
2018	Halil Serdar Emre Akbaş, Bozkurt, Kübra Yazıcı	Comparison With the Management Thought and the Guild Organization Structure at the Ottoman Government. *Journal of Accounting and Finance History Research*, 09 (Business history special issue), 165-202.	84.914
2019	Hatice Nur Pişkin	Evaluation of Ghazwas and Seriyyas in the Light of Sunen-i Ibn Mâja. *Journal of Niğde Ömer Halisdemir University Institute of Social Sciences*, 1 (2), 33-41.	81.520

The common features of the first three articles in the "trends" tab of Dergipark in 2021 were determined, coded and subjected to content analysis. The themes, concepts or topics discussed in the articles can be considered as common features. Identifying commonalities contributes to a more in-depth and meaningful content analysis. After analyzing the abstracts of these three articles, the common aspects of each article were determined based on the main themes of each article.

Content Analysis of Summary Texts

The summary texts of three articles were analyzed by removing prepositions and conjunctions. In this context, the word cloud created with the help of MAXQDA program is shown in Figure 2. The size of the words shows the frequency of use. According to this, the first five most frequently used words in the articles are "history" (f:7), "information" (f:7), "family" (f:6), "study" (f:6) and "guild" (f:6).

Figure 2. Word Cloud

Coding through MAXQDA Program

With the help of MAXQDA program, the texts were digitized and visualized to reveal the relationships between the summary texts of the 3 articles. By analyzing the summary texts of the articles, common themes were obtained, and these common themes make it possible to create strong codes for content analysis. After the texts were added in MAXQDA, codes were created for each common feature and the texts were marked with these codes. Each common feature was assigned to the relevant text fragment and analyzed. Codes and code lists were created. While creating these lists, their semantic/logical bases were also included (Table 2). The linguistic structures in the table which are included or derived from the code word in the form of a phrase were taken into consideration.

Table 2. Codes Generated for Content Analysis of Abstract Texts in Articles

Theme (Common Feature)	Code	Logical/Semantic Basis
2021 Most Downloaded Academic Work in 2021	Article1	Most downloaded article
	Article2	Second most downloaded article
	Article3	Third most downloaded article
Social Structure and Human Perception	Social Structure	It deals with the relationship between individuals and social structures such as family, guild or war
	Relationship between Individual and Society	How the individual is affected by the social structure, the impact of society on the individual
Ideological and Cultural Influences	Cultural and Ideological Structures	Each article discusses the relationship between culture, ideology and belief systems and social structures
	Politics and Governance	Governance structures, especially ideological foundations in guild organization or social norms in the principles of war
Modern Reflections of Traditional Buildings	Traditional Understanding	Traditional structures (family, guild, war, etc.) and structures and values from the past
	Modern Comparisons	Comparison of traditional structures with the modern world (comparison of the guild system with modern business)

Creating Code Proximity, Code Intersection Maps and Content Analysis

The above codes were coded with the relevant sections on the abstract texts of the articles using the MAXQDA program. Using MAXQDA's "Relationship between Codes" tool, it was determined how the codes were interconnected and clustered around common themes. In this way, "code intersection" and "code proximity" maps were created to visualize the relationships between codes and to examine in-text interactions and relationships. While the code proximity map reflects the proximity relations of the words and their meanings represented by the codes in the analyzed texts, the code intersection map reveals the intersection of a section marked with a code in the text with other codes. The thickness of the lines in these maps expresses the frequency/magnitude of the intersection or relationship (Altıntop & Altıntop, 2024, p. 32).

Code Proximity Table and Code Proximity Map Analysis of Articles

Code proximity map and code proximity table were used in the study. Code proximity map and code proximity table are not the same thing, but they are two different tools which are related to each other and used for similar purposes. The Code Proximity Table is usually organized in

a matrix format and shows numerically or descriptively the affinities or relationships among codes. In these ways, the relationship of each code with other codes on the table can be determined, as well as the degree of closeness or strength of connection between two codes. The Code Proximity Map is a visual representation of the relationships between themes or codes. It works like a kind of network diagram and visually expresses the proximity between codes, usually using colors, lines and links. Different visual elements (e.g. thicker lines or brighter colors) can be used depending on the intensity or degree of interactions between codes. In summary, while the code proximity table provides a numerical and textual analysis, the code proximity map provides a visual analysis. Both are used to understand the relationships between codes, but presented in different formats and methods. Below is an analysis of the Code Proximity Table (Table 3), which analyzes the three articles together.

Table 3. Code Proximity Table

Codes	Social structure	Relationship between individual and society	Cultural and ideological structures	Politics and governance	Traditional understanding	Modern comparisons
Social structure	-	High	Middle	Middle	High	Low
Relationship between individual and society	High	-	Middle	Low	Middle	Low
Cultural and ideological structures	Middle	Middle	-	High	Middle	Middle
Politics and governance	Middle	Low	High	-	Middle	High
Traditional understanding	High	Middle	Middle	Middle	-	High
Modern comparisons	Low	Low	Middle	High	High	-

Code Proximity Table Analysis of Articles

-In terms of Social Structure:

Relationship between Individual and Society (High): The relationship between social structures and individuals is strong.

Traditional Understanding (High): Traditional structures have a strong relationship with social structures as they constitute the basic building blocks of society.

Cultural and Ideological Structures (Medium): Although social structures are shaped by culture and ideologies, these themes are not directly in the same focus.

Modern Comparisons (Low): As a result of focusing on traditional structures in studies on social structures, the encounter with modern structures is low.

-In terms of the Relationship between Individual and Society:

Cultural and Ideological Structures (Medium): The individual-society relationship is shaped by the influence of cultural and ideological structures but does not establish a direct relationship.

Traditional Structures (Medium): There is interaction between the individual and traditional structures, but the relationship is not fully overlapping.

Governance and Ideology (Low): The relationship between the individual and society is weaker than the relationship between governance and ideology.

-In terms of Cultural and Ideological Structures:

Politics and Governance (Higher): These two themes have a strong relationship, as governance systems are often based on ideological foundations.

Traditional Understanding (Medium): Traditional structures are linked to ideologica structures but do not completely overlap.

-From the Perspective of Politics and Governance:

Modern Comparisons (High): Governance and ideological structures are often addressed through modern comparisons and therefore have a high degree of closeness.

-From a Traditional Perspective:

Modern Comparisons (High): The relationship between traditional structures and modern comparisons is high because past and modern structures are frequently compared.

Code Proximity Map Analysis of Articles

Below is the Code Proximity Map (Figure 3), and based on this map the analysis of each code according to its relationship with each other and the degree of closeness in the three articles. According to the code proximity map, Article 1 on family representations in cinema is at the same distance from the content defined by other codes except for the politics and governance code. Therefore, no content related to politics and governance was included in this article. Article 2, which describes a historical situation, is the study with the closest relationship to the politics and governance code. This image means that the subject of politics and governance is dealt with predominantly in Article 2. In addition, when Article 2 is compared to other articles, it has been observed that that it is closer to all codes. This means that Article 2 focuses more on socio-cultural issues. In Article 3, where a religious and historical topic is covered, the code for politics and administration is relatively close. The other codes are located in almost the same proximity as Article 1.

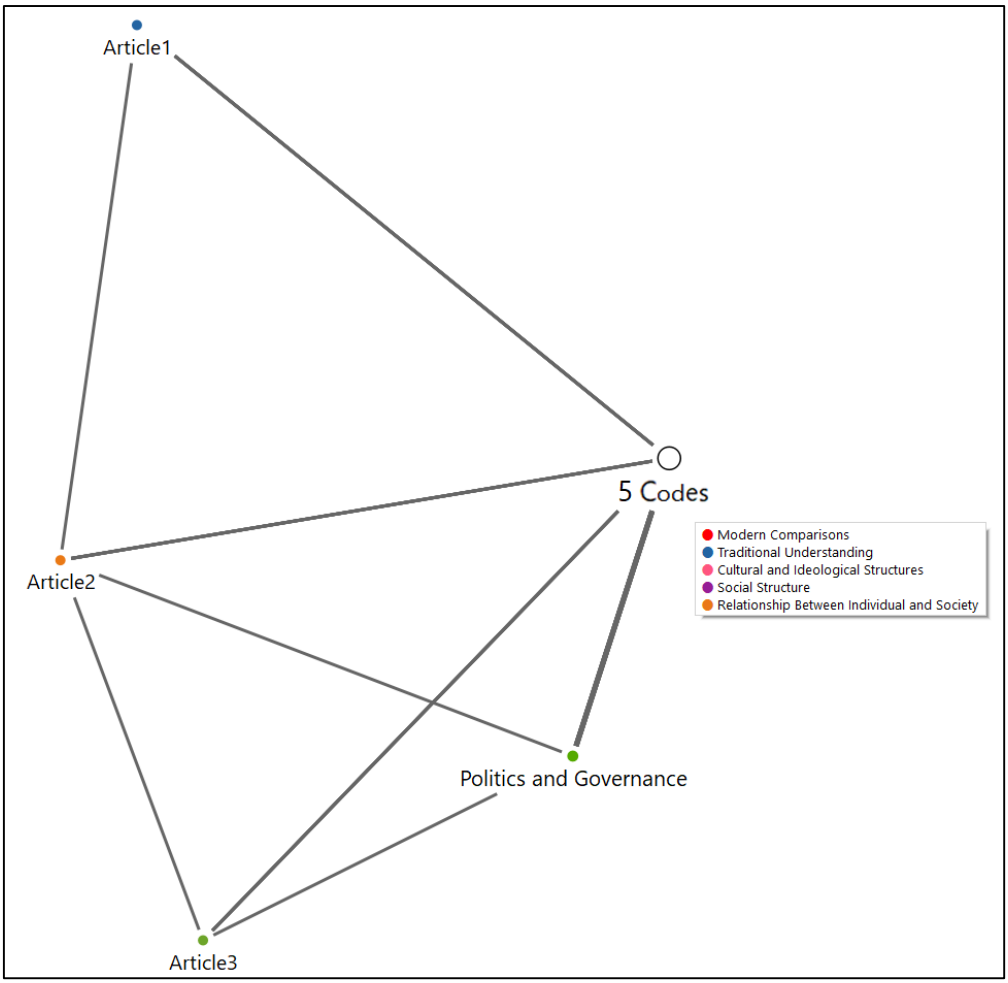

Figure 3. Code Proximity

The codes of social structure, the relationship between the individual and society, cultural and ideological structures, traditional understanding and modern comparisons have an extremely close relationship in all three articles. This means that all three articles overlap in socio-cultural terms even though they are written on different topics and fields. On the map, although the politics and governance code is closely related to the other codes, it is seen to stand apart. The main reason for this is the predominant use of this code in two of the three articles.

The strength of the relationships between the codes was determined using the MAXQDA software, which analyzes textual data by identifying the frequency and co-occurrence of codes. In this study, relationships were evaluated based on two main criteria: (1) the frequency of co-occurrence of codes within the same sections of text and (2) the proximity scores visualized in the code proximity map. Codes with higher co-occurrence frequencies or closer proximity on the map were interpreted as having stronger relationships. For example, the social structure and cultural and ideological structures codes often appeared together in all three articles, reflecting a strong connection. On the other hand, the politics and governance code, while related to the other codes, appeared predominantly in only two articles, which accounts for its relative separation on the map. These criteria provided a systematic basis for assessing the relationships between the codes.

Code Intersection Table and Code Intersection Map Analysis of Articles

Although the code proximity and code intersection maps used in the research are different, they are related to each other. Code Intersection Table is usually presented in the form of a matrix and shows the relationships or intersections between themes or codes. The table shows visually or numerically information such as which of each code intersects with and/or the other codes, which codes appear together in which texts. The purpose of this table is to explain the analysis map of intersections and interactions between codes.

A Code Intersection Map is a visual representation of the relationships between themes or codes. An intersection map works like a kind of network diagram, visualizing how certain codes are connected to each other and the strength of these connections. Usually with drawings, colors and lines, the interactions between codes are shown more clearly. In summary, a code intersection table provides a numerical and textual analysis, while a code intersection map

provides a visual analysis. Both have the same basic purpose: to understand the relationships between codes, but they are presented in different formats and methods. Below is the Code Intersection Table (Table 4) and its interpretation.

Table 4. Code Intersection Table

Codes	Article1	Article2	Article3
Social Structure	X	X	
Relationship between Individual and Society	X		
Cultural and Ideological Structures	X	X	
Politics and Governance		X	
Traditional Understanding		X	X
Modern Comparisons		X	X

Code Intersection Table Analysis:

The "X" in each cell of the table indicates that the code intersects with the relevant text and that the code is included in the content of that text. In this context, it is seen that the code intersection relationship is much more intense than the code proximity relationship.

-Social Structure

The code "social structure" is explicitly addressed in Article1 and Article2. In Article1, the relationship between the individual and social structures is discussed through the impact of the family institution on individual perception, while in Article2 the interaction of the guild organization with social structures is discussed. Article3, on the other hand, does not emphasize this issue.

-Relationship between the Individual and Society

The code for the relationship between the individual and society is found only in Article 1. In this text, the interaction of the individual with social structures and the impact of society on the individual are discussed in the context of the shaping role of the family structure on the individual. In Article2 and Article3, this relationship code was not used in any context.

-Cultural and Ideological Structures

The code of cultural and ideological structures is discussed in both Article1 and Article2. Article1 discusses the cultural and ideological effects of the family structure, while Article2

examines the cultural and ideological foundations of the guild organization. There is no emphasis on this theme in Article3.

-Politics and Governance

The code for management and ideology is only covered in Article2. In Article2, the administrative structures and ideological foundations of the guild organization are discussed, as well as the effects of this structure on the family and society. The other two texts (Article1 and Article3) do not provide any content that can be associated with this code.

-Traditional Understanding

The code of traditional structures is included in Article2 and Article3. Article2 discusses the relationship between the guild organization and traditional structures, while Article3 discusses traditional structures such as ghazwa and seriyas. There is no discussion of traditional structures in Article 1.

-Modern Comparisons

The code of modern comparisons is discussed in Article2 and Article3. Article2 compares the guild organization with modern business management, while Article3 discusses the modern equivalents of ghazwa and seriyyah. No such comparison was made in Article1.

In addition to the code intersection table, the Code Intersection Map (Figure 4), which shows how the codes intersect, which codes are together, and the connections between the codes in a more specific way, and its explanations are given below.

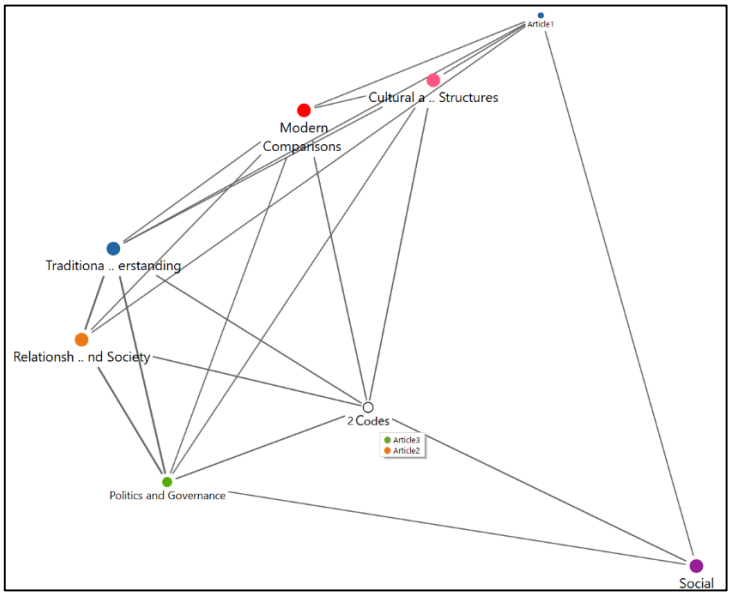

Figure 4. Code Intersection Map

The most discrete code in the code intersection map was social structure. However, it is seen that Article 1 does not intersect with the other two articles. The main reason for this is clearly the difference in the fields of the articles. The code with the strongest intersection of Article 1 is cultural and ideological structures. The order of intersection of Article 1 with other codes is as follows: modern encounters, traditional understanding, individual-society relationship. These intersections on the axis of family, society, traditional and modern life stem from the evaluation of family representations through a movie in Article 1. It is the only political and administrative code that Article 1 does not intersect with. On the other hand, Article2 and Article3 were located close to the center of the map and in the same area. This makes the intersections of Article2 and Article3 to all other codes the same. The intersection relationship of both articles is politics and governance from strong to weak, individual-society relationship, traditional understanding, modern encounters, cultural and ideological structures and social structure. The intersection map here means that Article 1 deals with separate topics, while Article 2 and Article 3 deal with similar topics.

Findings of the Study

An analysis of the most downloaded articles shows that certain academic fields attract more attention than others. In 2021, the first finding among the most downloaded articles on DergiPark is that there are studies belonging to the fields of social sciences. After examining the abstracts of the articles and creating common themes and codes, it was concluded that the articles were included under three different common features.

-Social Structure and Human Perception

Article1 (Family Representations): The role of the family in the social and cultural context and its impact on the individual.

Article2 (Guild Organization): The economic and administrative structure of the guild system in the Ottoman Empire and the structures that determine its place in society.

Article3 (The Prophet Muhammad's Ghazwa and Seriyas): The relationship of Prophet Muhammad's leadership and wars to the traditional structure of Arab society.

Common Feature Social Structure and Individual-Society Relationship

Although written on different topics, all three articles address the effects of the social structure on the individual or the determining roles of different segments of society. From the

family structure to the guild organization, each article examines important social and cultural structures in society.

-Ideological and Cultural Influences

Article1 (Representations of the Family): Cultural and ideological dimensions of the family myth, especially patriarchy and gender roles.

Article2 (Guild Organization): The management approach of the guild organization, the ideological foundations of Ahilik and the cultural structure associated with trade.

Article3 (Ghazwa and Seriyyahs): The link between the Prophet Muhammad's principles of warfare and the traditional values of Arab society.

Common Feature: Ideological and Cultural Structures

All three articles deal with ideological and cultural structures that play an important role in shaping the ways of thinking of individuals in society. This provides a powerful theme for understanding the interplay between culture, social order and the individual.

-Modern Reflections of Traditional Structures

Article 1 (Representations of the Family): Cinematic representation of the family structure in a traditional form.

Article2 (Guild Organization): A comparison of the traditional structure of the guild organization with modern business management.

Article3 (Ghazwa and Seriyyahs): How the traditional values of Arab society were shaped by the principles of warfare and the teachings of Islam.

Common Feature: Comparison of Traditional and Modern Buildings

The articles establish a relationship between traditional structures (family, guild, war principles) and modern understandings. Each discusses the place and impact of traditional understandings of the past in contemporary societies.

Conclusion and Recommendations

This research focuses on a detailed analysis of the three articles by coding them according to their common characteristics. The content analysis allowed for an in-depth examination of the articles' relationships between social structure, ideological influences and traditional and modern structures. Each article was placed in specific social and cultural

contexts and the similarities and differences between them were made explicit. This process provided a comprehensive exploration of the interactions between the themes.

As of 2021, the most downloaded articles in DergiPark reflect research trends shaped by the impact of social changes. These findings provide important clues about which areas the academic community is concentrating on and how future research in these areas will be shaped. Academic platforms such as DergiPark provide powerful tools to monitor trends in the research world and follow developments in this direction. By examining these trends in more depth, future research is expected to provide guidance in determining how to respond to social, cultural and technological changes.

However, it is important to note that drawing comprehensive conclusions based solely on the study of just three articles may not provide a full representation of the broader trends. A more robust analysis, incorporating a larger sample of articles, would be necessary to gain a clearer and more accurate understanding of the evolving research landscape.

This study provides a solid foundation for a review focusing on the analysis of the most downloaded articles on DergiPark as of 2021. The study aims to demonstrate the popularity of different research topics in the field of social science and the social impact of studies on these topics. For this purpose, the abstracts of the articles were analyzed, specific themes and codes were created, and three main common features were identified under these codes:

In the study, the relationships between codes were examined in detail and visualized using the "Relationship between Codes" tool of MAXQDA software. Through the created code proximity and code intersection maps, the interactions between the themes in the texts were made more understandable and these relationships were analyzed both numerically and visually. In this way, the interactions between variables such as social structures, individual-society relations, cultural and ideological structures were revealed by providing in-depth analysis of the relationships between themes. In conclusion, the code proximity and intersection maps used in this study contributed to a deeper understanding of qualitative data analysis and clarified the relationships between codes both numerically and visually.

Specifically, the numerical analysis focused on quantifying the frequency of code occurrences and their co-occurrences within the dataset, allowing for a clearer understanding of the strength and significance of the relationships between themes. The numerical results were visualized through proximity maps that depicted the intensity of these interactions, providing an empirical basis for the thematic analysis.

The research resulted in a deeper understanding of the relationships between important themes such as the impact of social structures on individuals, the links between cultural and ideological structures and patriarchy, and the interactions between traditional structures and modern comparisons. The intersections between these themes were an important tool in understanding social and cultural structures. Moreover, the visualization of the relationships between codes allows for a more effective analysis of the texts, enabling more comprehensive interpretations in the theoretical context. The research findings revealed that there is a strong interaction between social structure and themes such as individual-society relationship, cultural and ideological structures, but some themes intersect only in certain contexts. In particular, the relationship between social structure and traditional structures is high, while themes related to modern comparisons show lower affinity. These findings provide important insights into how interactions between social structures and cultural and ideological themes operate not only in specific texts but also within the broader structures of society.

This study ensures understanding of the interaction between these elements by examining the effects of social structures, ideological influences and traditional structures on modern societies in depth by examining the three most downloaded articles in DergiPark in 2021. As a result of the articles analyzed, it is important that the most downloaded academic studies are in the field of social sciences as well as being a research on DergiPark, Türkiye's important academic-digital and online database. In addition, the study contributes to a better understanding of the basic dynamics of the popular literature in the field of social sciences in general and thus contributes to our understanding of how social, cultural and ideological structures are shaped in today's societies. In this context, similar future research by expanding the sample, examining how the themes are addressed in different academic fields and/or investigating their effects on the changing structures of society will contribute to the literature.

However, it can be alleged that the study could enable insight into trends in social science research in Türkiye, rather than making an absolute claim regarding the generalization of these findings across the entire academic landscape. Given the limited scope of the three articles examined, the results are framed as indicative of potential trends, rather than definitive conclusions. This limitation is a conscious choice in the study design, acknowledging that a broader sample would offer a more comprehensive and accurate reflection of the academic environment.

In addition, this study explicitly recognizes its limitations. The small sample size, focusing solely on the three most downloaded articles, presents constraints that must be considered when interpreting the findings. These limitations were identified to ensure transparency and provide a clear context for the results. While this study provides valuable insights, it is crucial for future research to expand the sample size, explore a wider range of academic fields, and assess the broader implications of these findings. This approach would contribute to more robust and generalizable conclusions, enriching the current understanding of social science research trends.

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Strategies for Maintaining Social Order in Jerusalem From Ottoman Rule to The Present Day and Their Effects on Marketing Power

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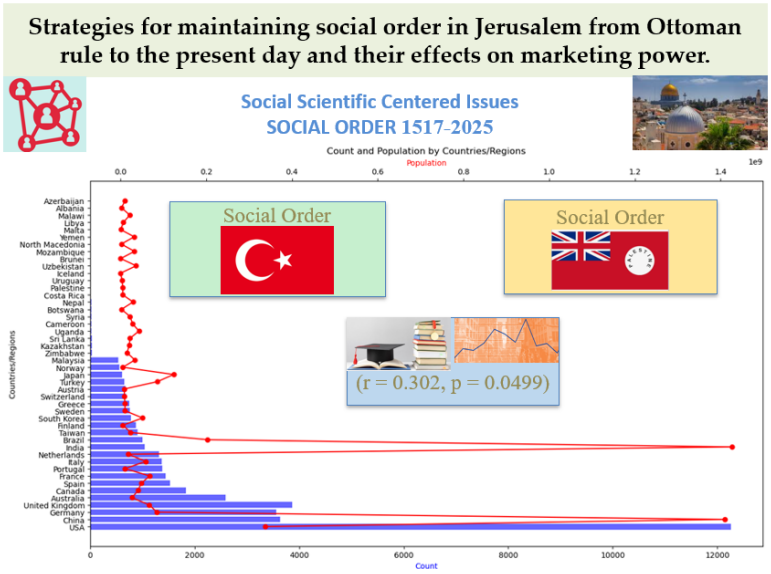
Graphical Abstract



Abstract

The study examines the strategies for maintaining social order in Jerusalem from the Ottoman period to the present day, and the effectiveness of today's modern information technologies in maintaining social order is analyzed. In the conceptual framework, the strategies used to organize and stabilize society during Ottoman rule are discussed in relation to historical practices. This point reveals the differences between the British Mandate's practices and the next administration period. Following the analysis of historical practices, the interaction between the academic study data obtained from the Web of Science (WoS) database and the country populations is presented with the help of the SPSS v21 program to measure the value countries attach to information systems in the social field today. Thus, a study covering historical strategies and modern practices used to manage dense population structures is presented. The findings provide valuable results to draw attention to the importance of information systems in maintaining social order. These findings offer strategic insights into government policies in managing population density, a key aspect of ensuring social stability.

Key words: social order, information systems, population, jerusalem, export strength, marketing

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Introduction

Growing populations and changing social structures have necessitated the development of new systems for governance and order throughout history. Jerusalem under Ottoman rule and the British Mandate is an important case study examining responses to demographic changes. Drawing on historical practices in Jerusalem, this study examines the interaction between population growth and the maintenance of social order. It also analyzes the correlation of information systems with social order and population growth, with global implications for the contemporary State of Palestine.

Organizing society effectively has been a significant challenge for governments throughout history, especially in regions where diverse communities live together and experience rapid demographic changes. It has been shown in the literature that managing diversity can improve the performance of organizations and promote social cohesion (Ezzy et al., 2020; Oucho & Williams, 2019; Laurence, 2009). Jerusalem during the Ottoman and British Mandate periods is a valuable case study for analyzing governance systems due to its complex population structure which instead includes different communities. During the Ottoman and British Mandate periods, different practices were tried to maintain social order, manage and distribute resources, and improve economic activities for the community's social well-being.

Rapidly changing demographics require innovative solutions to improve the efficiency of social services (Burian, Zimmermannová, & Macků, 2020). Modern information systems have inherited many of these historical precedents and, thanks to advancing technologies, have become indispensable tools for managing the problems of societies with high population density. In particular, the relationship between population size and dependence on information systems has been a prominent topic of contemporary management and academic studies.

This study aims to combine the administrative solutions of the past with the conceptual context of modern information systems. It also examines quantitatively global academic research trends. Bibliometric data from the Web of Science database and population statistics from the World Bank are analyzed to investigate the correlation between publication productivity and population size. Combining historical analysis with modern quantitative data, this research demonstrates the importance of information systems in maintaining social order and increasing the marketing power of countries.

Social order is one of the most important factors shaping consumer behavior and is decisive in creating marketing strategies (Kotler & Keller, 2019). Cultural norms, social values, and regulatory institutions directly affect consumers' purchasing decisions, making brands need to shape communication strategies (Hofstede, 2001; Solomon, 2020). By means of the examples in the literature, it is possible to observe customized marketing strategies of brands in countries with different social structures. In South Korea, the high level of collectivism in the social order requires brands to adopt group-based advertising strategies (Kim & Lee, 2019). Similarly, in Western European countries, sustainability and ethical consumption awareness have become part of the social order, leading many brands to adopt green marketing strategies (Peattie & Crane, 2005; White, Habib & Hardisty, 2019). Due to the strict regulatory structure in China, international brands are forced to integrate their digital marketing strategies into local platforms such as WeChat and Alibaba (Chiu et al., 2012). These decisive effects of the social order suggest that brands should determine their strategies by considering both economic and sociocultural factors (Bourdieu, 1984; Arnould & Thompson, 2005).

1. Conceptual Framework

In the conceptual framework, for two different historical periods, firstly, the topics of ensuring social order are examined, and then, for these two historical periods, trade-based examinations are included. Following the four headings, the relationship between information systems and social order are examined under two main headings. Finally, the interaction between information systems and marketing is reviewed under a separate heading.

1.1. Periodical Analysis of Social Order

The periodical analysis of social order is carried out under two main headings in this study. The concept of social order is analyzed in the period of Ottoman rule and the period of the British Mandate, and the studies carried out to ensure social order in these periods are examined. In particular, the importance of population records in ensuring social order is discussed under two headings.

1.1.1. Social Order During the Ottoman Rule

The Ottoman Empire ruled Jerusalem from 1517 until the end of the First World War in 1917. It developed various strategies to ensure social stability and order among the city's communities. One of the main strategic methods of the Ottoman administration was what is

known as the “millet system”. The millet system allowed different religious communities to manage their internal affairs. By allowing groups such as Muslims, Christians, and Jews to apply their laws in matters related to their status (e.g., marriage and education), this structure increased social stability and reduced tensions between communities (Barkey & Gavrilis, 2017; Coakley, 2018). Moreover, the Ottoman administration kept population registers of these communities, allowing for more efficient delivery of social and public services (Coşgel, 2004; Can & Kabadayı, 2021).

The efforts to maintain social stability and order in Jerusalem under Ottoman rule were supported by various practices, including population controls and careful record-keeping. Keeping these records carefully is an effective example of ensuring the coexistence of different communities in Jerusalem, a multicultural and multi-religious city. By analyzing the demographic structure of the city's population, the needs of the communities were identified, and policies were developed based on these results (Myres, 2000).

The Ottoman administration also contributed to social order by investing in infrastructure and public services in the city. Projects such as water supply, road construction, and the construction of public buildings can be analyzed under infrastructure, improved living conditions, and increased economic activity (Hassan, 2018; Davis, 1948). In particular, in terms of water supply, the Ottomans restored ancient waterways and built new systems. Infrastructure works were essential to meet the growing population's needs and improve communities' health conditions (Bourmaud, 2018).

1.1.2. Social Order During the British Mandate Period

Following the end of the Ottoman Empire, when Jerusalem came under the British Mandate in 1917, similar and different efforts were made to ensure social stability and order, this time by the British Mandate. For the British Mandate, it became essential to ensure the coexistence of different ethnic and religious groups in the city (Ezugwu, 2023).

The British Mandate conducted extensive censuses to determine the population structure in Jerusalem. The censuses were essential for the British Mandate to determine the number and distribution of different ethnic and religious groups in the city. Censuses were also instrumental in the planning and implementation of social services. Through these records, the British administration identified the needs of different communities and developed policies

accordingly (Cohen, 2020, p. 320). Population registers enabled effective service delivery, especially in health, education, and infrastructure areas.

During the British Mandate, infrastructure development in the city also played an essential role in maintaining social order. Projects such as water supply, road construction, and health services improved living conditions and increased economic activity (Roberts, 2013). In particular, health reforms helped to control infectious diseases. For example, vaccination campaigns were organized to prevent the spreading of diseases such as typhoid (Davidovitch & Greenberg, 2007).

1.2. The role of information systems in maintaining social order today

Today, various studies examining the effectiveness of information systems in maintaining social order reveal the effects of these systems on social structure. Franch-Pardo et al. (2020) reviewed the role of geographic information systems (GIS) in managing health services during the COVID-19 pandemic. The research shows that GIS is critical in tracking disease spread and managing health resources (Franch-Pardo et al., 2020). Another research examined the role of health information systems in managing health services during pandemics. The study reveals that these systems play a critical role in clinical practice, resource management by health managers, and population management by public health authorities (Schmidt, Abboud, & Bogaert, 2021).

Fitria et al.'s (2023) study examines the role of management information systems in developing human resource competencies. The research emphasizes that these systems are a strategic process for enhancing human resource skills in organizations (Fitria et al., 2023). The effective use of information systems in human resource management is essential in ensuring social order. Maarouf and Radwaan's (2024) study investigated the effects of management information systems on decision-making processes and employee performance. The results show that these systems provide organizational efficiency by increasing employee performance (Maarouf & Radwaan, 2024). Al-Bashtawi's study examines the effects of integrating management and accounting information systems on banking services. The study shows that these systems contribute to maintaining social order by improving the quality of banking services (Suleiman Hussein Al-Bashtawi, 2024). In this context, information systems help to maintain social order by increasing the efficiency of financial services.

Wu et al. developed a network effect and interest diffusion model for social recommender systems. The research reveals the impact of the interaction of social and interest networks on community management and population identification (Wu et al., 2019). All these findings suggest that information systems play a central role in establishing social order and enhancing interactions.

Methods

The study was conducted at Bursa Uludağ University using a dataset obtained from the WoS database without any date restrictions (to observe all studies on information systems in various countries) and with a field restriction (Social Sciences). Another data group in the dataset consists of export figures from different countries as of July 2022, obtained from the OECD database. The third data group is derived from the country's population census information provided by the World Bank (2022). The study aims to observe the interaction of academic studies on information systems with population and marketing power and to contribute to future studies by revealing the relationships between these phenomena through the datasets created. The necessity of this study is summarized as being able to elaborate on the interaction of population information systems by revealing the changes that historical management and economic improvement strategies have undergone until today. In the literature, the benefits of information systems have been examined in various scopes, including financial returns, social improvement power, and possible disadvantages. These studies demonstrate the contribution which a detailed examination of this topic with current data can make to the literature. The study method is carried out under two main headings: the interaction between studies on information systems produced in the social field and country populations and the interaction between studies on information systems produced in the social field and country export figures examined through two different datasets.

Data analyses were performed using SPSS v21 software. Bivariate correlation analysis (Pearson's r) was conducted to examine the relationship between the number of academic studies on information systems and export figures after verifying the normal data distribution. Export figures and examined studies on information systems in the social field were also correlated using bivariate correlation analysis.

Findings

The results of the analyses in the field of information systems and the field of trade are presented under separate headings. The study uses bivariate correlation analysis to reveal the extent to which countries with extensive populations value studies titled "Information Systems in the Social Field." In other words, it aims to show that countries conducting research on information systems in the social field are predominantly those with dense populations. For this purpose, the dataset includes the 25 most populous countries and the countries with the lowest population density. The number of studies conducted by countries on information systems were obtained from the WoS database to create the dataset. Some restrictions were applied when selecting the data to ensure accurate results. For example, countries with no academic studies were excluded, as they would significantly affect the results. A minimum of nine studies were set as the threshold, and countries with fewer studies were excluded from the dataset, as they are likely to have very low populations and could negatively impact the results. This threshold included countries like Palestine in the dataset while avoiding countries without academic publications.

The table consists of two columns comparing the number of studies on information systems in the social sciences and the population density of the same countries. Using SPSS bivariate analysis, a correlation between these two phenomena can be observed, showing that countries producing more studies on information systems in the social field also tend to have dense populations.

Table 1. Number of Academic Studies on Information Systems in the Social Field and Country Population Data

Countries/Regions	Count	Population
USA	12259	336.981.386
China	3637	1.409.670.000
Germany	3564	84.607.016
United Kingdom	3.862	67.026.292
Australia	2589	26.707.556
Canada	1832	41.012.563
Spain	1530	48.345.223
France	1439	68.226.000
Portugal	1386	10.467.366
Italy	1374	58.919.345
Netherlands	1317	17.947.684

India	1045	1.427.097.903
Brazil	998	203.080.756
Taiwan	908	23.420.442
Finland	871	5.581.767
South Korea	781	51.439.038
Sweden	760	10.545.310
Greece	751	10.482.487
Switzerland	687	8.865.270
Austria	678	9.159.993
Turkey	651	85.372.377
Japan	613	123.850.000
Norway	561	5.514.042
Malaysia	540	33.500.000
Zimbabwe	32	15.178.979
Kazakhstan	31	20.033.546
Sri Lanka	29	22.181.000
Uganda	27	42.885.900
Cameroon	25	28.088.845
Syria	20	22.125.000
Botswana	18	2.410.338
Nepal	17	29.164.578
Costa Rica	16	5.213.362
Palestine	15	5.483.450
Uruguay	15	3.554.915
Iceland	13	390.830
Uzbekistan	13	36.297.477
Brunei	12	429.999
Mozambique	12	32.419.747
North Macedonia	12	1.832.696
Yemen	12	31.890.000
Malta	11	519.562
Libya	10	6.812.000
Malawi	10	21.507.723
Albania	9	2.761.785
Azerbaijan	9	10.135.373

Table 1 shows the population data of the countries and the academic studies in the field of information systems. The table data includes the number of academic studies taken from the Web of Science (WoS) database and the population data of the countries. At this point, the only constraint used while collecting the data is that the academic studies produced should be in the field of social sciences.

Table 2: Correlation Table Between Studies on Information Systems in the Social Field and Country Population

		Count	Population
Count	Pearson Correlation	1	,302*
	Sig. (2-tailed)		,041
	N	46	46
Population	Pearson Correlation	,302*	1
	Sig. (2-tailed)	,041	
	N	46	46

*. Correlation is significant at the 0.05 level (2-tailed).

The analysis results show a positive, moderate relationship between population and the number of academic studies on information systems in the social field (r = 0.302, p = 0.0499). This result suggests that academic studies in countries with higher populations may also increase. However, this moderate relationship indicates that the correlation could become more vigorous when additional factors are considered.

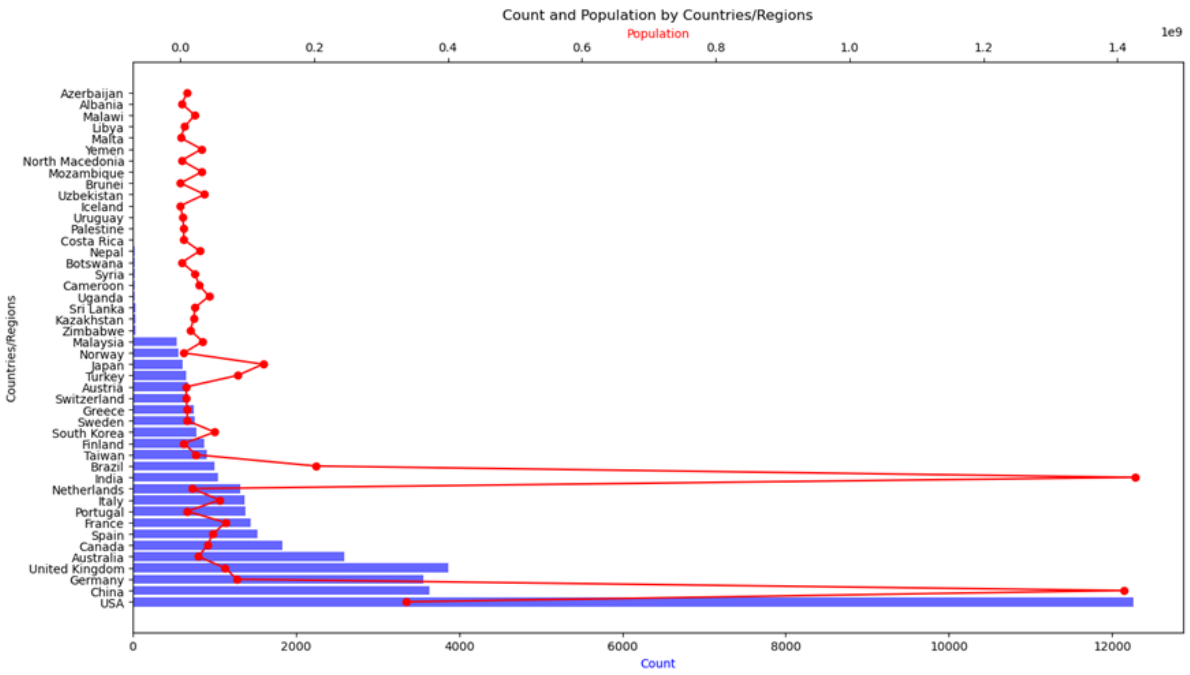

Figure 1: Result of Correlation between Population and Count

Figure 1 shows the number of academic studies on information systems in the social field in the countries included in the study and the population data of that country. A line-bar graph is used to observe the two different values in Figure 1. The blue horizontal bars represent the "number of academic publications" of each country, and the length of the bars varies according to that country's "number of academic publications" value. The bar for the United States of

America is the longest because this country produces the highest number of academic publications (12,259). The red line graph represents the population information of the countries included in the study. The line graph shows "Population" values on the horizontal axis and is marked with a dot opposite each country. In this graph, China has the highest population (1,409,670,000). For this reason, the red line extends to the far-right opposite China, emphasizing that China has the highest population in the world.

Conclusions and Discussions

This study demonstrates that information systems are central to maintaining social order and enhancing trade. Historical strategies from the Ottoman and British Mandate periods were effective but require modern technological support to remain relevant today. The findings suggest that effective use of information systems can be a strategic tool for improving countries' social and economic well-being. Strategic investments in information systems, such as funding interdisciplinary research and integrating technology-driven decision-making processes, are essential for fostering long-term trade development.

The study's findings show that countries with dense populations must invest more in information systems to sustain social order. In particular, digital governance and data analytics systems are important in crisis management and government public service efficiency. Today, technologies such as geographic information systems (GIS) are effectively used in public health crises and general public administration processes (Franch-Pardo et al., 2020). In this context, increasing government investments in information systems is an important step in ensuring social stability.

It is widely recognized in the literature that there is a direct relationship between the increase in academic studies on information systems and economic development. Technological developments in information systems offer solutions in many areas, from public administration to the private sector. Therefore, countries should support technological advances in information systems by encouraging academic research. Increasing international collaborations, expanding funding for information systems research, and encouraging interdisciplinary studies will increase scientific knowledge in this field (Schmidt, Abboud, & Bogaert, 2021). In this way, the effectiveness of information systems in maintaining social order will be strengthened.

The findings show that the use of information systems in developing countries is not at an adequate level. As shown in Table 1, some highly populated countries do not have sufficient academic and technological development in information systems. This suggests that countries need to increase technological investments and strengthen education policies in information systems. Especially for developing countries, financial incentives should be provided, and international support programs should be established (Kato, Tanaka, & Yamamoto, 2022). Strengthening information systems infrastructures is critical for public administration, private sector investments, and economic growth.

Finally, this study analyzed the effects of information systems based on population size, number of academic researches, and export data. However, to assess the effectiveness of information systems investments more comprehensively, future studies should examine additional variables such as investments in technological infrastructure, education policies, and government digitalization strategies (Wu et al., 2019). More comprehensive research to understand the effects of information systems on governance and the economy will help countries strategically direct their investments in this area.

This study, including a historical perspective, demonstrates the necessity for countries with large populations to use and invest in information systems to maintain social order and increase administrative and economic efficiency. The case of Jerusalem is at the center of the study as a regionally significant example of observing historical practices to meet social needs.

The findings of this study underscore the significant role of information systems in maintaining social order and enhancing trade. The analysis presented a positive, moderate relationship between population size and the number of academic studies on information systems in the social field ($r = 0.302$, $p = 0.041$). This suggests that countries with larger populations emphasize information systems more in the social field and produce more academic work. However, the moderate nature of this relationship implies that other factors may also influence this correlation, potentially by strengthening it. These results align with previous research indicating the critical role of information systems in managing societal complexity and maintaining social order.

In the trade domain, the study found a moderate positive relationship between academic studies on information systems in the social field and countries' export performance ($r = 0.666$,

$p < 0.001$). These results indicate a statistically significant correlation, suggesting that countries prioritizing information systems in the social field are more successful in marketing their products and enhancing their export performance. Specifically, academic work on information systems is crucial in product marketing and developing innovative technologies. This finding is consistent with the broader literature on the impact of information systems on economic activities and trade.

The positive correlation between population size and academic work on information systems suggests that larger populations may drive the need for more sophisticated information systems to manage social complexities. This is supported by Couch et al. work, which emphasizes the formative capacities of information technologies across different societies (Couch, Johns, & Chen 2017).

This study examines the importance of keeping different ethnic groups and societies in order. In this context, when the economic benefits of the phenomenon are analyzed, it can be thought that diversity will support economic growth by triggering innovation and creativity. A study by Alesina and La Ferrara (2005) examined the positive and negative effects of ethnic diversity on economic performance. The study shows that ethnic diversity contributes to economic growth by increasing innovation and creativity (Alesina & La Ferrara, 2005). Similarly, a study by Prosperix (2022) reveals that workforce diversity increases the ability of businesses to market their products and services to a broader demographic audience, which positively affects the profitability of businesses (Prosperix, 2022). These findings demonstrate the economic benefits of keeping diverse ethnic groups and society in order. When the scope is broadened further, it is found in the literature that integrating immigrants and ensuring social cohesion can positively affect economic growth. In a study by Konya and Kabaklarlı (2023), the contribution of immigrants to the national economy was found to be positive and statistically significant. The study shows that a 1% increase in immigrants leads to a 0.01% economic growth rate (Konya & Kabaklarlı, 2023). Thus, it is observed that countries which can maintain social order can quickly achieve economic growth and increase the country's economic performance.

In digital marketing, information systems investments play a significant role in audience segmentation, ad optimization, and increasing customer engagement (Tiago & Veríssimo, 2014). Google and Facebook's advertising platforms enable advertisers to reach the most

appropriate customer groups through algorithms which analyze users' online behavior (Deighton & Kornfeld, 2009). In another example, Coca-Cola uses big data analytics to monitor social media interactions in real time and aims to strengthen brand loyalty by designing campaigns based on this data (Gandomi & Haider, 2015). Netflix's content recommendation systems increase customer loyalty by offering personalized content based on users' viewing habits (Gomez-Uribe & Hunt, 2016). As a result, information systems investments help businesses achieve sustainable growth by increasing the effectiveness of marketing strategies (Brynjolfsson & McAfee, 2014).

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Prospective Science Teachers' Moral Reasoning About Environmental Issues and The Factors That Affect Their Moral Reasoning on This Topic

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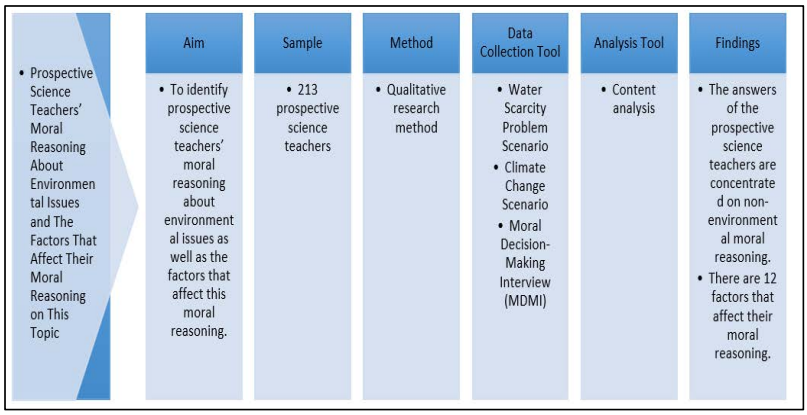
Graphical Abstract



Abstract

This study aims to identify prospective science teachers' moral reasoning about environmental issues as well as the factors that affect this moral reasoning. The qualitative research method was used to achieve this goal. The study group was made up of 213 prospective science teachers studying the 4th year of university at four different state universities. Two scenarios, about the water scarcity problem and climate change, were used to ascertain the moral reasoning patterns of the trainee teachers. The "Moral Decision-Making Interview (MDMI)" protocol developed by Sadler (2003) was used to look into the factors that affect the moral reasoning patterns of the participants. Semi-structured interviews were conducted with a total of 14 prospective teachers, 7 males and 7 females. Content analysis was used for the analysis of the data collected. The results of the study showed that the prospective science teachers' answers to the scenarios about the water scarcity problem and climate change were more centred around non-environmental moral reasoning. When comparing the participants' approach by how ecocentric or anthropocentric they were, we identified that the anthropocentric approach was more common. We also identified 12 factors that had an impact on the participants' moral reasoning, most importantly the economy, human health and future, duty and responsibility, environmental values, global power balances etc.

Keywords: Environmental ethics, moral reasoning, environmental issues, ecocentric, anthropocentric, climate change.

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Introduction

Environmental ethics is the branch of ethics that is related to the relationship between human beings and nature. Environmental issues such as endangered species, global warming, soil degradation, air and water pollution are the most significant problems faced by society in recent years. The way in which these challenges will be faced depends on how relationships to nature are perceived (Kortenkamp & Moore, 2001). Environmental ethics always highlights enhancing and developing our moral regard of the ecological system and non-human living beings. The main reason for environmental issues is a lessening of moral regard (Powys Whyte & Cuomo, 2017). In the literature on environmental ethics, beings that are given value are generally split into three categories. These categories are (i) the person themselves, (ii) other people, (iii) non-human components of nature (Stern & Dietz, 1994). So, we see different categories being used according the status of the subject being valued in the research. Stern et al. (1993) categorised value orientation as social-altruistic, biospheric and egoistic while in a parallel study Stern and Dietz (1994) used the names egoistic, altruistic and biospheric. Thompson and Barton (1994), suggested that there were at least two value orientations when it comes to environmental issues, namely ecocentric and anthropocentric values. In this study we used three categories, the two main ones being ecocentric and anthropocentric, alongside repulsion/apathy. Kahn (1997), who mainly focused on anthropocentric and biocentric reasoning also used sub-categories. Karpiak and Baril (2008) used three categories, ecocentric, anthropocentric and apathetic. Surmeli and Saka (2013) categorised approaches as ecocentric, anthropocentric and biocentric in their work on environmental ethics. In all the above examples, the two most prominent concepts are ecocentric and anthropocentric. When we evaluate the previous perspectives, we can say that human-centred moral reasoning comes from a mixture of the egoistic and social-altruistic orientations whereas nature-centred moral reasoning comes from the biospheric perspective (Amérigo et al., 2007).

Do we see nature as a commodity owned by humans? Do we want to use nature for human interests? Is nature intrinsically valuable, beyond how useful it is to humans? These are the questions that need be answered (Kortenkamp & Moore, 2001). In both the ecocentric and anthropocentric approach, the goal is to protect nature. However, the underlying reasons for this protection are different. For example, both approaches want to prevent air pollution however the basis for this want is different (Bjerke & Kaltenborn, 1999). Nature has its own

intrinsic value, beyond how useful it is to humans (Kortenkamp & Moore, 2001). Ecocentric people see nature as intrinsically valuable. They believe nature deserves protection because it is inherently valuable. These people support environmental causes because they see them as a way to protect the environment and the world, without focusing on the economy or protecting their own lifestyle (Thomson & Barton, 1994). On the other hand, the human being is the most important living thing in anthropocentric moral reasoning. This means, all other living things can only be important insofar as they impact humans or are useful to humans (Kortenkamp & Moore, 2001). Anthropocentric individuals want to protect nature because it is in the interest of human beings to do so. By protecting nature, human beings can protect or enhance their standard of living (Thompson & Barton, 1994). Hum nature affects mankind is evaluated by 'personal interest, prosperity, educational, judgemental and aesthetic' properties (Kahn, 1997). According to Kortenkamp and Moore (2001) there is a third category apart from ecocentric and anthropocentric moral reasoning: non-environmental moral reasoning. This approach focuses less on threats to nature or humans but more on non-environmental factors such as laws. If, for instance, protecting the environment or environmental issues harm the person economically, this is discussed as non-environmental moral reasoning. Meaning environmental issues are being looked at from a non-environmental perspective.

Environmental issues affect every person regardless of religion, race, age, gender, social status, education, background or occupation which means environmental issues are everyone's issues (Erten, 2004). What people need is not only to protect their ecosystem but to protect nature (Kellert, 1991). The truth of the matter is there is a lack of action on the part of humans when it comes to protecting the environment (Kılınç, 2010). For example, how interested a person in a particular issue depends on their proximity to the problem (Bamberg, 2003). Similarly, there are factors that affect whether a person uses ecocentric, anthropocentric or non-environmental moral reasoning about environmental issues (Tuncay, Yılmaz-Tüzün, & Tuncer Teksoz, 2012; Uzel & Gül, 2023).

The main goal of teaching science is to raise responsible students who will take action on social, economic, environmental, moral and ethical issues in a dependable and effective manner (Hodson, 2003). The reason for this is because the planet, the universe, all of creation is equally important and necessary and humans have an ethical responsibility towards all these components (Kırkpınar Özsoy & Çini, 2020). To this end, Melville, Yaxley and Wallace (2007)

argue that ethical moral approaches should be emphasised more in the science teaching. Moral reasoning is the decision-making process we use to decide if an idea is right or wrong (Littledyke, 2004). Moral reasoning is also not monolithic. In fact, it comes out differently in different groups, making it multiple (Adger, Butler &Walker-Springett, 2017). This is why any study related to this field is considered important. In our times, perhaps the main reason for new environmental issues or the worsening of environmental issues that were already present may be that humans are looking at the issues from the wrong perspective. What nature means to humanity is an issue not to be taken lightly because based on what the world is going through, the answer varies according to the situation a person is faced with. This is why the moral approach people have to environmental issues are particularly important. Gerçek (2016) in researching university students' level of awareness on environmental ethics found that the students had a medium level of awareness about environmental ethics. In this study, we asked science teachers in training to make decisions related to environmental issues they are faced with or could be faced with. To this end, we used environmental dilemmas related to the water scarcity problem and climate change. In researching moral reasoning, social dilemmas based on environmental issues are used (Kortenkamp & Moore, 2001). In this study we aimed to identify prospective science teachers' moral reasoning on the water scarcity problem and climate change and the factors that affect their moral reasoning on these issues. To this end, we looked for answers to the questions given below.

1. What is the moral reasoning of prospective science teachers on the issues of the water scarcity problem and climate change?

2. What are the factors that affect the moral reasoning of prospective science teachers on the issues of the water scarcity problem and climate change?

Method

Research Design

This study was conducted using the qualitative research method. The best way to understand qualitative research is for individuals to be aware of their social relations. Qualitative research aims to make the phenomenon being studied according to the perspective of the participants. Inductive and deductive research strategies are used and the end product is appropriate for description (Merriam, 2002). In this study, qualitative research was used to identify trainee

teachers' moral reasoning about the water scarcity problem and climate change alongside the factors that affect their moral reasoning on these issues.

Study Group

The study group for this study was made up of 213 prospective science teachers studying their 4th year of at four different state universities. When the study group was being put together the criterion sampling method, which is a type of purpose sampling was used in line with the aim of the study. In criterion sampling, a list of criteria, one that can be pre-prepared or prepared by the researcher, can be used for sampling (Yıldırım & Şimşek, 2013). The criterion for this study was that the participants had completed their courses on environment included in the undergraduate program in science education. The prospective science teachers were sampled from different universities using maximum diversity sampling. As a result, a total of 213 students, made up of 171 females and 42 males were selected for the study. For the semi-structured interviews conducted to identify the factors that affect the moral reasoning of the participants, the number of female and male interviewees were equal so as to prevent factors related to gender (Sadler, 2003). Since the number of male participants was lower than the number of female participants, we first identified the number of male volunteers and the number of female students who were interviewed was decided based on the number of male volunteers. Semi-structured interviews were conducted with a total of 14 prospective teachers, 7 males and 7 females. To ensure the privacy of the students' privacy information, the participants were given identity numbers unrelated to the study. So, the 1st prospective teacher was labelled P1, the 2nd P2 and so on until the 213th student, P213.

Data Collection Tool

In this study, two scenarios were used to identify the moral reasoning patterns of the prospective teachers (Appendix A, B). The scenarios as data collection tools are generally interesting, attention-grabbing and challenging. The scenarios encourage the teacher/prospective teacher to think about and answer questions on a particular issue (Bütün, 2012). The scenario on the water scarcity problem, which was used in this study, was developed by Uzel & Gül (2023). The original of the climate change scenario was initially developed by Lee et al. (2012) and adapted into Turkish by Uzel & Gül (2023). The scenarios use situations that the prospective teachers have or could observe in real life. Thus, it will be easier for them

to form opinions and the answers they give will be related to their true thoughts and feelings. The scenarios are also environmental dilemmas. At the end of the scenario, the prospective teachers are asked to make a decision and later explain their decision. The water scarcity problem scenario is a national problem whereas the climate change scenario encompasses a more global issue. The average time spent by the prospective teachers to answer the scenario questions was 20-25 minutes.

Semi-structured interviews were used to research the factors that affect the prospective science teachers' moral reasoning patterns. To this end, the Turkish versions of the Moral Decision-Making Interview (MDMI) protocol, adapted to Turkish (Appendix C) according to the two scenarios by Uzel & Gül (2023) and developed by Sadler (2003) were used. In the original protocol there are 13 semi-structured interview questions for The Huntington's Disease Gene Therapy scenario and 12 questions for The Accident Cloning scenario. The goal of these questions is to research the factors that affect the participants' moral decision-making processes. Uzel & Gül (2023) consulted with two education specialists in the field in adapting their questions. Next, the questions were presented to a Turkish language specialist for consultation about the meaning and wording of the questions before being finalised. The form contains 14 semi-structured interview questions. The interviews for this study were conducted by the researcher. A quiet environment where the prospective teachers could be comfortable was provided for the interviews. The interviews were recorded with a sound recording device and lasted 20-25 minutes.

Data Analysis

In qualitative research, large amounts of data, collected from observation, interviews and document analysis, are analysed and coded before they are synthesized in accordance with the codes to reach findings (Büyüköztürk et al., 2012). The content analysis technique was used to identify the prospective science teachers' moral reasoning patterns and the factors that affect these patterns. Content analysis is used in many different ways. This type of analysis is used to analyse the content of any text or document (observation, interview, official or personal documentation, newspapers etc.) and present it numerically or statistically (Ekiz, 2013). The phrases used by the prospective science teachers were coded as ecocentric, anthropocentric or non-environmental moral reasoning. Kortenkamp and Moore's (2001) study was used for the categories used in the coding. To summarise these categories, if an answer proposes the

protection of nature for the sake of nature or talks about the intrinsic value of nature and its rights, it is categorised as ecocentric. If the answer proposes protecting the environment for the good of humanity and includes arguments about how humans cannot survive without nature it is coded as anthropocentric. If the answer discusses the impact of environmental issues insofar as laws or other subjects not related to nature or the impact of the issue on nature or humans, it is categorised as non-environmental. After this categorisation, the frequency of each moral reasoning pattern was calculated. Graphs and tables have been used to present data on moral reasoning patterns and factors that affect these moral reasoning patterns.

Validity and Reliability

Reliability in qualitative research generally refers to compliance between the answers of more than one encoder (Creswell, 2013). In order to produce reliable results on the data collected in this study, the researcher and one educator in the field encoded the data independently. Reliability between the two encoders was calculated using the Miles and Huberman consensus and disagreement formula and the results were 85% for the scenarios and 86% for the semi-structured interviews. The data collected from the scenarios and interviews were also supported by direct quotes from the prospective teachers.

To enhance reliability of the study, the researcher records detailed field notes on a high-quality recording device and puts them into writing (Creswell, 2013). In this study the recordings of the semi-structured interviews conducted with the prospective teachers were transcribed. Then, three volunteer prospective science teachers were asked to read the transcriptions and validate their accuracy. Data collected from the same individual using more than one interaction method is also more powerful in reflecting the truth (Yıldırım & Şimşek, 2013). Even though the topics are different in this study, the interview questions are concordant and all aim to identify the factors that affect the prospective teachers' moral reasoning patterns. Thus, we aim to enhance reliability by asking the same prospective teacher parallel questions twice to enhance reliability.

When qualitative researchers provide a more detailed description of the study, the data is more realistic and richer. Thus, the validity of the findings is enhanced (Creswell, 1994). In the

research design, prospective science teachers, data collection tools, data analysis and the data collection process have been described in detail.

Findings

This chapter presents the result of analysis aimed at identifying prospective science teachers' moral reasoning patterns related to the water scarcity problem and climate change and the factors that affect these moral reasoning patterns.

The first question this study aimed to answer is "What is the moral reasoning of prospective science teachers on the issues of the water scarcity problem and climate change?". The distribution of moral reasoning patterns of prospective science teachers based on the answers they provided for the scenarios about the water scarcity problem and climate change are presented in Figure 1.

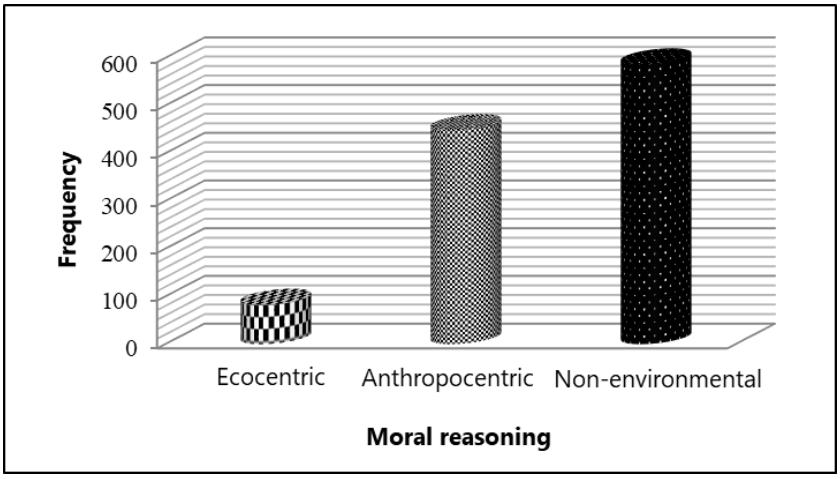

Figure 1. Distribution of moral reasoning patterns of answers prospective science teachers gave to the scenarios

It was identified that the highest frequency of answers was recorded for non-environmental moral reasoning (f=586) and the lowest was recorded for ecocentric moral reasoning (f=82) (Figure 1). The distribution of these patterns was presented separately for the water scarcity problem and climate change. The distribution of moral reasoning for the prospective science teachers' answers to the water scarcity problem scenario are provided in Figure 2.

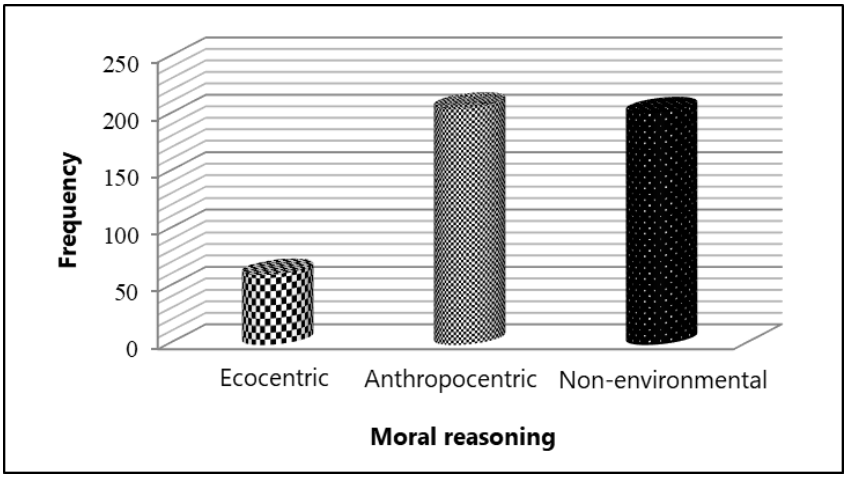

Figure 2. Distribution of moral reasoning patterns of answers prospective science teachers gave to the water scarcity problem scenario

In the prospective science teachers' answers to the water scarcity problem scenario, the lowest frequency was recorded for ecocentric moral reasoning (f=61) while the frequency for anthropocentric (f=206) and non-environmental (f=202) reasoning were close (Figure 2).

In the scenario related to the water scarcity problem, the prospective teachers were asked "Many factories were found to not use treatment plants because of the cost. It is known that these factories have an important role in employment in the country. Accordingly, should these factories be shut down or not?". The distribution of moral reasoning patterns according to the students' answers is provided in Table 1.

Table 1. Distribution of moral reasoning patterns of answers given by prospective science teachers to the question on the water scarcity problem scenario

Answer	Moral reasoning		
	Ecocentric	Anthropocentric	Non-environmental
Should be shut down (62 people)	61	72	4
Should not be shut down (151 people)	-	134	198

Of the prospective science teachers who said the factory should be shut down, the most common form of moral reasoning was anthropocentric (f=72), somewhat closely followed by ecocentric moral reasoning (f=61) (Table 1). On the other hand, among the students who were in favour of keeping the factories open, the most common pattern was non-environmental (f=198), followed by anthropocentric (f=134) while none of the answers in this category conveyed ecocentric moral reasoning. Some examples of the phrases used by prospective teachers to convey their opinions on the water scarcity problem scenario are provided below.

- The factories should be shut down. Because;

P143: It harms the environment. All living things in nature have a right to live (Ecocentric)

P10: Harm to nature is above any benefit (Ecocentric)

P172: There is a high likelihood that the waste will end up in our drinking water and harm our health (Anthropocentric)

P188: Water is an important life source for humanity. While humans can stay alive for a number of days without food, they can only last 3 days at most without water (Anthropocentric)

P91: One or two should be shut down to send a message. If they are all cut down, there will be employment problems in the country. There will be economic problems (Non-environmental)

- The factories should not be shut down. Because;

P120: Treatment plants must be used, if necessary, the state should support factories for this. Human life must not be endangered (Anthropocentric)

P165: Factories are not ornaments, they are producing something (Non-environmental)

P85: When factories are shut down, the already high unemployment rate will be even higher and this will cause unrest and poverty in the country (Non-environmental)

P3: Factories not only contribute to employment but also to national development (Non-environmental)

When the phrases used by the prospective science teachers are analysed, it is seen those who were for shutting down the factories emphasised the importance of water for human health and life or for nature as a whole. We also see that those who were against shutting down factories care about employment, national economy, national development or preventing harm to nature in order to protect human life.

The distribution of moral reasoning patterns according to the students' answers to the climate change scenario is provided in Figure 3.

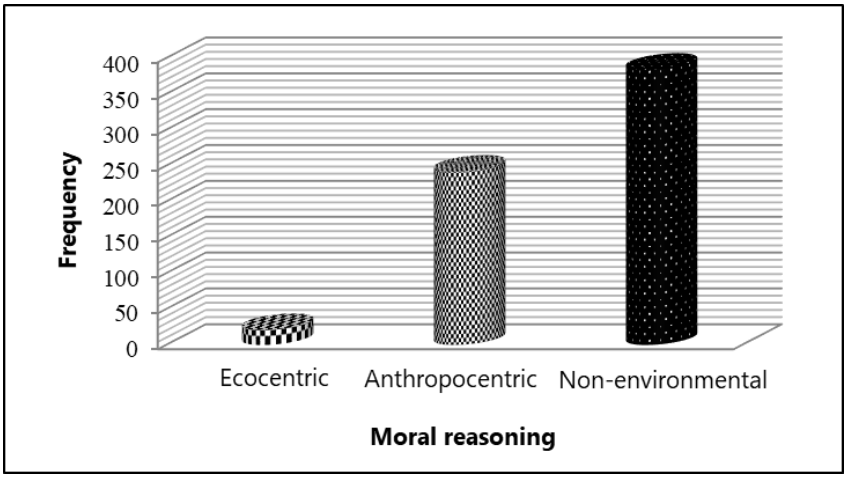

Figure 3. Distribution of moral reasoning patterns of answers given by prospective science teachers to the question on the climate change scenario

According to the answers provided by the prospective teachers on the climate change scenario, the most common category was non-environmental (f=384) moral reasoning, followed by anthropocentric (f=242) and the least common was ecocentric (f=21) moral reasoning (Figure 3).

In the climate change scenario, the prospective science teachers asked "How would you distribute the 10 units of CO_2 you possess?". The distribution of moral reasoning patterns according to the students' answers to the climate change scenario is provided in Table 2.

Table 2. Distribution of moral reasoning patterns of answers given by prospective science teachers to the question on the climate change scenario

Answer	Moral reasoning		
	Ecocentric	Anthropocentric	Non-environmental
More points for the highly developed country (148 people)	-	143	309
More points to the under developed country (41 people)	12	87	24
More points to their own country (16 people)	-	-	48
Equal distribution of points (8 people)	9	12	3

It was identified that the answers provided by the prospective science teachers on the climate change scenario were in one of four categories, the highly developed country, the under developed country, their own country and equal distribution of points (Table 2). It was found that those who gave the most points to the highly developed country had non-environmental (f=309) and anthropocentric (f=143) moral reasoning. Those who gave more points to the

under developed country used phrases that showed anthropocentric (f=87) moral reasoning the most and ecocentric (f=12) moral reasoning the least. The prospective teachers who gave the most points to their own country only used non-environmental (f=48) moral reasoning. Among the students who distributed the points equally, anthropocentric (f=12) moral reasoning and ecocentric (f=9) phrases were more common. Some examples of the phrases used by prospective teachers to convey their opinions on the climate change scenario are provided below.

- More points for the highly developed country

P183: Because it is a highly developed country, it has technological capabilities. This is why they will produce solutions and protect the health of their citizens (Anthropocentric)

P145: You need money to spend on a clean environment. Only the highly developed country has money. This is why they will spend the money necessary to ensure their citizens live in a clean environment (Anthropocentric)

P51: A highly developed country has more industry and therefore more production. This is why they need a higher CO_2 quota (Non-environmental)

P196: Giving a highly developed country a lower quota would be unfair; it would be blocking their way (Non-environmental)

- More points for the under developed country

P72: Highly developed countries that have a developed industry and overconsumption have made the world dirty enough. By lowering its quota, I will have protected all living things (Ecocentric)

P21: Because this country doesn't have an industry, it may not be able to fill the quota so all humans on earth will breathe easier in a cleaner world (Anthropocentric)

P116: This country will find investors to have industry, this country will have a chance to develop (Non-environmental)

- Points for their own country

P72: I would give my own country a higher quota. So, industry will develop, the economy will get better and it will become a highly developed country (Non-environmental)

- Equal distribution of points

P212: By distributing the points equally, I want to remind that all living things have the same right, the world doesn't just belong to humans.

P79: Every event that happens affects the whole world; we should all be equally responsible for the world we leave to the next generations (Anthropocentric)

The answers provided by prospective science teachers to the climate change scenario show that the economy is prioritised in their decision-making process. We also see that any efforts to protect the environment have more to do with protecting human health and the future of humanity. There were very few answers that indicated that nature should be protected for ecocentric reasons and that all living things were equal.

The second question posed by this study is "What are the factors that affect the moral reasoning of prospective science teachers on the issues of the water scarcity problem and climate change?". The factors that affect the prospective science teachers' moral reasoning on the water scarcity problem and climate change, along with examples of phrases used by the participants are shown in Table 3.

Table 3. Factors that affect the moral reasoning of prospective science teachers and examples of phrases

Factor	f	Phrases
Economy	87	*P3: The workers who work there need this job, and the country needs them to produce. I don't even want to think about the crisis that could happen if we make people unemployed and stop the factories (Water scarcity problem).* *P31: Highly developed means a lot of factories and production. If you stop production, the flow of money will be the first to stop (Climate change).*
Human health and the future of humanity	61	*P29: Causing harm to nature, perhaps harm that can never be undone can cause very serious illnesses. It would put a lot of people at risk. This may even impact future generations (Water scarcity problem)* *P13: I wouldn't want to fill my lungs with dirty air, I think it's only natural that I think about my own health and survival first (Climate change).*
Duty and responsibility	49	*P54: Factory owners and the state should work together. They should do development projects and solve the problem (Water scarcity problem).* *P9: Countries with a good economy and developed technology should develop solution policies. They have the appropriates system and workforce to do this (Climate change).*
Environmental values	40	*P10: If the factories are closed, the ecosystem will obviously be affected positively. What I mean is, this negative factor that affects the things living there will be gone. Nature will revive (Water scarcity problem).* *P15: Many countries now put in significant effort to protect the environment. Such as fuel made from algae that does not have carbon emission, fewer private cars and more use of bicycles or public transportation, city*

		infrastructure that keeps clean and rainwater separate from sewage. The whole world should fight for nature (Climate change)
Global power balance	38	*P29: Developed countries make better policies to solve problems. Taking this power away from them will cause global chaos (Climate change).* *P9: I believed this was better for the world. Otherwise countries that are not able to or barely able to support themselves do not have the technology to come up with solutions (Climate change).*
Emotional approach	38	*P31: I thought what if it was me or my father who worked at the factory. That is why I couldn't bring myself to shut it down (Water scarcity problem).* *P13: The fact that I will be a mother someday made me look at this more emotionally. I imagined my children living in a cleaner country and I wished for that (Climate change).*
Universal values	32	*P10: I would think the same way even if someone close to me worked there. In these kinds of important things, I don't think it is ethical to make a decision according to individual emotions or positions (Water scarcity problem).* *P18: Of course, all people have a right to live. Yes, they may be categorised as highly developed or underdeveloped but this only classifies countries not people, at the end of the day, we don't pick where we are born (Climate change).*
National values	29	*P44: The future of my country is extremely important for me. I can't lock the doors of my country's factories (Water scarcity problem).* *P3: Because I believe protecting our own country is the most natural and logical thing (Climate change)*
Personal experiences	27	*P7: I know all too well what unemployment means for a family. As someone who has gone through this I can't make the decision to just shut it down because it apparently harms nature (Water scarcity problem).* *P31: I mean look at it this way, isn't it the same for us? The one who has the power, rules. I've never seen the weak, the meek win (Climate change).*
Media-pop culture	21	*P15: I read this somewhere the other day. Holland is going to completely get rid of vehicles in the street in the time to come (Water scarcity problem).* *P26: I saw it on the news. China has done 361 billion dollars' worth of work to prevent air pollution (Climate change).*
Indecision or contradiction	16	*P59: Actually, I don't have a clear-cut opinion (Water scarcity problem).* *P7: I could change my mind if there are other perspectives that I haven't noticed (Climate change).*
Religious beliefs	15	*P57: It will also cause a lot of people to be unemployed. In line with my religious beliefs I cannot play with a families' bread (Water scarcity problem).* *P44: My religious education affected my decision (Climate change).*

12 factors were identified as factors that affect the prospective science teachers' moral reasoning on the water scarcity problem and climate change (Table 3). According to this analysis, "economy" (f=87) was the most frequent Here "economy" includes financial situations including individual issues such as unemployment and national issues such as the financial state of the nation. The factor with the second highest frequency was "human health and the future of humanity" (f=61) which refers to any health issues caused by environmental issues, situations related to quality of life and the impact of all of this on new generations. Next most common was the factor "duty and responsibility" (f=49) which includes all types of

administrative/authoritative responsibility, laws, regulations, policies, individual responsibilities etc. The factor "Environmental values" (f=40), refers to environmental issues, ecological relationships, the unity of nature. The factor "global power balance" (f=38) was especially prevalent in the climate change scenario which includes the relationships between countries. The prospective science teachers took into account the possible global implications of changes that would occur in countries' political, social or economic situations. In the category "emotional approach" (f=38) we see that the prospective teachers were affected by a variety of emotions such as empathy, compassion, respect or anxiety. The prospective teachers' ideas related to basic rights of all living things including equality, freedom or justice were represented in the category "universal values" (f=32). The factor titled "national values" (f=29) includes the opinions of students who wanted prioritised the development, betterment and strength of their country by putting the interests of their countries first. "Personal experiences" (f=27) relates to the impact of their personal experiences or the experiences of their families, their extended families or those close to them on the prospective teachers' decisions. "Media-pop culture" (f=21) encompasses any mentions of films, TV shows, documentaries, newspapers, magazines, TV or social media platforms. Some of the prospective teachers didn't give a clear reason and expressed that they were conflicted. These opinions are included in the factor titled "indecision or contradiction" (f=16). Finally, the factor that recorded the lowest frequency was "religious beliefs" (f=15). The participants stated that religion was a factor that affected how they made their decision. However, they refrained from explanations as to how religion affected their decision.

Conclusions and Discussions

This study found that the answers prospective science teachers gave to the scenarios on the water scarcity problem and climate change converged the most on non-environmental moral reasoning. When the students' approaches to environmental are analysed for ecocentric and anthropocentric, this study concluded that the anthropocentric approach was far more common than the ecocentric approach.

When the participants' moral reasoning is analyzed according to the scenarios, we see that non-environmental moral reasoning was far more common in the climate change scenario when compared to its prevalence in the climate change scenario. It is also apparent that ecocentric moral reasoning is more frequent in the water scarcity problem scenario as

compared to the climate change scenario. According to Kortenkamp and Moore (2001), if there is social conflict in an ecological dilemma, this causes there to be less ecocentric reasoning. The reason is that social conflict is centred around humans and non-environmental thinking only focuses on people. Social conflict also doesn't make a difference when it comes to anthropocentric reasoning. This is because anthropocentric reasoning focuses on both humans and nature. In line with this, Ünal (2008) found that when prospective science teachers consider global environmental issues to be more complicated, dangerous and important than local environmental issues. The participants also assumed that global environmental problems would affect human life far more than local environmental problems because they believe humans are more responsible for global environmental problems. In this study, non-environmental reasoning may be more prevalent because of the nature of the scenarios used. The water scenario focuses on a regional environmental problem while the climate change scenario is about a more global problem that involves different countries. This is why non-environmental reasoning was common in the climate change scenario. The data collected by this study shows that the participants had a more anthropocentric approach as opposed to an ecocentric approach.

Uzel & Gül (2023) found that student biology teachers used anthropocentric moral reasoning more often in the water scarcity problem and climate change scenarios. Uzel & Gül (2023) also found that non-environmental moral reasoning was quite close to anthropocentric moral reasoning when it came to the climate change scenarios. Uzel & Gül's (2023) findings are quite similar to the findings of this study. However, the Uzel & Gül (2023) study found that the rate of non-environmental moral reasoning was slightly lower. The reason for this discrepancy may be that difference in the number of participants and the fact that the students were from different departments that have different course content. Similarly, Erten (2008), in a study conducted on Turkish and German teachers, found that Turkish teachers were more likely to have an anthropocentric attitude. Erten (2008) concluded that the reason behind this was that at the basis of the society's culture was the belief that humans were created superior to other living things.

Tuncay, Yılmaz-Tüzün and Tuncer Teksoz (2012) found that prospective science teachers showed ecocentric and anthropocentric moral reasoning when faced with local and non-local environmental dilemmas. They also found that they showed less non-environmental moral

reasoning. Tuncay, Yılmaz-Tüzün and Tuncer Teksoz (2012) also found that the participants made their decisions based on the problem's relationship to nature and not on the locality of the problem. Tuncay (2010) identified that prospective science teachers had more ecocentric and less non-environmental moral reasoning when it comes to local and non-local environmental problems. The reason why the results are like this could be because of the different classes of the participants, the number of scenarios used and the difference in content. The water scarcity problem and climate change scenarios also include issues related to the economy and Turkey is impacted by both the scenarios. The participants may have been concerned about the economy because they may have been concerned about Turkey, which is a developing country. Similarly, Ozturk and Yilmaz Tuzun (2017) found that prospective teachers were more likely to present ecology-oriented and economy-oriented arguments compared to the other types of reasoning. People also take into account different factors such as status or comfort when making decisions about environmental issues (Steg & Vlek, 2009). Some students in particular care about the economy when it comes to food security, employment, income etc. when taking part in environmental justice (Kopnina, 2019). Moreover, in most discussions about climate change, the current and future finances of the issue are often highlighted (Corner & Randall, 2011).

Semi-structured interviews were used to identify the factors that affected the prospective science teachers' moral reasoning on the environmental issues of the water scarcity problem and climate change. The economy, human health and the future of humanity, duty and responsibility, environmental values, the global power balance, emotional approach, universal values, national values, personal experiences, media-pop culture, indecision and contradiction, and religious beliefs were the 12 factors that were identified by this study. Similarly, Tuncay, Yılmaz-Tüzün and Tuncer Teksoz (2012) identified 15 factors that impact prospective science teachers' moral reasoning. While the content of these factors has significant overlap with the content of the factors identified by this study, this identified factors such as national values and religious beliefs. Sadler and Zeidler (2005) used the same questions as this study in their study on college students. Sadler and Zeidler (2005) found that students made moral evaluations in informal reasoning. They also identified that these moral evaluations were just as affective in the decision-making process as personal experiences or social factors.

Sadler (2004) found that factors such as religion, health improvements, pop culture, slippery slope, taking human life, personal experiences had an impact on the students' moral decision making. Uzel & Gül (2023) named impact on human life, personal experiences, emotional approach, religious beliefs as some of the factors that affected the moral reasoning of student biology teachers. These studies all used the MDMI. While the names of the factors may vary, the factors identified are close in content. Lee et al. (2012) argued that conflicting values may change the moral reasoning of individuals. Similarly, Sternäng and Lundholm (2011) identified that students form their moral reasoning according personal interest and benefit. Thus, the differences between the studies in the literature occurred because the priorities of the students are different as the topics are different.

The high number of participants is significant in this study which aims to identify prospective science teachers' moral reasoning on environmental issues and the factors which affect their moral reasoning on environmental issues. In addition, moral reasoning is inherently limited in how much it can be generalised. This is because as we can see in the literature (Sadler, 2004; Sadler & Zeidler, 2004; Tuncay, 2010; Tuncay, Yılmaz-Tüzün, & Tuncer Teksoz, 2012; Uzel, 2020; Uzel & Gül 2023) there are many factors that affect moral reasoning. Therefore, conducting more studies with different student groups from different cultures and diversifying the topics included in the studies will be very effective in enriching the literature on this topic.

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Appendix A

Water Scarcity Problem Scenario

Clean and useable water is vital for the continuity of life on Earth. Even though a large portion of the Earth is covered by water, only 3% of this water is made up of useable, fresh water sources. When countries are categorised according to their water resources, Turkey is neither rich nor poor in water resources. Growth in population, higher rates of industrialisation, and the misuse and overuse of natural resources have caused more and more clean water supplies to be polluted.

It has been identified that many factories do not use treatment facilities because of the cost. It is known that factories play an important role in employment for the country. **According to this, should the factories be shut down?**

☐ They should be shut down.

☐ They should not be shut down.

Appendix B

Climate Change Scenario

Human impact such as the burning of fossil fuels, misuse of land, deforestation and industrialisation, and the build-up of the emitted gasses strengthen the greenhouse effect. The resulting rise in the average surface temperature of the globe is called "global climate change". Climate change is not only made up of ecological events and is also related to fields such as the economy, energy, industrialisation, social life and law. At this point, climate change has an impact on every stage of life directly or indirectly. This situation forces administrations to enhance efforts to enact solutions in problem areas. Discussions on climate change such as the Kyoto Protocol are some global efforts by developed nations to stabilise the greenhouse gasses in the atmosphere. Some countries are enacting limits on greenhouse gasses while others do not agree with this practice.

Imagine you have the authority to distribute 10 units of CO_2 to three countries within a carbon market that will be implemented to slow down climate change. These countries are America (highly developed), Turkey (developed) and Afghanistan (under-developed). **How would you distribute the 10 units of CO_2? Which countries citizens would be more negatively impacted because of your distribution?**

Highly developed country (America)	Developed country (Turkey)	Under-developed country (Afghanistan)	Total
..... Units	..... Units	..... Units	10 Units

Appendix C

Moral Decision-Making Interview
Interview Questions for Water Scarcity Problem Scenario

1. It has been identified that many factories do not use treatment facilities because of the cost. It is known that factories play an important role in employment for the country. According to this, should the factories be shut down?
2. What factors were you affected by when making this decision?
3. Did you have an immediately positive or negative thought about shutting down the factories? Were you aware that you had this thought before you made a rational decision? Did you have any prior thoughts on this topic?
4. Did you consider the position or feelings of any of the following included in the scenario when making a decision?

a) Did you consider the position or feeling of someone working at one of these factories? If you did, how did this affect your decision?
b) Did you consider the position or feeling of the owner of one of these factories? If you did, how did this affect your decision?
c) Did you consider the position and feelings of someone who lives close to these factories? If you did, how did this affect your decision?

5. Did you try to put yourself in the place of any of the following included in the scenario?

a) Did you try to put yourself in the place of someone who works at one of these factories? If you did, how did this affect your decision?
b) Did you try to put yourself in the place of someone who owns one of these factories? If you did, how did this affect your decision?
c) Did you try to put yourself in the place of someone who lives close to one of these factories? If you did, how did this affect your decision?

6. Do you think the laws and regulations related to the running of factories such as presented in this scenario are upheld enough? How does this affect your decision?
7. Did you take the factory owners' responsibilities into account? If so, what are the responsibilities of the factory owners in this scenario?
8. Did you take the state authorities' responsibilities into account? If so, what are the responsibilities of the state authorities?
9. As an educator, did you consider the future impact of shutting down or not shutting down the factories on the future of the country? If so, how did this affect your decision?
10. Did you consider the position and feelings of a potential parent when it comes to shutting down the factories? If so, how did this affect your opinion?
11. Did you consider how shutting down the factories would impact the environment (ecosystem)? If so, how did this affect your opinion?
12. What kind of position or feeling do you have when it comes to shutting down the factories under these circumstances?
13. Are there any factors that would change the opinion you have? If so, what are they?
14. Is there anything else I should now about your thinking and decision-making process when it comes to this scenario?

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Bibliometric Research on the Teaching of Political Topics

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Abstract

This study aims to systematically and bibliometrically analyze the scholarly literature on the teaching of political issues within the scope of citizenship and social studies education. The research examines 426 journal articles indexed in the Web of Science Core Collection database, with no publication date restrictions. The analysis employs VOSviewer software to identify thematic trends, conceptual frameworks, influential authors, and international collaboration networks in the field. The findings demonstrate a significant rise in academic interest in political and citizenship education, particularly between 2013 and 2024, with a notable concentration on studies in the

post-2020 period. Emerging themes such as digital citizenship, political efficacy, youth participation, and the integration of technology into civic education reflect a dynamic shift in the field, driven by evolving democratic needs and global challenges like the COVID-19 pandemic. Moreover, the results highlight key contributors, leading journals, and institutions which shape the research landscape. The study also uncovers gaps in literature, especially regarding comparative studies and the use of interactive digital tools in political education. Based on these insights, the research offers recommendations for future studies, including the diversification of data sources, enhanced international collaboration, and the use of advanced bibliometric tools. Ultimately, this study contributes to a deeper understanding of how political education within citizenship education can support democratic engagement and foster civic responsibility in contemporary societies.

Key words: Citizenship education, political education, social studies education, bibliometric analysis

Introduction

Political education is crucial for individuals to comprehend democratic systems, cultivate critical thinking skills, and engage effectively in societal activities. In contemporary societies, the significance of political education is paramount in ensuring the sustainability of democratic values and promoting a sense of social responsibility among individuals. It is well-established that effective political education can enhance both individual and collective decision-making processes (Easton & Dennis, 1969; Galston, 2001; Goldman, 1999). Political education is instrumental in instilling democratic values, assessing diverse perspectives, and strengthening individuals' resilience against political manipulation (Crick & Heater, 1977; Freire, 2018).

Furthermore, effective political education promotes the development of critical thinking skills, which enables individuals to understand the functioning of democratic systems. In addition to enhancing individuals' understanding of political processes, political education plays a crucial role in fostering civic awareness and developing the skills necessary for active participation in democratic practices (Anderson & Mendes, 2006; Finkel, 2002). Additionally, political education is acknowledged for its contribution to strengthening social cohesion by assisting individuals to understand and respect diverse perspectives (Glasford, 2013; Mills & Waite, 2018; Singh & Mukeredzi, 2024).

Political education serves as a fundamental element of civic education, significantly contributing to the cultivation of individuals' sense of social responsibility and encouraging

their active engagement in democratic processes (Shen, 2024). The internalization of democratic rights and responsibilities is more effectively facilitated through the enhancement of civic awareness, which is strengthened by political education. In this context, citizenship education is acknowledged in various studies (Finkel, 2002b; Finkel & Ernst, 2005; Kuran, 2014; Thelma, 2024) as a crucial element which facilitates individuals' comprehension of democratic values and fosters the skills required for active and meaningful participation in democratic processes.

Citizenship education serves as a fundamental process for the sustainability of democracy by facilitating individuals' understanding of their rights, responsibilities, and democratic values (Leung & Ng, 2014; Levinson, 2003). This educational approach promotes democratic participation and fosters solidarity and social cohesion among individuals. It empowers learners to comprehend their democratic rights and responsibilities while enhancing their awareness of social issues. As a result, citizenship education is essential for the continuity of a democratic society. Ersoy (2016) emphasized that this form of education not only conveys theoretical knowledge but also equips individuals with the skills necessary to effectively apply this knowledge within democratic processes. In this context, various studies have been conducted both globally and nationally, offering valuable insights into different aspects of civic education. For instance, Zulkifli (2021) performed a bibliometric analysis to explore global research trends in political literacy. Similarly, Yeşiltaş and Çinpolat (2022) focused on studies related to digital citizenship education from a bibliometric perspective. Pedraja-Rejas et al. (2023) examined the development of global citizenship education in the context of sustainable development, mapping emerging trends within literature. Karaca and Akbaba (2021) conducted a bibliometric analysis of citizenship education research from 1980 to 2020, providing a comprehensive overview of developments in the field.

In addition to these content-focused studies, it is also important to consider how the method of bibliometric analysis itself is understood and utilized across disciplines. In this regard, İri and Ünal (2024) evaluated the concept of bibliometric analysis itself by conducting a comprehensive descriptive analysis based on 18,432 scientific publications from 1980 to 2023. Their findings have revealed the interdisciplinary nature of bibliometric analysis across fields such as communication, education, technology, and politics. Notably, they emphasize the

absence of a common conceptual or keyword association surrounding bibliometric analysis, suggesting a fragmented yet evolving landscape in the scholarly discourse.

Significance of Study

Research investigating political issues within the context of civic education is significant, as it enhances individuals' awareness and competencies. Furthermore, a systematic review of these studies is essential for advancing our understanding of the current scientific landscape in this field and for providing a more comprehensive perspective on the existing literature. By examining thematic trends, theoretical frameworks, and methodological approaches within this body of work, we can achieve a more effective evaluation of research in civic education. In this regard, bibliometric analysis serves as a valuable tool for gaining a thorough understanding of literature on civic education and for identifying potential directions for future research. For instance, studies in this area have been conducted both globally and locally, offering insights into various aspects of civic education.

Aim of the Study

This study aims examining the existing research on the teaching of political issues within the framework of civic education through the application of bibliometric methods. This approach will facilitate the identification of current trends, key topics, and theoretical frameworks present in literature. The bibliometric analysis will not only yield insights into the current state of the field but will also play a pivotal role in informing future research endeavors related to civic education and the promotion of democratic awareness. By providing new perspectives on the interplay between civic education and political education, this research aims to serve as a valuable resource that supports the sustainability of democratic societies.

Methods

Research Design

This study employs a bibliometric methodology to investigate academic research related to the teaching of political issues within the fields of social studies and civic education. Bibliometric analysis is a research technique which analyses and assesses the significance of scholarly publications by identifying significant research outputs, including publications, authors, and journals (Aria & Cuccurullo, 2017; Cobo et al., 2011). Through bibliometric analysis,

researchers can identify prevailing trends, discern gaps, and uncover future research opportunities within a given domain (Ulu & Akdağ, 2015; Ukşul, 2016). Furthermore, this methodology is instrumental in visualizing interdisciplinary collaborations and assessing the outcomes of such partnerships (J. Zhang & Lin, 2023). By mapping the intellectual landscape of research areas, bibliometric analysis offers researchers a comprehensive framework for guidance. Ultimately, bibliometric methods do not aim to replace traditional literature review practices; instead, they complement them by providing a macro-level perspective based on empirical data. By identifying research concentrations, underexplored areas, and patterns of scholarly collaboration, bibliometric analysis significantly contributes to the strategic development of knowledge and academic planning (Kozan, 2020).

The data derived from this analysis were employed to generate graphical representations using Microsoft Excel. Additionally, VOSviewer software (Version 1.6.9), (Van Eck & Waltman, 2009) was used for conducting keyword analysis, source co-citation network analysis, author co-citation network analysis, and collaboration network analysis, with the aim of identifying patterns of international collaboration.

Data for the study was extracted from the WoS using the following query within the Abstract, Title, and Keywords fields on November 1 in 2024.

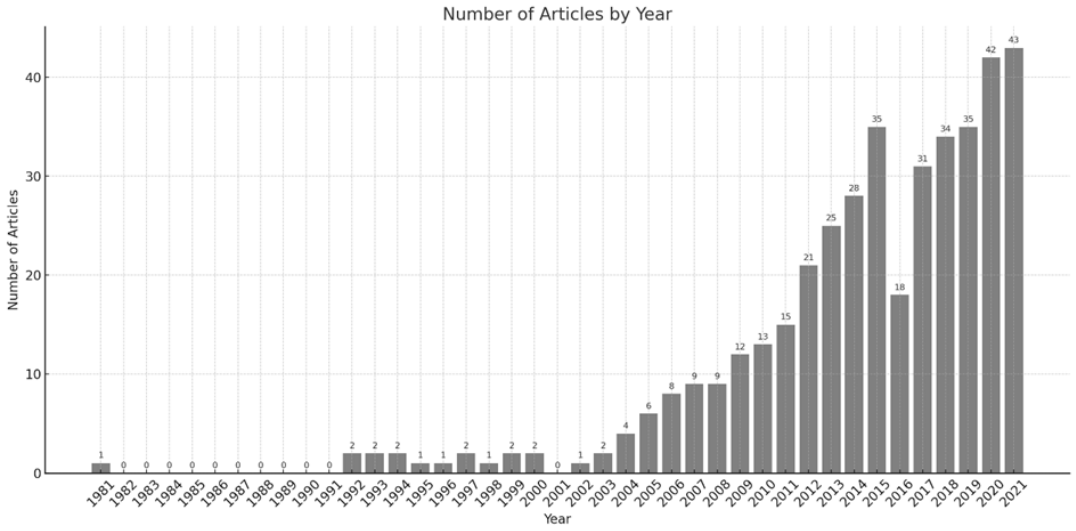
"civic education" OR "citizenship education" or "social studies education" or "social studies" or "active citizenship" or "political Education" AND "political literacy" or "political issues" or "political engagement" or "political knowledge" or "political efficacy" or "controversial issues"

The query was meticulously crafted to identify research articles that focus on political education within the framework of Citizenship and Social Studies Education. The search parameters were confined to journal articles, with no limitations imposed on the publication date. Consequently, a total of 426 articles were identified as a result of this query.

Findings

This section delineates the findings and interpretations derived from the analysis of data pertaining to studies within the subject area, as sourced from the Web of Science database, in accordance with the research objectives. The bibliometric analysis conducted in this domain identified a total of 426 articles. The annual distribution of the published articles is illustrated in Graph 1.

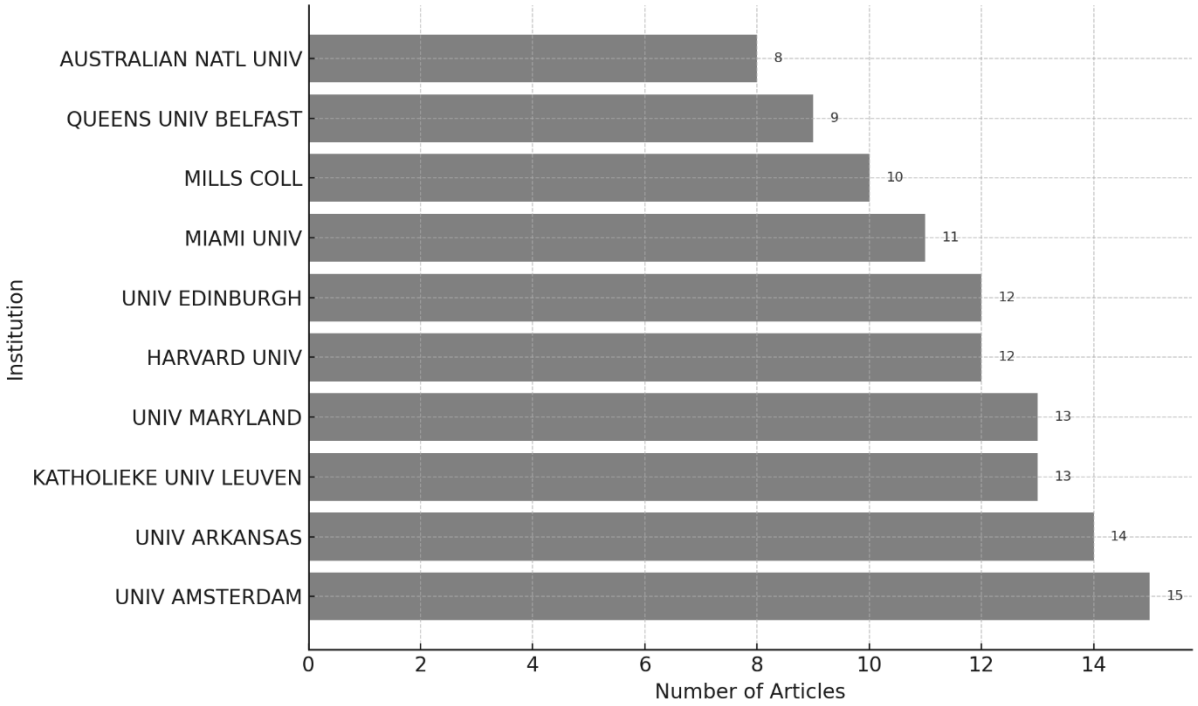
Graph 1. Number of Articles by Year



Graph 1 shows the distribution of academic studies in the subject area over the years. Research began in 1981, with little growth until the 2000s. Since 2013, there has been a significant rise in published articles, peaking at 43 in 2024. This trend reflects a growing academic interest and greater engagement from the scientific community.

Research in this field has been conducted at 479 institutions, with the top ten publication counts displayed in Graph 2.

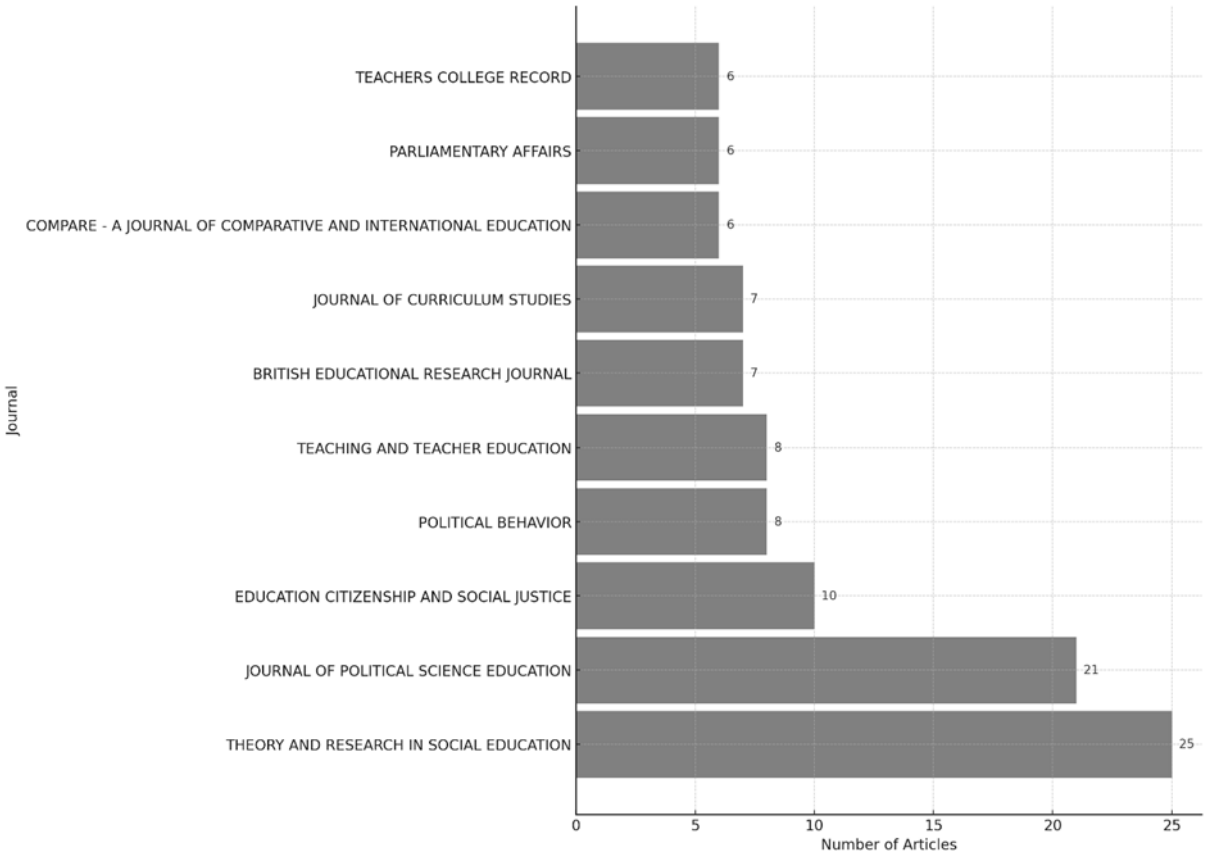
Graph 2. Distribution of Subject Area Studies by Institutions



Graph 2 shows the distribution of studies across institutions, highlighting the top contributors. The University of Amsterdam leads with 15 articles, followed by the University of Arkansas with 14. Katholieke University Leuven and the University of Maryland each contributed 13 articles, while Harvard University and the University of Edinburgh published 12 each. Miami University, Mills College, Queen's University Belfast, and the Australian National University contributed 11, 10, 9, and 8 articles, respectively. These findings emphasize the significant contributions of these institutions to the field.

Research in this field is published in 240 journals. The top ten journals by publication volume are displayed in Graph 3.

Graph 3. Distribution of Subject Area Studies According to Academic Journals

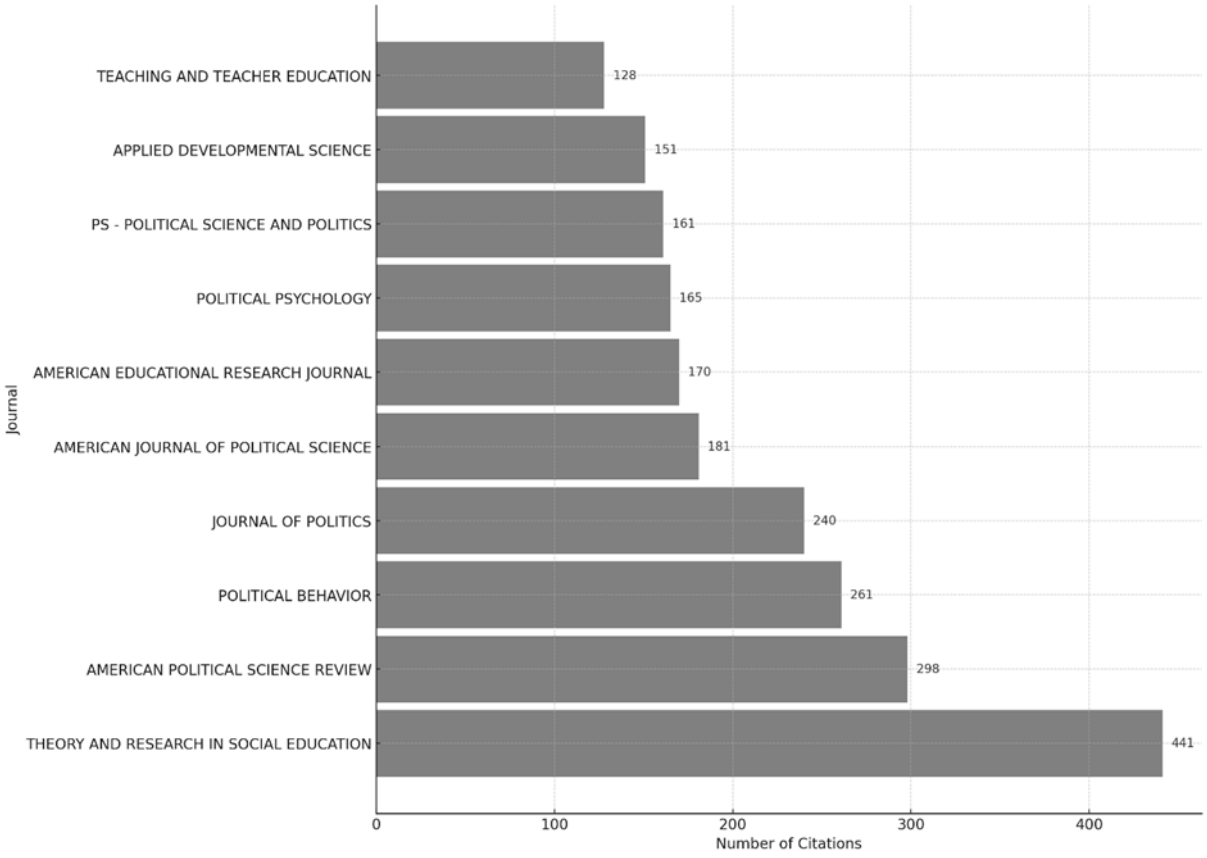


Graph 3 illustrates that publications pertaining to the subject area are disseminated across a broad spectrum of journals, thereby reflecting the diverse scope of research within this discipline. The journal with the highest volume of publications is “Theory and Research in Social Education” (25 articles), followed by the “Journal of Political Science Education” (21 articles)

and "Education Citizenship and Social Justice" (10 articles). This distribution underscores the interdisciplinary character of the field and emphasizes that research is notably concentrated in these three journals.

Graph 4 illustrates the ten academic journals with the highest citation scores within the specified subject area, whereas Figure 1 depicts the citation collaboration network among these journals.

Graph 4. Top-Cited Academic Journals in the Subject Area and Their Citation Counts



Graph 4 illustrates the journals that have received the highest number of citations within the specified subject area, along with their respective total citation counts. The journal that leads in citation frequency is "Theory and Research in Social Education", with 441 citations. It is followed by "American Political Science Review" with 298 citations, and "Political Behavior" with 261 citations. Journal of Politics ranks fourth with 240 citations, while "American Journal of Political Science" stands out with 181 citations. Furthermore, the list includes "American

Educational Research Journal" (170 citations), "Political Psychology" (165 citations), "PS-Political Science and Politics" (161 citations), "Applied Developmental Science" (151 citations), and "Teaching and Teacher Education" (128 citations).

The data presented are indicative of the academic impact of the most-cited journals within the subject area. The citation network among these journals is illustrated in Figure 1.

Figure 1. Citation Collaboration Network of the Most Cited Academic Journals in the Subject Area

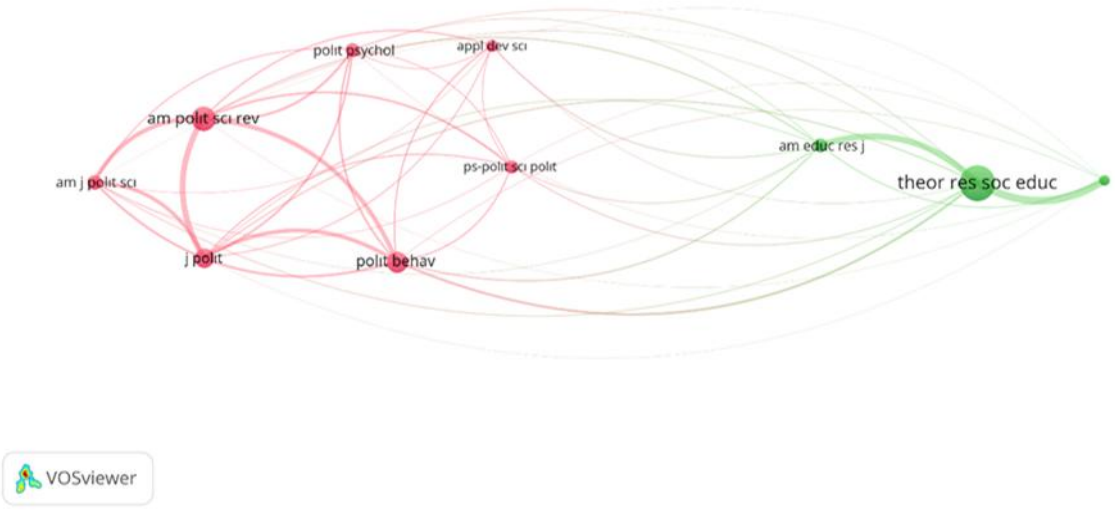
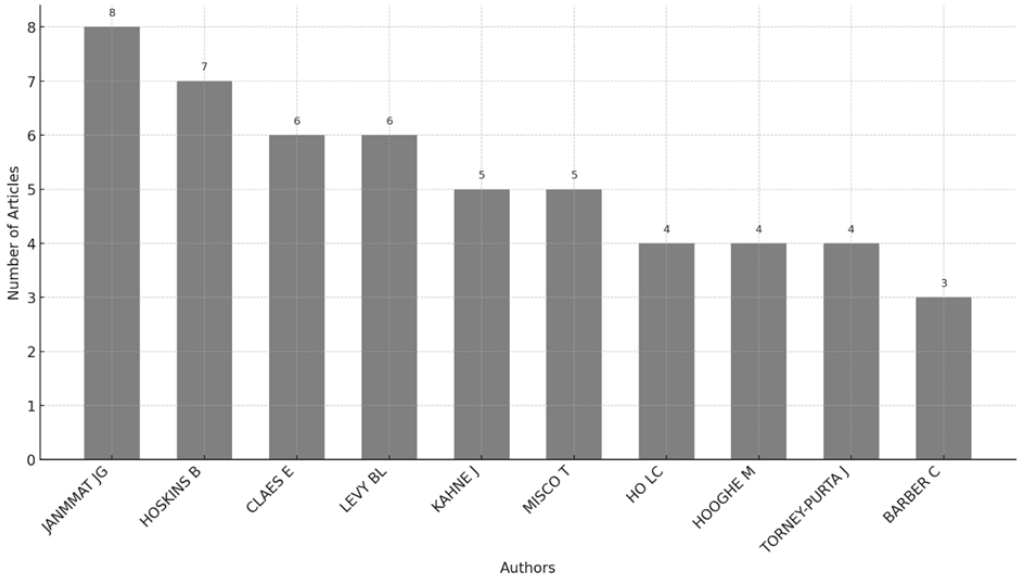


Figure 1 depicts the collaborative relationships among sources within the subject area. An analysis of Figure 1 reveals that "Theory and Research in Social Education" and "American Political Science Review" hold a significant position among the most-cited sources in this field, exhibiting a robust network of interconnections.

A total of 784 authors have contributed publications pertinent to this subject area. Graph 5 illustrates the top 10 authors with the highest publication counts, while Figure 2 depicts the co-authorship collaboration network among these authors.

Graph 5. Authors with the Most Publications in the Subject Area and Their Publication Counts



Graph 5 illustrates the leading authors within the specified subject area, ranked according to the volume of articles they have published. The data indicate that Janmaat JG is the most prolific author, having published a total of 8 articles. Following closely is Hoskins B, with 7 publications. Both Claes E and Levy BLM have made significant contributions, each author having published 6 articles. Furthermore, Kahne J and Misco T have each contributed 5 articles to the field. Additionally, Ho LC, Hooghe M, and Torney-Purta J have each published 4 articles, while Barber C is noted for having published 3 articles. These findings underscore the contributions of the most prolific authors in the subject area and their influence on the advancement of the field.

Figure 2. Co-Author Collaboration Network

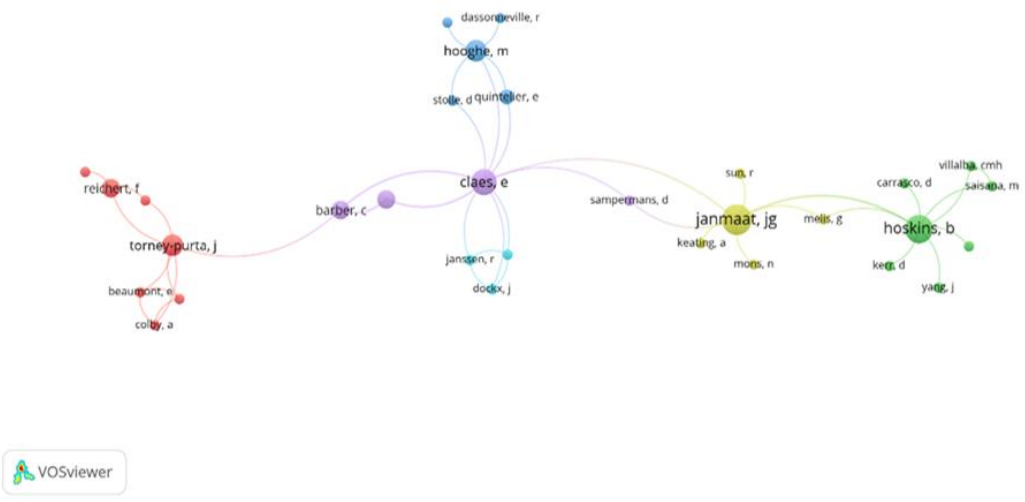


Figure 2 illustrates the collaboration network among authors within the specified subject area. Each node in the network represents an individual author, while the connections between nodes denote the existence of co-authored publications. The varying colors indicate distinct thematic groups or clusters within the collaboration network. Notably, authors such as Claes E, Janmaat JG, Hoskins B, and Torney-Purta J, occupy central positions, functioning as intermediaries between different groups. This analysis provides a significant framework for comprehending the interactions among authors and the structural dynamics of research groups.

Table 1 presents data regarding the h-index, total citation counts, and the years in which authors commenced their publication activities within the subject area. These metrics provide valuable insights into the contributions and academic impact of authors engaged in this field.

Table 1. Authors' h-Index and Total Citation Information Related to the Subject Area

Author	h-index	Total Citations	Number of Articles	Year of First Publication
Claes, E.	5	72	6	2009
Janmaat, J. G.	5	128	8	2016
Kahne, J.	5	477	5	2013
Ho, L. C	4	111	4	2012
Hooghe, M.	4	112	4	2009
Levy, B. L. M.	4	54	6	2016
Torney-Purta, J.	4	145	4	2001
Barber, C.	3	49	3	2009
Bee, C.	3	32	3	2014
Campell, D. E.	3	400	3	2007

Table 1 presents an overview of authors' h-index values, total citation counts, published articles, and their years of publication in the subject area, serving as a resource for evaluating academic impact and continuity.

Claes E and Levy BLM each authored six articles, but Claes E has a greater impact with 72 citations and an h-index of 5. Janmaat JG leads with eight publications, totaling 128 citations and an h-index of 5. Ho LC and Hooghe M each published four articles, with 111 and 112 citations, respectively, and both have an h-index of 4, indicating their academic influence.

Kahne, J. has published five articles, achieving the highest citation count of 477 and an h-index of 5, indicating a significant research impact. In contrast, Torney-Purta, J. has published three articles, with 145 citations and an h-index of 4, reflecting commendable academic performance.

Other authors, including Barber C, Bee C, and Campbell DE, have lower h-index values (3). However, Campbell DE has a notable citation count of 400, reflecting significant academic influence despite fewer publications.

This data evaluates the impact and lasting influence of authors' publications in the academic community. The h-index and total citation counts are key metrics reflecting the quality and contribution of an author's work.

Table 2 lists the ten most-cited articles in the subject area with their citation counts. Figure 3 visually represents the citation collaboration network among these articles, using color clusters to highlight their connections and emphasizing key works in academic discourse.

Table 2 presents a comprehensive overview of the authors, article titles, journals of publication, years of publication, and citation counts for the articles that have garnered the highest number of citations within their respective subject areas. This table serves as a valuable resource for assessing the academic impact of research studies within the field and for evaluating the contributions made to the subject area.

The article that has received the highest number of citations is "Political Knowledge, Political Engagement, and Civic Education" by Galston, W. A., and published in 2001 in the Annual Review of Political Science, which has garnered a total of 65 citations. In this work, the author explores the significance of political knowledge, engagement, and civic education in fostering democratic citizenship, as well as the function of such education within the political socialization process (Galston, 2001).

The second most frequently cited work is "Voice in the Classroom: How an Open Classroom Climate Fosters Political Engagement Among Adolescents", by Campbell DE. Published in 2008 in the journal Political Behavior, this article has garnered 64 citations. The study is particularly noteworthy for its examination of the influence of an open classroom climate on the political engagement of socioeconomically disadvantaged youth (Campbell, 2008).

Table 2. Articles by Number of Citations Within Their Subject Area

Author	Article Title	Journal of Publication	Year	Subject Area Citation	Color Scheme
Galston, W. A	Political Knowledge, Political Engagement, and Civic Education	Annual Review of Political Science	2001	65	Red
Campbell, D. E	Voice in the Classroom: How an Open Classroom Climate Fosters Political Engagement Among Adolescents	Political Behavior	2008	64	Red
Neundorf, A	The Compensation Effect of Civic Education on Political Engagement: How Civics Classes Make Up for Missing Parental Socialization	Political Behavior	2016	33	Green
Pasek, J	Schools as Incubators of Democratic Participation: Building Long-Term Political Efficacy with Civic Education	Applied Developmental Science	2008	24	Red
Kahne, J	Different Pedagogy, Different Politics: High School Learning Opportunities and Youth Political Engagement	Political Psycology	2013	24	Red
Feldman, L	Identifying Best Practices in Civic Education: Lessons from the Student Voices Program	American Journal of Education	2007	23	Red
Kahne, J	Developing Citizens: The Impact of Civic Learning Opportunities on Students' Commitment to Civic Participation	American Educational Research Journal	2008	22	Red
Hillygus, D. S	The MISSING LINK: Exploring the Relationship Between Higher Education and Political Engagement	Political Behavior	2005	16	Green
Campbell, D. E	Sticking Together: Classroom Diversity and Civic Education	American Politics Research	2007	15	Green
Campbell, D. E	Testing Civics: State-Level Civic Education Requirements and Political Knowledge	American Political Science Review	2016	14	Red

Neundorf et al. (2016) conducted a study titled "The Compensation Effect of Civic Education on Political Engagement: How Civics Classes Make Up for Missing Parental Socialization", has received 33 citations, indicating its significant impact within the field. This research explores the relationship between civic education and political engagement, specifically examining how civic education can serve as a compensatory mechanism for the absence of political socialization provided by parents.

The research conducted by Pasek et al. (2008) which has garnered 24 citations, is significant for its examination of the educational influences on youth democratic participation and political efficacy.

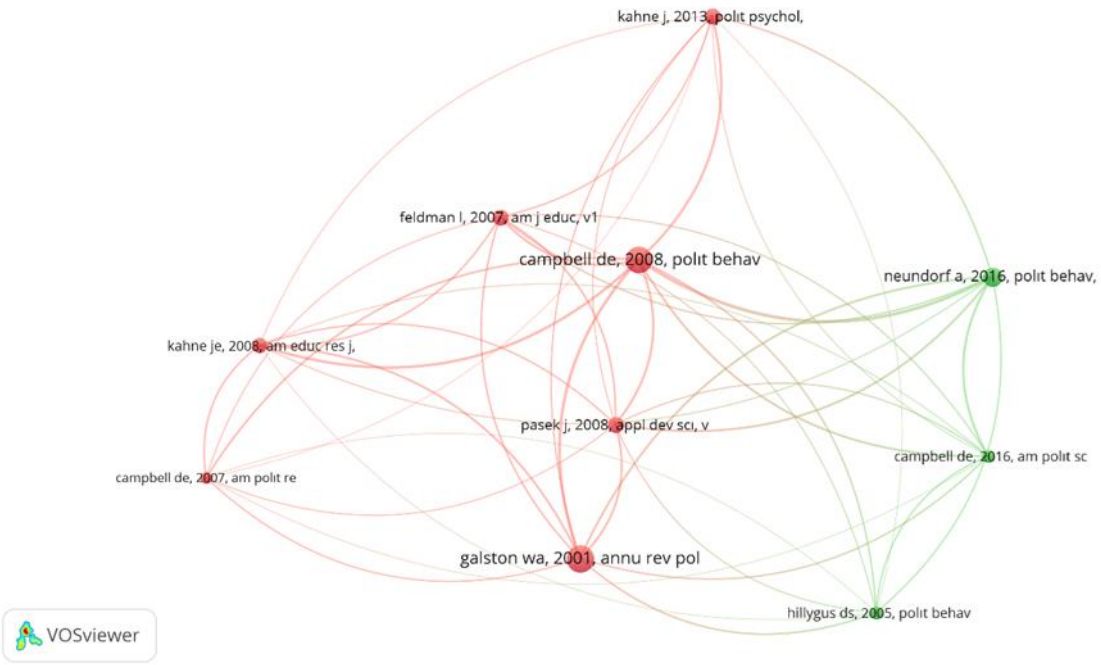
Among the studies that exhibit lower citation counts but nonetheless make significant academic contributions are Feldman et al. (2007), which has received 23 citations, Hillygus (2005) work titled "The MISSING LINK: Exploring the Relationship Between Higher Education and Political Engagement", which has garnered 16 citations. Both studies examine the relationship between education and political engagement.

The table further illustrates that Campbell DE is referenced multiple times (2007; 2016), indicating the sustained nature of their contributions to the field. The citation counts for Campbell's articles vary from 14 to 64, underscoring their considerable impact on the subject area.

This table demonstrates that publications within this subject area have facilitated significant theoretical and practical discussions, with certain works occupying a pivotal position in the academic landscape. The discrepancies in citation counts indicate the originality and enduring impact of these publications.

Figure 3 provides an analysis of significant studies within the subject area, utilizing citation counts and thematic connections to visualize prevailing trends and theoretical frameworks in the field. The influence of these studies in the existing literature is effectively illustrated through citation intensity and the formation of thematic clusters.

Figure 3. Citation Collaboration Network Within the Subject Area



The red cluster encompasses research which concentrates on conventional methodologies for civic education and the advancement of democratic values. This cluster examines the improvement of political knowledge, the promotion of democratic participation, and the impact of open classroom environments on the learning process. The studies underscore the significance of school-based civic education in cultivating individuals' political knowledge and participatory skills. Notably, open classroom environments are identified as conducive to fostering democratic thought and civic engagement. The research within this cluster articulates the beneficial effects of civic education on individual socialization and its capacity to partially alleviate socioeconomic disadvantages.

The green cluster encompasses research which investigates contemporary methodologies in civic education, the challenges posed by the digital era, and the significance of media literacy. These studies extend beyond conventional approaches to analyze the impact of educational diversity on the cultivation of democratic values and the ways in which the digital landscape shapes the political knowledge and engagement of youth. Furthermore, they emphasize that educational interventions can mitigate the deficiencies in parental socialization and underscore the essential role of media literacy in the acquisition and assessment of accurate information.

This cluster provides valuable insights into the potential reconfiguration of civic education within a modern framework.

Table 3 displays the ten most-cited articles worldwide within the specified subject area, along with their respective citation counts. Figure 4 illustrates the collaborative citation patterns and thematic networks associated with these articles.

Table 3. Globally Most-Cited Articles in the Subject Area

Author	Article Title	Journal of Publication	Year	Global Citation	Color Scheme
Galston, W.A	Political Knowledge, Political Engagement, and Civic Education	Annual Review of Political Science	2001	702	Blue
Hillygus, D. S	The MISSING LINK: Exploring the Relationship Between Higher Education and Political Engagement	Political Behavior	2005	302	Blue
Campbell, D. E	Voice in the Classroom: How an Open Classroom Climate Fosters Political Engagement Among Adolescents	Political Behavior	2008	281	Red
Kahne, J	Developing Citizens: The Impact of Civic Learning Opportunities on Students' Commitment to Civic Participation	American Educational Research Journal	2008	277	Red
Harris, A	Beyond apathetic or activist youth: 'Ordinary' young people and contemporary forms of participation	YOUNG	2010	242	Green
Kahne, J	Educating for Democracy in a Partisan Age: Confronting the Challenges of Motivated Reasoning and Misinformation	American Educational Research Journal	2017	241	Green
Davies, L	Global citizenship: abstraction or framework for action?	Educational Review	2006	198	Yellow
Jasanoff, S	Beyond Epistemology: Relativism and Engagement in the Politics of Science	Social Studies of Science	1996	194	Green
Morrell, M. E	Deliberation, Democratic Decision-Making and Internal Political Efficacy	Political Behavior	2005	153	Blue
Oulton, C	"Controversial issues - teachers' attitudes and practices in the context of citizenship education"	Oxford Review of Education	2004	137	Blue

Table 3 presents the most-cited studies worldwide within the relevant subject area. As indicated in the table, the article by Galston, W. A., titled "Political Knowledge, Political Engagement, and Civic Education" occupies the top position with a total of 702 citations. This article is regarded as a seminal resource in the field, owing to its comprehensive analysis of civic knowledge and political engagement (Galston, 2001).

In second place, with 302 citations, is the work of Hillygus, D. S., titled "The Missing Link: Exploring the Relationship Between Higher Education and Political Engagement". This study offers a substantial contribution to existing literature by examining the relationship between higher education and political participation (Hillygus, 2005).

The third most-cited article, with 281 citations, is Campbell DE's "Voice in the Classroom: How an Open Classroom Climate Fosters Political Engagement Among Adolescents". This study examines the relationship between an open classroom environment and the promotion of political engagement among adolescents (Campbell, 2008)

Kahne & Sporte (2008) "Developing Citizens: The Impact of Civic Learning Opportunities on Students' Commitment to Civic Participation" ranks fourth with 277 citations. This study investigates the correlation between students' civic learning opportunities and their commitment to civic engagement.

In fifth place, with 242 citations, is Harris A.'s article titled "Beyond Apathetic or Activist Youth: "Ordinary Young People and Contemporary Forms of Participation". This work contributes a novel perspective to the existing literature by examining the participation patterns of young individuals (Harris et al., 2010).

A more recent study, (Kahne & Bowyer, 2017) ranked sixth with 241 citations, is titled "Educating for Democracy in a Partisan Age: Confronting the Challenges of Motivated Reasoning and Misinformation". This article examines the role of digital media and media literacy, as well as the processes through which young individuals develop judgments, particularly within the context of the digital age.

Further along the list, the works of Davies (2006), Jasanoff (1996), Morrell (2005), and Oulton et al. (2004) have garnered 198, 194, 153, and 137 citations, respectively. These studies address themes including civic education, global citizenship, and political participation, thereby highlighting their significance within the field.

The table illustrates the global influence of research within this subject area. Notably, authors such as Kahne, J.E. and Campbell, D.E., are frequently cited, underscoring their enduring contributions to the field. These findings suggest that civic education and political participation hold a prominent place in academic literature, reflecting a growing interest in these topics in the context of the digital age.

Figure 4. Global Citation Collaboration Network in the Subject Area

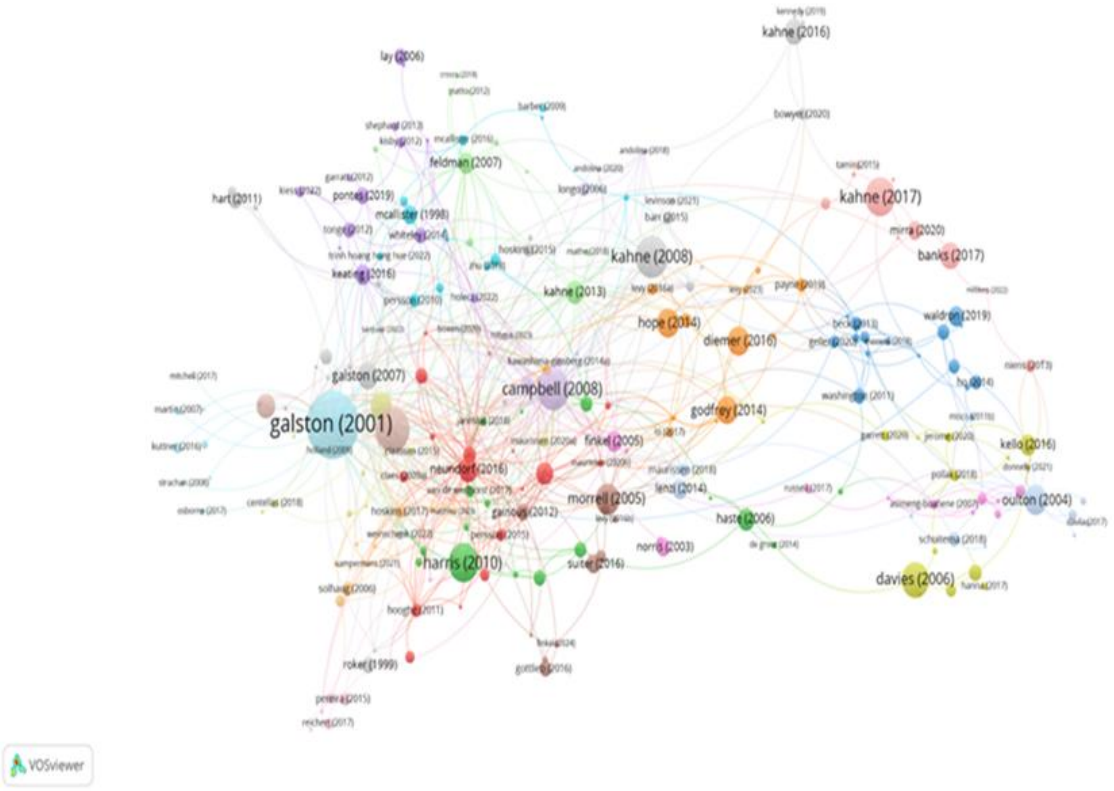


Figure 4 provides an analysis of significant studies within the subject area, utilizing global citation counts and thematic connections to visualize trends and theoretical frameworks pertinent to the field. The influence of these studies on the existing literature is effectively illustrated through citation density and thematic clusters.

The red cluster emphasizes civic education and the promotion of democratic values. The blue cluster underscores studies that investigate the relationship between democratic participation and education. The green cluster presents research on media literacy and the skills necessary for information verification in the digital age. The yellow cluster highlights global citizenship education and the theme of social justice.

The studies presented demonstrate the thematic diversity inherent in the literature on civic education and political participation, as well as the interconnections among various research domains. These seminal works provide a valuable framework for researchers, offering guidance both theoretically and practically.

Table 4 delineates the countries of the corresponding authors, the number of articles published by each country, and the proportion of collaborations with other nations. Figure 5 illustrates the network of international collaborations.

Table 4. Corresponding Authors' Countries, Number of Articles, and SCP-MCP Ratios

Countries	Number of Articles	SCP Single Country Publication	MCP Multiple Country Collaboration Publications	MCP % Multiple Country Collaboration Ratio
USA	164	156	8	4.9
United Kingdom	59	45	14	23.7
China	22	17	5	22.7
Belgium	17	13	4	23.5
Australia	14	13	1	7.1
Germany	13	13	0	0.0
Netherlands	12	9	3	25.0
Sweeden	11	9	2	18.2
Türkiye	10	9	1	10.0
Irland	9	8	1	11.1

The data presented in Table 4 offers a comprehensive analysis of the scientific productivity levels across various countries, as well as their tendencies toward international collaboration. The findings indicate that the United States (US) ranks highest in scientific output, with a total of 164 published articles. Notably, 95.1% of these articles, amounting to 156, were authored exclusively by researchers based in the US. Furthermore, the US demonstrates a relatively low Multiple Country Collaboration (MCP) ratio of 4.9%, signifying that only 8 articles resulted from international collaborative efforts. This trend suggests a pronounced national focus within the scientific research activities conducted in the US.

In contrast, countries such as the United Kingdom (23.7%), China (22.7%), Belgium (23.5%), and the Netherlands (25%) exhibit high ratios of multiple-country publications (MCP). These elevated percentages indicate that these nations cultivate a research ecosystem that is significantly dependent on international collaboration and actively encourages cross-border

partnerships. Notably, despite having a comparatively low total number of publications, the Netherlands distinguishes itself with the highest MCP ratio, highlighting its dedication to international collaboration in scientific research.

The collaborative approach adopted by European countries and China underscores the global advancement and distribution of scientific innovations. Furthermore, nations such as Sweden (18.2%) and Ireland (11.1%), despite having a lower total output of scholarly articles, exhibit relatively high multi-country publication (MCP) ratios. This suggests that a considerable proportion of their constrained scientific output is associated with international research initiatives.

Figure 5. International Collaboration Network Among Countries

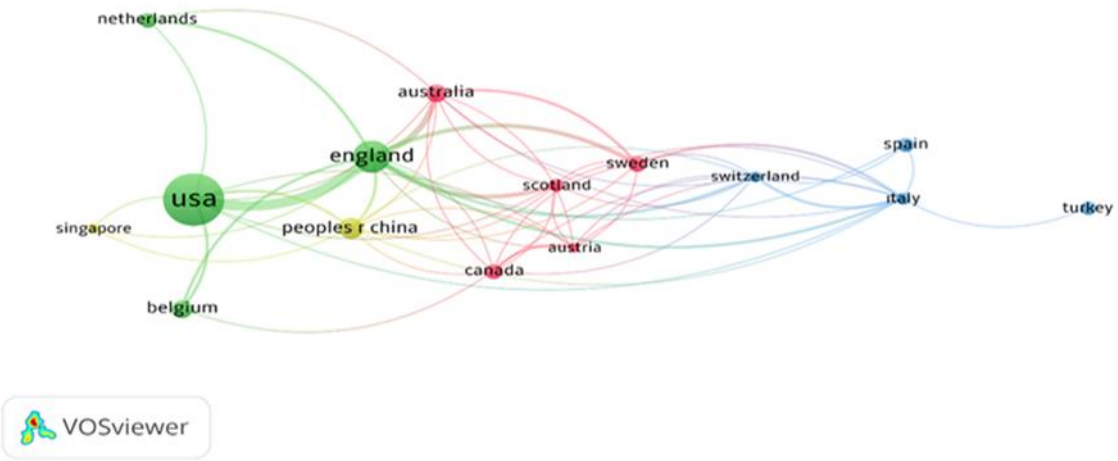


Figure 5 illustrates the scientific collaboration network among various countries. The dimensions of the nodes correspond to the volume of scientific output, whereas the connections signify the collaborative relationships established between nations. The United States, depicted by the largest node, is at the forefront of scientific output; however, it exhibits a relatively restricted number of international collaborations. This observation underscores the tendency of the United States to prioritize research activities that are predominantly nationally focused.

In contrast, countries such as the United Kingdom, Belgium, the Netherlands, and China are positioned in a manner that underscores their receptiveness to various international collaborations. These nations maintain robust connections both within Europe and with other continents. Notably, the close cooperation among European countries, along with the pivotal

roles played by the Netherlands and Belgium, highlights their importance in international research initiatives.

The figure provides a visual representation of the ratios of Single-Country Publications (SCP) and Multiple-Country Publications (MCP) as discussed in the accompanying table. It highlights the influence of international collaboration on scientific research.

Figure 6 depicts the temporal trends of significant terms within the subject area.

Figure 6. Network Visualization of Keywords

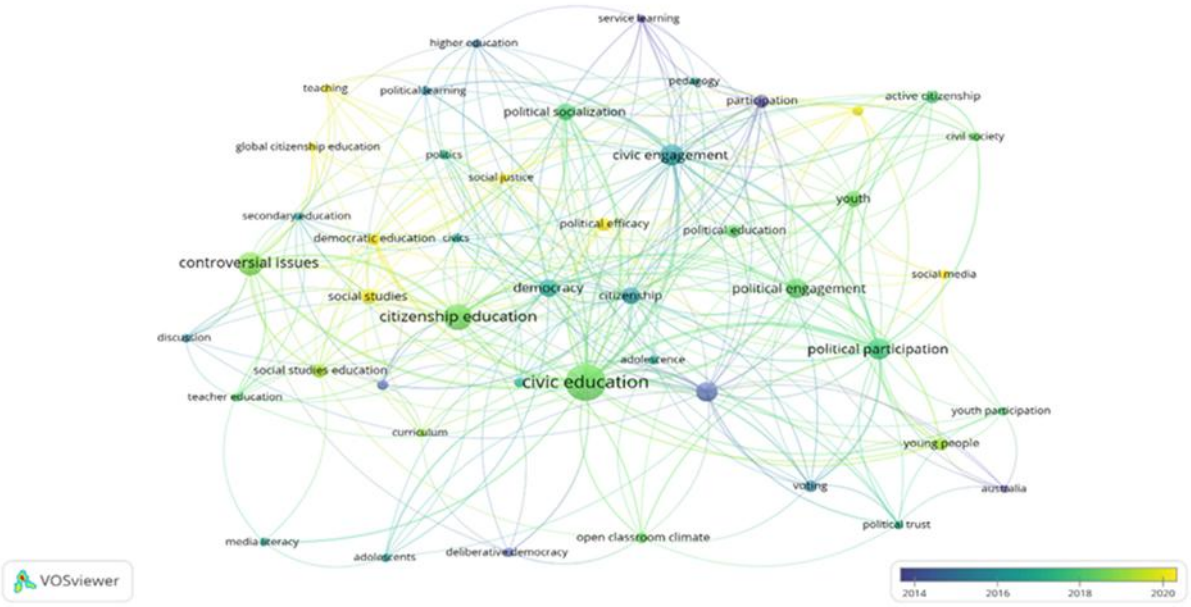


Figure 6 shows that the most common keywords in the articles are civic education, citizenship education, political participation, and political engagement. From 2014 to 2016, civic education and citizenship education were predominant, while from 2018 to 2020, keywords like youth, social media, and active citizenship became more significant.

This observation indicates a thematic shift in research. While early studies in the 2010s focused on education-related concepts, recent trends emphasize contemporary themes like youth, digital media, and active citizenship. This evolution shows that researchers are broadening the field's philosophical scope by engaging with relevant social and political contexts.

Conclusion, Discussion and Recommendations

This study examines international publications on active citizenship, citizenship education, social studies education, and political education by analyzing data from the Web of Science (WoS) database. The analysis focuses on key concepts such as political literacy, political issues, political participation, political knowledge, political efficacy, and controversial issues. A total of 426 articles were identified without limitations regarding article type or publication date and

were analyzed using bibliometric methods through VOSviewer software. Similarly, Karaca and Akbaba (2021) analyzed citizenship education research in the WoS database for the period from 1980 to 2020, emphasizing emerging themes such as digital citizenship, critical citizenship, identity, and justice. These findings closely align with the key concepts addressed in the present study.

Most of the concepts selected within this scope are directly related to citizens' capacities for critical thinking and informed participation in the public sphere. In this regard, Paulo Freire's (2018) critical pedagogy aligns with the conceptual framework of the study, as it advocates for the development of individuals not merely as recipients of knowledge but as agents capable of questioning and transforming society. Similarly, the bibliometric analysis conducted by Yeşiltaş and Gez Çinpolat (2022) on digital citizenship highlights a significant increase in the literature after 2014, drawing attention to the growing prominence of concepts such as digital literacy, digital competence, and technology. This finding underscores that citizenship education is shaped not only by traditional dimensions but also increasingly by its digital components.

The study analyzed the temporal distribution of articles, the most prolific journals, leading authors, authors' h-index scores, country-level productivity, frequently cited sources, and current research topics. The findings reveal a growing academic interest in citizenship and political education, underscoring their crucial role in promoting democratic values, fostering social responsibility, and encouraging political participation. The identified thematic networks also highlight existing research gaps and potential directions for future studies. In this context, the bibliometric analysis conducted by Pedraja-Rejas et al. (2023) from a sustainable development perspective in education demonstrates the increasing relevance of themes such as global citizenship, migration, and sustainability within the field of citizenship education. Consequently, the thematic structures and emerging research gaps identified in this study should be considered not only at a national level but also in a global context.

According to data from the Web of Science (WoS), 85% of studies on political and citizenship education have been published between 2013 and 2024, with over 40% of these appearing between 2020 and 2024. This increase reflects the growing recognition of the role of citizenship education in promoting civic engagement and the corresponding rise in scholarly interest in the field. C. Zhang and Fagan (2016) emphasized that ideological and political education in mainland China aims to cultivate active citizens, highlighting the importance of educational frameworks that encourage civic participation. This trend underscores the expanding role of educational institutions in fostering engaged citizens and illustrates how this development is influencing research and publication activity. In this context, Westheimer and Kahne's (2004) model of the "participatory citizen" appears to be gaining prominence in contemporary citizenship education. However, the relatively limited representation of their "justice-oriented citizen" model indicates a need to further develop the critical and social justice dimensions of citizenship education.

The Web of Science (WoS) database encompasses 240 journals focused on political and citizenship education. Among the leading journals in this field are Theory and Research in Social Education, Journal of Political Science Education, and Citizenship and Social Justice. Similarly,

Karaca and Akbaba (2021) identified Theory and Research in Social Education and Education, Citizenship and Social Justice as the most prolific journals in this domain. The most productive researchers in the field are Janmaat, J.G. (8 publications), Hoskins, B. (7 publications), and Claes, E. (6 publications), who are affiliated with the University of London, the University of Roehampton, and KU Leuven, respectively. These scholars also exhibit the highest levels of research collaboration. The most active institutions include the University of Amsterdam, the University of Arkansas, and KU Leuven.

Janmaat, J.G., leads the field with eight publications, 128 citations, and an h-index of five, while Kahne, J., has the highest citation count, with five publications, 477 citations, and an h-index of five. Claes, E. has published six articles, received 72 citations, and also holds an h-index of five. Other notable researchers include Ho, L.C. (four publications, 111 citations, h-index of four), Hooghe, M. (four publications, 112 citations, h-index of four), Torney-Purta, J. (three publications, 145 citations, h-index of four), and Campbell, D.E. (three publications, 400 citations, h-index of three). These data underscore the significant influence of these scholars within the academic community.

The most cited study in the field is "Political Knowledge, Political Engagement, and Civic Education" by W.A. Galston. This article has garnered 65 citations within the field and 702 in broader academic contexts. It is renowned for its influential analysis of democratic participation and civic awareness. Galston's (2001) work is particularly pertinent to the concepts of internal political efficacy and political literacy, both of which are essential for empowering citizens to take active roles in democratic societies.

An examination of Figures 3 and 4 reveals that the most highly cited articles are interconnected, forming clusters represented by distinct color groupings. These connections underscore the importance of integrating traditional educational approaches with contemporary demands. Consequently, it can be argued that citizenship education practices, adapted to the dynamics of the digital age while remaining grounded in traditional pedagogies, are likely to yield more effective outcomes. Key themes such as diversity, bridging gaps in socialization, and media literacy emerge as significant points of intersection between the two clusters, thereby broadening the scope of citizenship education. These findings resonate with both Freire's (2018) critical pedagogy and Habermas's (1989) theory of the public sphere. In particular, the potential of digital citizenship environments to foster democratic engagement suggests a transformative capacity for these spaces to evolve into digital public spheres—idealized arenas for rational discourse and civic participation.

While the United States is among the leading countries in terms of scientific productivity, the majority of its research is conducted at the national level. In contrast, the United Kingdom, the Netherlands, Belgium, and China are distinguished by their high rates of multi-country collaboration (MCP). Notably, although the Netherlands produces a relatively smaller number of publications, its high MCP ratio indicates robust international collaborations, thereby contributing to the global dissemination of scientific innovation.

These findings underscore the critical importance of promoting international collaboration to enhance both the scope and impact of scientific advancement. Chinchilla-Rodríguez et al.

(2018) emphasize that fostering interest in such collaborations is essential for building research capacity. Collaboration networks play a pivotal role in advancing scientific productivity and innovation. Consequently, these findings underscore the strategic importance of international partnerships in enhancing researcher mobility and collaboration while also offering clear guidance on selecting suitable institutions and collaborators.

Among the most frequently used keywords in the field are civic education, citizenship education, political participation, and political engagement. From 2014 to 2016, themes related to civic and citizenship education were predominant, while the period from 2018 to 2020 witnessed a shift toward youth, social media, and active citizenship. This transition reflects a growing focus within the field on contemporary social and political contexts. The COVID-19 pandemic further accelerated the development of innovative approaches to citizenship education. Hidayah et al. (2022) emphasized that interactive learning tools played a crucial role in promoting civic values among students during challenging times. This technological integration may encourage researchers to explore effective pedagogical strategies suitable for the digital age.

Levy et al. (2015) provided early empirical evidence supporting the impact of digital tools on promoting political participation. Their study examined the role of political blogging within a high school curriculum, finding that students who engaged in structured online discussions exhibited increased political interest, enhanced internal political efficacy, and greater confidence in political writing. These findings underscore the significance of interactive learning tools in fostering civic awareness and participation within digital learning environments. However, Levy et al. (2015) also identified challenges in facilitating peer-to-peer deliberation, which is essential for meaningful online political engagement.

Given the expanding role of technology in citizenship education, future research should concentrate on developing interactive and participatory digital models that enhance political literacy and promote meaningful civic engagement. These insights align with Mihailidis and Thevenin's (2013) conceptualization of media literacy as a fundamental civic competency. In this context, digital citizenship extends beyond mere technological proficiency to include critical thinking, responsible content creation, and active participation in the digital public sphere.

This research recommends the following:

This study used only the Web of Science (WoS) database. Future research should examine citizenship education literature in political education using other databases like Scopus, ERIC, and ProQuest for a broader perspective.

Future bibliometric analyses should incorporate various document types, including master's theses, doctoral dissertations, books, and conference proceedings, to enrich citizenship and political education research.

Including publications in national indices like the TR Index could improve our understanding of citizenship education research's national impact and support the field's growth.

"It is recommended that researchers in citizenship and political education consider forming international partnerships based on the study's findings, including insights on influential authors, collaboration networks, and productive universities and countries.

This study utilized VOSviewer, but future research could apply tools like R Studio, CiteSpace, and Bibliometrix for more comprehensive analyses of existing findings.

This study identifies research gaps in citizenship education. Future research should focus on themes like youth, social media, and digital citizenship.

Researchers in citizenship education should focus on high-impact journals such as "Theory and Research in Social Education," "Journal of Political Science Education," and "Education, Citizenship and Social Justice" which publish the most articles in this area.

The findings show high international collaboration in the Netherlands, China, and the United Kingdom. Future research could compare citizenship education practices across countries.

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The authors of the article declare that there is no conflict of interest between them.

Summary of Contribution Rate Declaration of Researchers

The authors declare that they have contributed equally to the article.

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Analyzing 5th Grade Science Textbook Activities in Light of the Turkish Century Education Model: A STEM and Design Thinking Perspective

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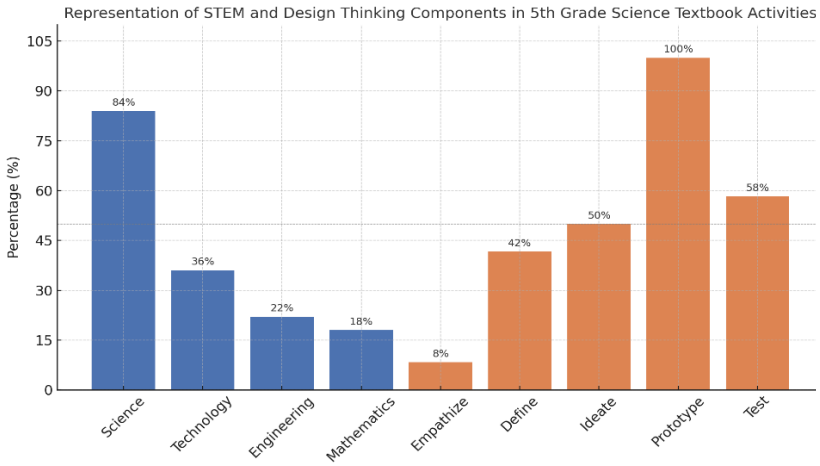
Graphical Abstract



Abstract

This study examined how the activities in the 5th grade Science textbook, updated within the Turkish Century Education Model (TCEM), were structured in terms of STEM education and the Design Thinking (DT) approach. Using document analysis, the 2024 Science textbook published by the Ministry of National Education was analyzed. Fifty activities were evaluated based on the four STEM components (science, technology, engineering, mathematics) and five DT stages (empathy, define, ideate, prototype, test).

Findings showed that the activities were mostly science-focused, while technology, engineering, and mathematics were less represented. About half of the activities involved some DT stages, yet creative production phases such as ideation, prototyping, and testing were limited. Only 40% of the activities included both STEM and DT components.

The qualitative analysis indicated that most activities emphasized observation and information gathering rather than creative thinking or problem-solving. This suggests that the TCEM's vision of raising productive and versatile individuals is only partially reflected in the textbook. It is recommended that textbook activities be redesigned to more fully integrate STEM and DT approaches, providing students with interdisciplinary, student-centered, and production-oriented learning experiences which support 21st-century skills.

Key words: STEM Education, Design Thinking, Science Textbook.

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Intoduction

The dynamic structure of the twenty-first century expects individuals not only to access information but also to make sense of this information, transform it into creative solutions and become productive individuals (Saavedra & Opfer, 2012; Trilling & Fadel, 2009). This change necessitates the restructuring of education systems. Today, the main purpose of learning processes is to move away from rote learning and to equip students with multifaceted skills such as critical thinking, problem solving, communication, collaboration and creativity (OECD, 2018). The importance of interdisciplinary integrated approaches in gaining these skills is increasing.

In this context, STEM (Science, Technology, Engineering, Mathematics) education and Design Thinking (DT) approach have become central to contemporary education. STEM education supports students' integrated learning of science, technology, engineering and mathematics disciplines through tasks associated with real-life problems (Yıldırım, 2016). STEM aims at not only scientific knowledge but also the operationalization of this knowledge through technology and engineering. In addition, the design thinking process integrated into STEM is a creative and innovative learning cycle which enables students to empathically define a problem, develop original solutions, and embody the solution by creating prototypes (Razzouk & Shute, 2012; Sarıkoç & Ersoy; 2022).

Design-based thinking (DT) has gained prominence as a transformative pedagogical approach in STEM education, offering a human-centered, iterative problem-solving framework which that fosters creativity, empathy, collaboration, and innovation (Brown, 2009). Rooted in constructivist and experiential learning theories, DT bridges engineering designs with real-world problem contexts, aligning well with 21st-century learning goals. Its core cycle—empathize, define, ideate, prototype, and test—guides students through authentic learning experiences which that promote deeper engagement and interdisciplinary thinking. Numerous studies underscore DT's educational value: Goldman et al. (2014) illustrated its effectiveness in the "Dive In!" curriculum, where students addressed water-related community issues through iterative design, Mahil (2016) demonstrated its scalability, and Frear and Fillip (2019) highlighted positive student outcomes from immersive DT workshops. The DT approach has the power to unleash the creative potential of the individual, especially in student-centered learning environments. The role of DT in education should be considered not only as a method

but also as a pedagogical stance towards building a productive, creative and collaborative learning culture (Plattner et al., 2011; Öztürk, 2021).

In this context, it is seen that STEM and STEM-based education practices have become widespread at various levels and have been the subject of research in Turkey in recent years. The studies such as Güneş Varol (2020), Kavacık (2019), and Şen (2018) show that design-based STEM activities make significant contributions to students' academic achievement, inquiry skills, and interest in STEM professions. Similarly, studies conducted by Sarıkoç and Ersoy (2022) emphasize that the DT approach enables more effective and meaningful learning experiences when integrated with STEM.

The most prominent reflection of this holistic approach at the institutional level was the Turkish Century Education Model (TCEM) introduced by the Ministry of National Education in 2023. The TCEM aims to restructure not only curricula but also educational philosophy, learning experiences, measurement and evaluation approaches, and material design processes (MoNE, 2023). The model aims to transforming the individual into a "virtuous, competent and productive" individual by taking into account his/her mental, social, cultural and moral development. In this framework, the TCEM proposes that learning processes should be built with structures which support creative thinking, problem solving and multidisciplinary work.

Within the scope of TCEM, updated curricula and textbooks have been put into practice at the 1st, 5th and 9th grade levels as of the 2024-2025 academic year. Science, in particular, is one of the areas where the most tangible reflections of the transformation targeted by TCEM can be seen due to its scientific knowledge and practical nature. This course offers many learning environments where students can actively participate in STEM and DT processes (Demirezen, 2024). The type, purpose, content, and pedagogical structure of the activities in the textbooks are important sources of data to understand the extent to which students can be involved in these processes.

Although recent studies have emphasized the importance of STEM and Design Thinking (DT) in education and explored their classroom implementations (Sarıkoç & Ersoy, 2022), there remains a significant gap in evaluating how these approaches are reflected in official curricular materials, particularly in the context of recent national reforms. The Turkish Century Education Model (TCEM), introduced in 2023, marks a major shift in educational philosophy, emphasizing

creativity, production, and interdisciplinary learning. However, resources revealing the extent to which these principles are operationalized within the structure of newly developed textbooks are limited. This study addresses this gap by systematically analyzing the activities in the 5th grade Science textbook—one of the first educational materials designed in line with TCEM. To the best of our knowledge, this research represents one of the first attempts to evaluate the implementation of TCEM through textbook content analysis from a STEM and Design Thinking perspective. In doing so, it offers original insights into how policy-level transformations are (or are not) concretely translated into classroom learning experiences.

The main purpose of this study is to analyze the activities in the 5th grade Science textbook, which was updated within the scope of the Turkish Century Education Model in the context of STEM education and Design Thinking (DT) approach. The study aims to reveal to what extent the activities offer integrated interdisciplinary learning opportunities, whether they support students' 21st century skills (creativity, collaboration, problem solving, computational thinking, etc.), and whether they reflect the pedagogical transformation envisaged by the TCEM at the textbook level.

In particular, considering the four basic components of STEM (science, technology, engineering, mathematics) and the five stages of DT (empathizing, defining the problem, generating ideas, prototyping, and testing), whether the activities are structured within this framework will be evaluated through content analysis. The question "Does the textbook focus only on knowledge transfer or does it offer a student-centered and production-based learning environment?" is regarded as the main starting point.

In line with the main objective of the research, answers to the following questions will be sought:

1. How often and in what way do the activities in the 5th grade Science textbook, which was updated within the scope of TCEM, include STEM components (science, technology, engineering, mathematics)?
2. Which stages of the Design Thinking approach (empathy, identification, idea generation, prototyping, testing) are included in the activities?
3. What is the proportion of activities which include STEM and DT components together and what are the characteristics of these activities?

4. How is TCC's vision of transforming learning experiences reflected in textbook activities?

Methods

This research was conducted with document analysis method, one of the qualitative research designs. Document analysis is a data collection and analysis process based on the systematic examination of written materials (Yıldırım & Şimşek, 2018). In the study, the activities in the 5th grade Science textbook, which was updated within the scope of the Turkish Century Education Model, were analyzed in line with STEM education and Design Thinking (DT) approaches. This method was regarded to be appropriate for evaluating how the pedagogical and structural approaches of the TCEM are reflected in teaching materials.

Data Source

The main data source of the study is the 5th grade Science textbook prepared and published by the Ministry of National Education in 2024 in line with the TCEM and put into practice as of the 2024-2025 academic year. All units and activities in the book were analyzed; not only the information texts but also the activity instructions and experiment suggestions directed to the students were included in the scope of the analysis.

Data Collection Process

All activities in the textbook were evaluated in terms of DT stages (empathy, identification, idea generation, prototyping, testing) and STEM components (science, technology, engineering, mathematics).

Data Analysis

The collected data were analyzed using descriptive and content analysis methods. In the content analysis process, themes aligned with the research questions—namely the components of STEM (science, technology, engineering, mathematics) and the stages of the Design Thinking (DT) approach (empathizing, defining the problem, idea generation, prototyping, and testing)—were determined in advance. Each activity in the 5th grade Science textbook was then systematically coded based on these themes. For example, the activity titled "Designing a Thermal Insulation Experimental Set" was coded as involving all four STEM components (S, T, E, M) and four DT stages (defining, idea generation, prototyping, testing), as

it required students to develop a hypothesis, design a solution using insulation materials, build a prototype, and test its effectiveness. These codes were entered into a structured Excel matrix, including fields for activity title, description, STEM/DT representation, and relevant 21st century skills (e.g., problem-solving, creativity).

To ensure the reliability of the coding process, two researchers with doctoral degrees in science education—who were not involved in the study—coded the data independently. The intercoder reliability was then calculated by comparing the two sets of codes using percentage agreement, resulting in a consensus rate of 0.88, which is considered high and indicates strong consistency between coders (Miles et al., 2014).

Ethical Considerations

Since the study involved document analysis of an openly accessible and publicly available 5th grade Science textbook published by the Ministry of National Education, no ethical approval was required. However, all procedures adhered to research ethics principles regarding responsible use, citation of sources, and accurate representation of official documents. The study did not involve human participants or sensitive data.

Limitations

This study is limited to the analysis of a single grade level (5th grade) and a single subject (Science), which may restrict the generalizability of the findings to other levels or disciplines within the TCEM framework. Additionally, although a coding guideline was developed and intercoder reliability was calculated, the interpretation of the presence and depth of STEM and Design Thinking components may still reflect some degree of subjectivity due to the qualitative nature of the study.

Findings

In this section, the activities in the 5th grade Science textbook prepared within the scope of the Turkish Century Education Model were analyzed in terms of STEM components and Design Thinking (DT) stages. The 50 activities in the Excel spreadsheet were evaluated by content analysis method and the following findings were obtained.

A visual summary of the presence of STEM and Design Thinking components across activities is provided in the heatmap below. Each row represents a textbook activity, and each column

represents a specific component. The intensity of the color indicates whether the component is included (darker shades) or absent (lighter shades).

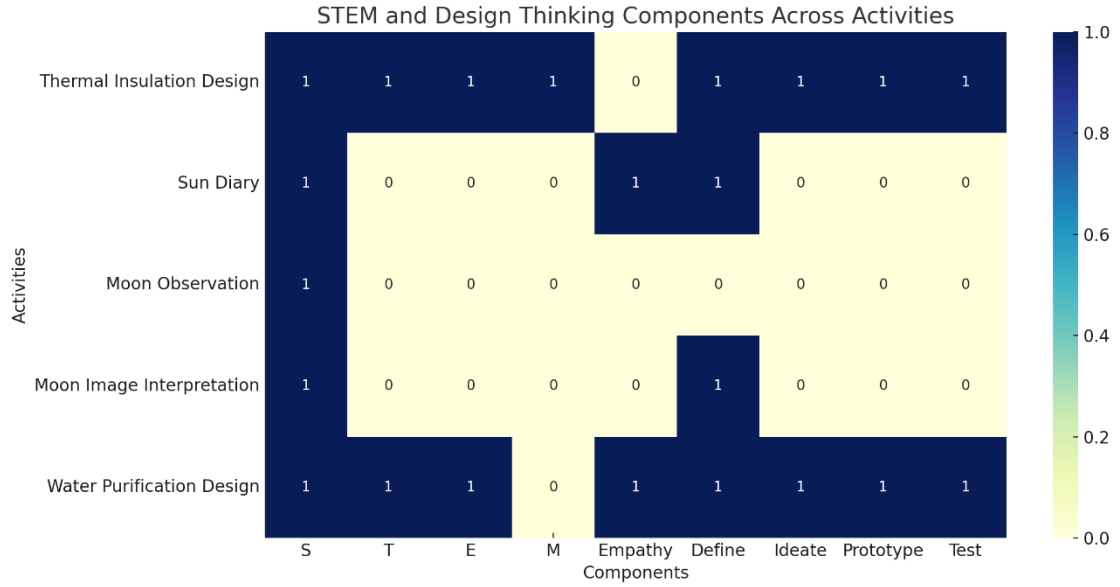

Figure 1. Heatmap showing the distribution of STEM and DT components across textbook activities

The inclusion of STEM components in the total activities in the book is presented in the table.

Table 1. Distribution of STEM Components

STEM Component	Number of Events	Rate (%)
Science	42	%84
Technology	18	%36
Engineering	11	%22
Mathematics	9	%18

Only three activities were found that included all STEM components. One of these activities, "Designing a Thermal Insulation Experimental Set", asks students to both develop a hypothesis about heat transfer and design a prototype by choosing an insulation material. In this process, students are expected to calculate heat loss, consider engineering principles and test the design. The low number of such integrated activities indicates that the "application and production" aspect of STEM is not adequately represented in the book.

These data show that the activities in the book are largely science-oriented; however, engineering and mathematics disciplines are represented at a limited level. Although STEM is considered as an integrated structure, in practice it is seen to be more science-oriented. TCEM suggests that learning processes should not only be based on accessing information, but also on production-oriented, collaborative and solution-oriented learning (MoNE, 2023). However, as seen in the table, science-intensive activities mostly remain at the level of making observations and drawing conclusions, and the active productive role of the student remains limited. This finding suggests that the textbook is still close to the "traditional science education + STEM label" formula; it is not integrated with all components of STEM and design-oriented processes. However, the expectation today is that students should not only observe the phase of the Moon, but also model, question, develop solutions and reflect on it.

The activities were evaluated separately within the framework of the five stages of the DT approach. The results are presented in the table below.

Table 2. Representation of Design Thinking Stages in Activities

TOD Phase	Number of Events Including	Rate (%)
Empathize	1	%8,33
Defining the problem	5	%41,66
Idea generation	6	%49,98
Prototyping	12	%100
Testing	7	%58,31
Total containing DT	12	%100

The Design Thinking (DT) approach is a five-stage process which that aims at developing students' creative problem solving skills: empathizing, defining the problem, generating ideas, prototyping and testing (Öztürk, 2020). Each of these stages supports students' active participation in the learning process and their creative potential. However, as a result of the analysis, it is seen that the level of representation of the activities in these stages is uneven.

When Table 2 is analyzed, it is seen that all of the 12 activities in the book include the prototyping phase (100%). This shows that students had the opportunity to transform their ideas into concrete products. However, the testing phase, which should accompany the

production process, is included in only 7 activities and is represented by 58.31%. This indicates that student products were not sufficiently included in the process of receiving feedback and improvement.

On the other hand, the idea generation stage was included in 6 activities (49.98%) and the problem identification stage in 5 activities (41.66%). These two stages are the basic building blocks of creative thinking and solution-oriented approach. However, the rates show that these stages are included in less than half of the activities in the book. The empathizing stage is included in only one activity and is represented at a very low rate of 8.33%. This shows that students are not sufficiently involved in the processes of understanding user needs and developing human-centered solutions.

Overall, only half of the activities in the book include at least one of the Design Thinking stages. While the most intensive stages are the practical sections such as "prototyping" and "testing", critical cognitive stages such as empathizing and defining the problem, which constitute the beginning of the process, are represented at a limited level. This shows that the activities only provide students with the opportunity to develop products; however, they do not fully support DT and STEM processes. It is important that all stages are represented in a balanced way in order for the DT approach to be applied holistically.

The heatmap below visualizes how frequently each STEM component overlaps with the Design Thinking stages. Prototyping and science components show the highest levels of co-occurrence, whereas empathy and mathematics rarely intersect. This visualization offers insight into the depth and integration of interdisciplinary elements within the analyzed activities.

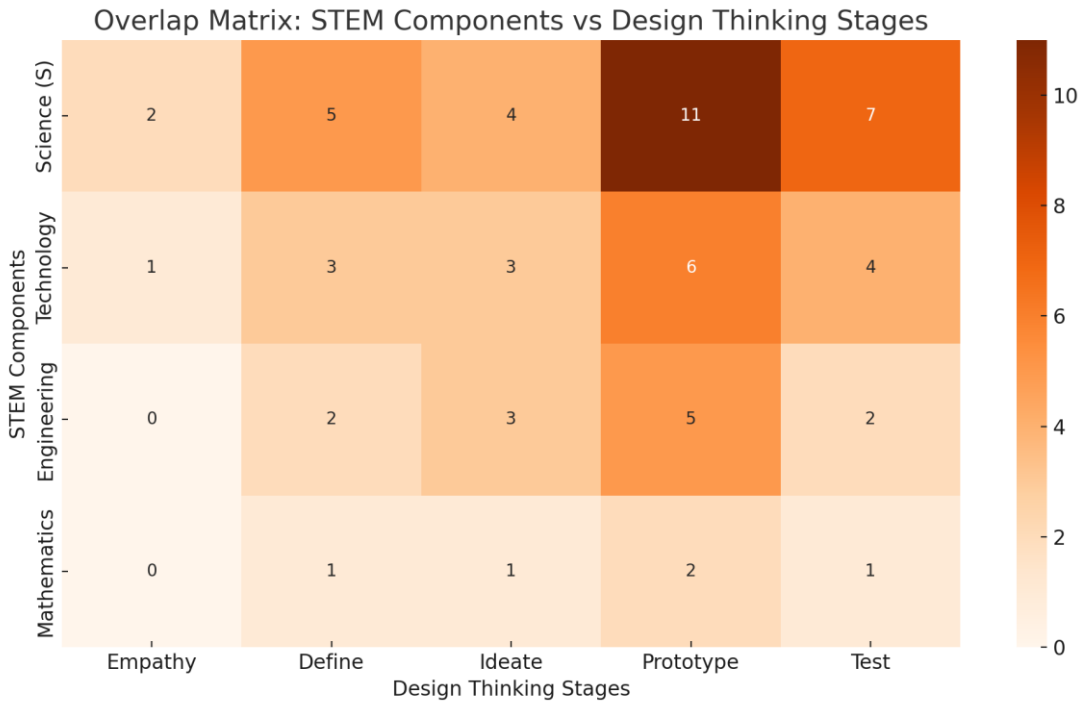

Figure 2. Heatmap showing the distribution of STEM and DT components across textbook activities

As seen in the visual below, the presence of STEM and Design Thinking components across all activities varies significantly. While science and prototyping stages are dominant, empathy and mathematical modeling are relatively rare.

Some activities in the 5th grade Science textbook prepared within the scope of the Turkish Century Education Model (TCEM) were analyzed qualitatively. The selected examples were analyzed multi-dimensionality in terms of the structure of the activity, its content, the skills it includes, and its relationship with STEM and Design Thinking (DT) approaches.

In the first activity, "Sun Diary", students are expected to observe the position of the sun throughout the day and record their observations in a diary format. This activity supports observation and data recording skills in accordance with the discipline of science, and partially serves the learning philosophy of TCEM based on establishing a relationship with nature. However, the student is not a knowledge producer here, but only an information collector. Although the empathy and identification stages of DT are partially represented, production-oriented stages such as generating ideas, prototyping or testing are not integrated into the activity. If students had been asked to design a model of solar motion based on these

observations, the learning process could have been more functional in terms of both the DT approach and the engineering component of STEM.

In the similarly analyzed "Moon Observation" activity, students observe the phases of the Moon for a week and record the changes. This activity also has a strong science foundation. Students develop systematic data collection and observation skills; however, they are not involved in an active production process. In terms of DT, this activity does not reflect any stage. However, if this activity had been presented to students with tasks such as writing a creative story about the phases of the Moon, producing an animation, or designing a three-dimensional model, it could have provided a much more appropriate experience in terms of both creativity and productivity in line with the student profile objectives of the TCEM.

The third activity, "Analyzing Moon Images", presents students with images of different phases of the Moon and asks them to interpret these images. This activity is structured to develop skills such as visual reading, analysis and comparison. While it contains a limited connection with science in terms of STEM, it can be said that it indirectly touches the identification stage of DT. However, there is no production process or creative solution development step. If this activity had been supported with tasks such as designing infographics or preparing digital presentations after analyzing the visuals, a much richer learning environment could have been provided.

The analysis of these three examples shows that the activities in the book are generally structured at the level of making observations, recording data and drawing conclusions. This structure, in which students are positioned as observers and repeaters rather than constructors of knowledge, is in partial harmony with the vision of TCEM. However, the lack of components of DT which make students producers such as generating ideas, prototyping and testing limits the depth of the activities. In terms of STEM, although the science component is strongly represented, engineering and technology disciplines are not sufficiently integrated.

In conclusion, it can be said that in order for the activities to be fully in line with the goal of "virtuous, competent and productive individuals" envisaged by the TCEM, they should be reconstructed with structures which include problem solving, creative thinking, production and reflection processes, rather than being based solely on acquiring knowledge.

Conclusions and Discussions

Within the scope of this study, the activities in the 5th grade Science textbook prepared in line with the Turkish Century Education Model (TCEM) were analyzed in terms of STEM education and Design Thinking (DT) approach. The findings show that the goal of raising productive, competent and versatile individuals, which is included in the vision of the TCEM, is partially reflected in the textbook activities; DT and STEM are not fully integrated.

The vast majority of the activities in the book are science-oriented. Engineering, technology and mathematics, the other components of STEM, are represented at a very limited level. This situation contradicts the interdisciplinary nature of STEM and limits the participation of learners in the processes of production, application and solution development (Corlu et al., 2014). STEM requires not only science-based learning, but also the operationalization of this knowledge through technology, embodiment through engineering, and modeling through mathematical thinking. However, this holistic structure is not fully established in the current textbook structure (Kavacık, 2019; Yücel & Karamustafaoğlu, 2020). Learning scenarios in which STEM and DT are structured in an integrated way provide students with opportunities not only to acquire knowledge but also to make sense of this knowledge and transform it into practice. When the process which starts with the empathy and idea generation steps of DT is reinforced with the engineering and mathematics components of STEM, students can become individuals with both technical knowledge and creative problem solving skills. Such learning environments enable students to assume the role of active producers rather than mere observers (Becker & Mentzer, 2015; Öztürk, 2020). At this point, the necessity of adding daily life problems is seen as important (İncikabı & Tjoe, 2013).

The findings also show that about half of the activities included certain stages of DT, but production-oriented stages such as generating ideas, prototyping and testing were very limited. Creative problem solving and user-oriented design development processes, which are one of the strengths of DT, were not observed in the book activities. However, design thinking provides a strong basis for students to be not only observers but also creative producers (Razzouk & Shute, 2012; Avcu & Er, 2020; Chang et al., 2023). In this context, it can be said that DT should be integrated more consciously and systematically into the book content.

Many activities included only STEM or only DT components. Considering the holistic learning experiences recommended by the TCEM, this disconnected structure may limit students' ability to develop systematic solutions to real-life problems. Chang et al. (2023) showed that the integrated implementation of DT and STEM had positive effects on student creativity, computational thinking, and motivation. In this context, textbooks should be enriched with meaningful and design-based learning scenarios, not just representative STEM examples (Şen, 2018; Sarıkoç & Ersoy, 2022). This need becomes even more apparent when considering international best practices. Several countries have successfully integrated STEM education with design thinking to promote creativity, problem-solving, and student-centered learning. For example, Singapore's Applied Learning Programme incorporates design thinking into STEM activities to foster experiential and innovation-driven learning (Zhan & Niu, 2023). In Finland, the LUMA Centre initiatives offer interdisciplinary, project-based STEM environments that embed empathy and iterative prototyping (Tawbush et al., 2020). Likewise, Germany's Siemens Stiftung project highlights how global cooperation and design-based education enhance student engagement with real-world challenges (Siemens Stiftung, n.d.). Compared to these cases, the Turkish 5th grade science textbook demonstrates relatively limited integration of early-stage design thinking components—particularly empathizing and ideation—despite the strong visionary emphasis of the TCEM. This contrast suggests a need to further align Turkish instructional materials with internationally recognized models of integrated STEM and Design Thinking education. In particular, it supports the conclusion that the fact that our teachers have pedagogical knowledge only in their own fields of specialization is insufficient to train the qualified human resources which our country needs (Çorlu et al., 2014).

Considering the "virtuous, competent and productive individual" goal of the TCEM, it is seen that the activities in the book are mostly based on traditional teaching methods such as observing, collecting information and drawing conclusions; however, cognitive high-level processes such as productivity, creativity and generating solutions are not sufficiently structured. Contemporary approaches such as STEM and DT enable students to experience a learning process based on both academic success and social contribution (Demirezen, 2024; Güneş Varol, 2020). From this point of view, the transformation brought about by TCEM should be realized holistically not only at the curriculum level but also at the level of textbook and activity design.

As a result of this study, the following recommendations can be put forward:

- Textbook activities should include not only science-based knowledge transfer, but also multidimensional and real-life learning scenarios that include all components of STEM.
- The DT approach should not be limited to cognitive processes such as identification and idea generation; it should also be integrated into activity designs to include practical phases such as prototyping and testing.
- Students should be presented with open-ended, design-based tasks that build skills such as creative thinking, production, modeling and reflection.
- The number of activities which that support interdisciplinary learning, in which STEM and DT are structured together, should be increased and these processes should be planned to serve the individual profile targeted by TCEM.

These suggestions can contribute to the more concrete and effective realization of the transformation targeted by TCEM in teaching materials. Future studies can comparatively reveal the reflections of TCEM at the implementation level through similar analyses in different grade levels and courses.

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Summary of Contribution Rate Declaration of Researchers

The authors declare that they have contributed equally to the conception, design, data analysis, and writing of this article.

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Primary School Students' Knowledge On The Concept Of "Planet": A Survey Study

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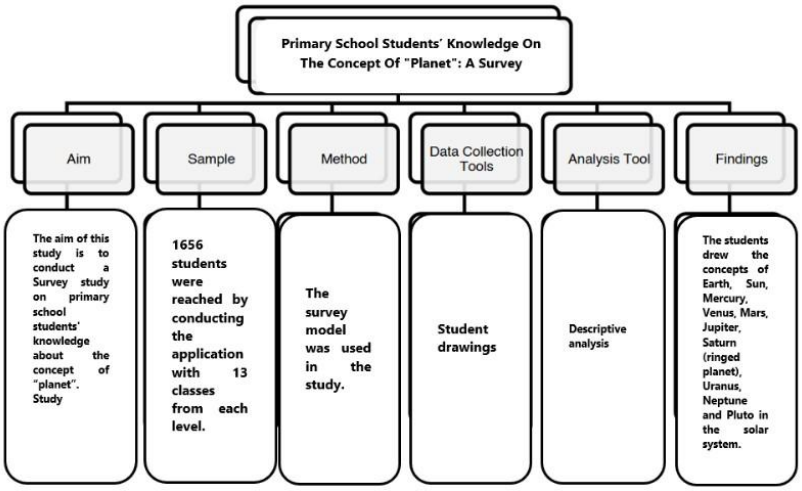

Abstract

The aim of this study is to conduct a survey study on primary school students' knowledge about the concept of "planet". The survey model was used in the study. The study was conducted in a primary school in a district with a low socioeconomic level in Istanbul. Within the scope of the study, a total of 1656 students were reached by conducting the application with 13 branches from each level. In the study, certain questions guided by the researcher were directed to the students to think and realize their drawings. They were given approximately 25-30 minutes for drawing. The drawings were evaluated using descriptive analysis method. Each drawing was analyzed separately. The concepts in the drawings were categorized as drawings related to the concepts in the solar system, drawings related to astronomy concepts, and drawings other than astronomy concepts. As a result of the coding, percentage frequency was determined according to the frequency of students' use of concepts at each level. In this context, it was determined that students in the first two levels made drawings and coding other than astronomy concepts, while students in the last two levels concentrated more on drawings and coding related to the concepts in the solar system and astronomy concepts.

Key words: Planet, Conceptual Knowledge, Science Education, Primary school students.

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Introduction

Science and technology literacy is the ability of all citizens in society to understand and explain some scientific concepts and phenomena at the most basic level and to have the ability to follow technological developments and use these concepts in their lives (Kamaraj, 2009). Science and technology literate individuals perceive the nature of science and scientific knowledge; understand basic science concepts, principles, laws and theories and use them in appropriate ways (Kavak, Tufan, & Demirelli, 2006). Considering the increase in the amount of information today, the need for technology and science has also increased. For this reason, it is important for individuals to be science literate at a basic level.

When the literature is examined, the concept of science literate started with the change in university curricula in 1997 and continued with the change in primary education curricula in 2004 (Özcan & Düzgünoğlu, 2017). Thus, science literate individuals can be more effective in accessing and using information, solving problems, making decisions about relevant problems by taking into account possible risks, benefits and available options, and producing new knowledge. In this sense, it should be aimed that each individual who is planned to be educated should actively experience this process and carry his/her concept knowledge to a different and improved step than the previous step.

The awareness of individuals who are expected to be science literate at many stages of their lives throughout their lives is directly proportional to their awareness of science subjects, self-development, and an active process both in their education and in all areas of their lives, and their early exposure to science (Kaya, 2017). In this context, encountering science at an early age and the differences that this process creates in the mind of the individual will help him/her learn by coding the concepts correctly.

In addition, factors such as students' daily experiences, belief systems, experiences gained in their social environments and their efforts to attribute meaning to concepts with their undeveloped mental skills contradict the nature of science and the process of formation of scientific knowledge. For this reason, these experiences of the students attribute wrong meanings to the concepts (Ercan, Taşdere, & Ercan, 2010). For this reason, it is important to reveal how these concepts are shaped in students' minds. One of the main goals of science education is to ensure that students learn concepts in a meaningful and permanent way (Köse & Uşak, 2006). Science course, which contains many abstract concepts, is very difficult to learn

and perceive at the conceptual level due to these abstract concepts. In the studies conducted by Ünsal, Güneş, and Ergin (2001), it was determined that students formed non-scientific concepts and that students at higher education level had some misconceptions. In this context, it is foreseen that astronomy teaching that is not based on a solid foundation at the primary school level creates a basis for misconceptions at the higher education level.

Teachers play an important role in raising students as science literate individuals. Teachers should guide and direct students in understanding science and integrating it into their daily lives, and in acquiring skills such as expressing their thoughts about science, decision making, critical thinking, etc. Again, the teacher should have sufficient knowledge about these cognitive steps that manage and develop the level of science literacy and manage this process competently (Kaya & Bacanak, 2013). In this direction, the way a teacher can assimilate a system that aims to raise science literate individuals is through being a science literate individual himself/herself (Aldan Karademir, 2012).

Another step taken towards effective and permanent teaching in science teaching is the change in the science curriculum in 2005. When this change is examined, the task of teachers is to help students understand the steps of the scientific process and to guide them in the process of gaining these steps (Lapadat, 2000); to reveal the knowledge that exists in the student and to guide him/her in the process. Lapadat (2000) emphasized that students experience a conceptual change process in their minds. In this process, conceptual changes occur and the student's mental knowledge and belief change are related to the words the teacher chooses while guiding the process. However, the operational process stage of the students' period is also one of the main factors that form the student's perception and the way he/she interprets information. The aim of the science course education, which includes concrete, complex and abstract concepts, is to ensure that the science course is transformed into something that can be made sense of by the students and, accordingly, to raise individuals who are inquisitive, inquiring and science literate (MoNE, 2013).

Using drawings to understand how children perceive astronomical concepts is an effective method, especially in the representation of celestial bodies such as the Sun. In a study conducted by Villarroel and Villanueva (2019), it was observed that children depicted the Sun with human features (e.g., facial expressions) in their drawings before observing the Sun with a telescope, but after the observation, these anthropomorphic features decreased and more

scientific representations emerged. This change indicates that children were able to internalize scientific concepts more accurately through direct observation. Therefore, this study is important in terms of determining students' conceptual knowledge and knowing their current level of knowledge in the education process they will receive at the next level. The aim of this study is to determine students' mental schemas related to the concept of “planet”.

The concept of planet is defined in the dictionary of the Turkish Language Association as "the common name of celestial bodies orbiting around the Sun and reflecting the light they receive from it" (TDK, 2005, p.378). Making guesses about the part we cannot see, that is, the part outside the Earth, is limited to what we see in the sky, especially for a student at primary school level. Moreover, since the concept of "planet" includes many abstract concepts, it becomes difficult to understand the concept of planet and similar concepts in the solar system. However, in this century, which is called the age of science and technology, the boundaries of knowledge are expanding day by day, the number of sources of information is gradually increasing, and access to information is reaching a dimension that we can access at any time (Yenca, 2016). For this reason, the students were guided with the questions asked and allowed to imagine the concepts that remained abstract because they could not see them. According to the interests of children at this age, cartoons, videos, visuals in books and science centers they have visited help them to form their concept knowledge.

Methods

Research Model

Survey model, one of the descriptive research methods, was used in the study. The survey model, which is one of the descriptive research methods, is a model that aims to describe the current situation as it existed in the past or currently exists (Karasar, 2005). In survey studies, the larger the sampling, the less the possible generalization error (Karasar, 2005). Within the scope of this study, a large sample was tried to be reached in order to describe the current situation.

Participants

The study was conducted in a primary school with a low socioeconomic level in Sultanbeyli district of Istanbul. In the school where the study was carried out, there are 2330 students, including 24 branches at the first grade level, 28 branches at the second grade level, 23

branches at the third grade level, and 20 branches at the fourth grade level. Within the scope of this study, the application was carried out with 13 sections each at the 1st, 2nd, 3rd and 4th grade levels. A total of 1656 students were reached, including 379 students from the first grade, 414 students from the second grade, 430 students from the third grade and 433 students from the fourth grade.

Data Collection Tools

This study aimed to reveal students' existing conceptual knowledge about the concept of "planet". Student drawings were used as data collection tool. During the application, students were asked to draw what they visualized in their minds about the concept of "planet". It was ensured that the students carried out the drawing application individually. Meanwhile, in order for the students to focus on the concept of "planet", the researcher asked them questions (What is a planet? What are their characteristics, what do they look like? Do you think there is only one planet? Are there more than one planet? If more than one, are they similar to each other? Where are the planets?) were asked. While the questions were being asked, students were asked to close their eyes and focus only on the teacher's questions and think. Students were given approximately five minutes for thinking.

Data Analysis

At the end of the application, the pictures drawn by the students were evaluated within the scope of this study. The pictures were evaluated using the descriptive analysis method. Each drawing was analyzed separately. The concepts in the drawings were divided into separate headings as "drawings related to the concepts in the solar system", "drawings related to astronomy concepts" and "drawings other than astronomy concepts". Based on the pictures, separate criteria were determined and the pictures were coded under these criteria. The coding was done separately by two researchers and continued until a common point was reached.

Results

Based on the drawings, the findings were evaluated in the context of the drawings of the concepts in the solar system. When the student drawings were analyzed, it was determined that the students drew the concepts of Earth, Sun, Mercury, Venus, Mars, Jupiter, Saturn (ringed planet), Uranus, Neptune and Pluto in the solar system. Drawing examples for each concept

were categorized according to their main characteristics such as drawing the concept, naming it correctly, and drawing more than one concept.

Findings Related to the Concept of World

Students' drawings were analyzed and as a result of the evaluation of the drawings, criteria for the concept of the world were determined by the researcher. In line with these criteria, student drawings were coded and analyzed. As a result of this coding, the world drawings at each level were evaluated separately. The criteria determined and the data obtained are given in Table 1.

Table 1. World concept drawings

	Classes (f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
World drawings	67	201	313	280	861
Pictures where the world is drawn more than once	11	14	16	10	51
Pictures in which the proportion of the size of the world is drawn correctly	3	4	8	50	65
Pictures where the world drawing is named correctly	60	170	281	248	759
Pictures indicating continents in world drawing	31	17	108	173	329
Pictures showing the layers of the earth	2	1	20	0	23
Pictures showing the orbit of the Earth	1	4	7	22	34

When Table 1 is analyzed, it is seen that a total of 861 students drew the world in their drawings. 795 students did not draw a world. While 810 students indicated the concept of the world as a single concept in their drawings, 57 students drew the world more than once in their drawings. An important situation that draws attention in students' drawings is that the proportion of the size of the world is not drawn correctly by most students. Only 65 students drew the proportion of the size of the world correctly. Almost all of the students (f=759) named the drawn world pictures correctly. Approximately 50% of the students who drew the world (f=329) drew the world by indicating its continents. In the drawings of the world, students at the 3rd and 4th grade level stated that the Earth has an orbit and continues its movement according to this orbit. Examples of World pictures drawn by students from different grade levels are given in Figure 1. While sharing examples of student drawings, care was taken to include the drawings of students from all levels.

Figure 1. Examples of World drawing

Findings related to the concept of Sun

As a result of the findings obtained from the drawing studies, different criteria for the concept of Sun were determined and these criteria were divided into separate headings. These criteria and the data obtained are given in Table 2.

Table 2. Drawings of the Sun concept

Sun Concept	Classes(f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Sun drawings	208	202	256	248	914
2. Those who draw the correct proportion of the size of the sun	5	7	9	78	99
3. Those with more than one sun drawing	12	14	10	7	43

When Table 2. is analyzed, a total of 914 students, 208 of whom were in the first grade, 201 in the second grade, 256 in the third grade and 248 in the fourth grade, included the Sun in their drawings. 742 students did not draw the Sun. An important finding is that most of the students could not draw the size of the sun correctly. . Examples of drawings from different grade levels that include the sun are given in Figure 2.

Figure 2. Examples of sun drawings

Findings Related to the Concept of Mercury

Students' drawings were analyzed and as a result of the evaluation of the drawings, the criteria given in the table were determined for the concept of Mercury. Student drawings were coded and analyzed in line with the determined criteria. As a result of this coding, Mercury drawings at each level were evaluated separately. The data obtained are given in Table 3.

Table 3. Mercury concept drawings

Mercury Concept	Classes(f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Mercury drawings	0	5	36	23	54
2. Those who correctly draw the proportion of the size of Mercury	0	0	1	7	8
3. Those with more than one Mercury drawing	0	0	1	0	1
4. Those circling Mercury	0	4	2	3	9

When the table is analyzed, there were no students who drew Mercury at the first grade level, while 5 students at the second grade level, 36 students at the third grade level and 23 students at the fourth grade level included Mercury in their drawings. In total, 54 students drew Mercury, while the concept of Mercury was not encountered in the drawings of 1602 students. . Examples of Mercury drawings from different grade levels are given in Figure 3.

Figure 3. Examples of Mercury drawings

Findings Related to the Concept of Venus

Criteria for the concept of Venus were determined by the researcher and student drawings were coded and analyzed in line with the determined criteria. As a result of this coding, Venus drawings at each level were evaluated separately. The data obtained are given in Table 4.

Table 4. Venus concept drawings

Venus Concept	Classes(f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Venus drawings	2	13	41	63	119
2. Those who named the concept of Venus correctly	2	13	37	61	113
3. Those who drew a ring around Venus	0	9	6	16	31
4. Those with more than one Venus drawing	0	1	1	4	6

When Table 4 is examined, a total of 119 students, mostly upper grades, drew Venus and named it correctly. 1537 students did not include Venus in their drawings. Venus pictures drawn by students from different grade levels are given in Figure 4.

Figure 4. Examples of Venus drawing

Findings Related to the Concept of Mars

Students' pictures were analyzed and criteria were determined. Student drawings were coded and analyzed in line with the determined criteria. As a result of this coding, Mars drawings at each level were evaluated separately. The data obtained are given in Table 5.

Table 5. Mars concept drawings

Mars Concept	Classes(f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Mars drawings	2	23	53	92	170
2. Those who can name the concept of Mars correctly	0	16	39	82	137
3. Those who drew a ring around Mars	0	5	13	11	29
4. Those with more than one Mars drawing	0	1	2	2	5

When Table 5 is analyzed, it is seen that a total of 170 students, including two first-grade students, 23 second-grade students, 53 third-grade students and 92 fourth-grade students, drew Mars in their drawings. 1486 students did not draw Mars in their drawings. Pictures of Mars drawn by students from different grade levels are given in Figure 5. While sharing examples of student drawings, care was taken to include the drawings of students from all levels.

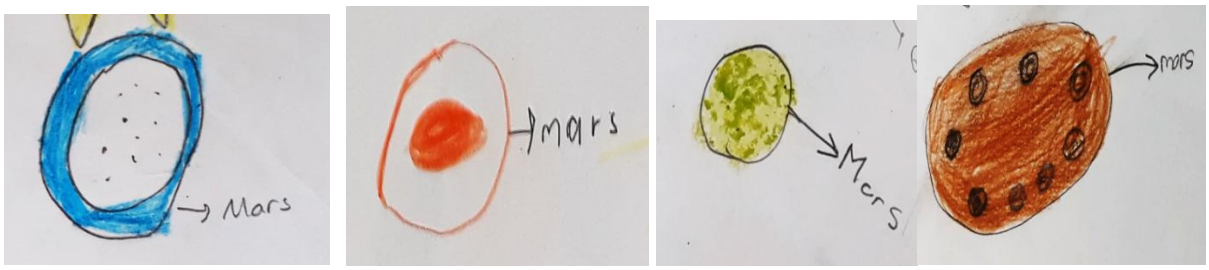

Figure 5. Examples of Mars drawing

Findings Related to the Concept of Jupiter

As a result of the evaluation of the pictures, criteria were determined by the researcher for the concept of Jupiter. In line with the determined criteria, student drawings were coded and

analyzed. As a result of this coding, Jupiter drawings at each level were evaluated separately. The data obtained are given in Table 6.

Table 6. Jupiter concept drawings

Jupiter Concept	Classes(f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Jupiter Drawings	3	6	44	72	125
2. Can name the concept of Jupiter correctly	3	6	44	72	125
3. Those who drew a ring around Jupiter	2	2	17	29	50
4. Those with More Than One Jupiter Drawing	0	0	3	1	4

When Table 6 is analyzed, it is seen that a total of 125 students, mostly fourth grade students, included Jupiter in their drawings. 1531 students did not draw Jupiter. At the first and second grade levels, no student drew more than one Jupiter. Three students in the third grade and one student in the fourth grade drew more than one Jupiter. Examples of student drawings are shown in Figure 6.

Figure 6. Jupiter Drawing Examples

Findings Related to the Concept of Saturn

In line with the determined criteria, student drawings were coded and analyzed. As a result of this coding, Saturn drawings at each level were evaluated separately. The data obtained are given in Table 7.

Table 7. Saturn concept drawings

Saturn Concept	Classes(f)				
	1st grades	2nd grades	3rd grades	4th grades	Total
1. Saturn Drawings	9	29	47	110	195
2. Those who can name the Saturn drawing correctly	3	10	24	34	71
3. Those who drew a ring around Saturn	7	23	40	100	170
4. Those with More Than One Saturn Drawing	1	0	1	1	3

When Table 7 is analyzed, it is seen that a total of 195 students drew Saturn in their drawings and 1461 students did not draw Saturn. Seven students in the first grade, 23 students in the second grade, 40 students in the third grade and 100 students in the fourth grade drew rings around Saturn. In some drawing examples (first grade f=2, second grade f=9, third grade f=9, fourth grade f=22), Saturn was even named as a ringed planet. Examples of student drawings are shown in Figure 7.

Figure 7. Examples of Saturn drawings

Findings Related to the Concept of Uranus

Student drawings were coded in line with the determined criteria and the data obtained are given in Table 8. When Table 8 is analyzed, no Uranus drawing was found at the first and second grade levels. A total of 37 students, including 17 third-grade and 20 fourth-grade students, drew Uranus in their drawings. 1619 students did not draw Uranus. Examples of student drawings are shared below.

Table 8. Uranus concept drawings

Uranus concept	Classes (f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Uranus Drawn Pictures	0	0	17	20	37
2. Name the Drawing of Uranus Correctly	0	0	16	14	30
3. Ring Around Uranus	0	0	3	1	4

Figure 8. Examples of Uranus drawings

Findings Related to the Concept of Neptune

Student drawings were coded and analyzed in line with the determined criteria. The data obtained are given in Table 9. When the table is analyzed, it is seen that very few students included Neptune in their drawings. 1613 students did not draw Neptune. Examples of student drawings are given below.

Table 9. Neptune concept drawings

Neptune Concept	Classes (f)				
	1st grades	2nd grades	3rd grades	4th grades	Total
1. Neptune drawings	0	1	17	25	43
2. Name the Neptune Drawing Correctly	0	1	17	18	36
3. Ring Around Neptune	0	0	2	1	3

Figure 9. Examples of Neptune drawings

Findings Related to the Concept of Pluto

Student drawings were coded and analyzed in line with the determined criteria. The data obtained are given in Table 10.

Table 10. Pluto concept drawings

Pluto Concept	Classes(f)				
	1st Grades	2nd Grades	3rd Grades	4th Grades	Total
1. Pluto Illustrations	0	0	6	15	21
2. Name the Pluto Drawing Correctly	0	0	6	14	20
3. Those who drew a ring around Pluto	0	0	0	1	2

When the table is analyzed, no Pluto drawing was found at the first and second grade levels. Of those who drew Pluto, a total of 21 students, 6 in the third grade and 15 in the fourth grade, included Pluto in their drawings. 1635 students did not draw Pluto. Examples of Pluto pictures drawn by students from each grade level are given in Figure 10.

Figure 10. Pluto drawing examples

Discussions, Conclusions and Recommendations

The main purpose of this study is to determine the existing conceptual knowledge of primary school students about the concept of "planet" through a survey study. In the light of the findings obtained as a result of the drawing studies carried out for this purpose, the concepts of sun and earth, which have a large place in the curriculum, were frequently encountered in the drawings made by the students. In the findings related to the solar system, the frequency of the concept of the sun increased in the drawings of students in the third and fourth grade levels, while the value of this frequency decreased in the first and second grade levels.

Children's misconceptions about astronomy concepts and revealing these misconceptions through drawing methodologies have taken an important place in educational research in recent years. In particular, children's perceptions of the shape and structure of the Earth are often represented by a flat or hollow Earth model. However, research by Nobes and Panagiotaki (2008) suggests that such misconceptions may result from the ambiguity of the drawing and questioning methods used. These findings suggest that the non-scientific representations seen in children's drawings may in fact be due to the complexity of the tasks and the inadequacy of the instructions.

When the findings regarding the planets in the solar system are analyzed; Earth drawings were found at every grade level. In addition, elaborations such as the continents on the Earth, the layers of the Earth, the Earth's orbit, the proportion of the size of the Earth compared to other planets in the Solar System were found in drawings made at all grade levels. Although 102 of the 861 students who drew the Earth drew the Earth, they could not name it. This shows that students have a concept of Earth in their minds visually, but they have problems in naming it.

The second most common concept in the drawings and drawn at all levels is the sun. This is not the case for many other planets. Drawings of other planets were not found at every grade level. In addition, it was determined that the number of drawings with direct proportion and names was very low. This is a striking result. In a study conducted by İnaltekin and Akbaba (2024), 8th grade students' models of astronomical events and the information sources of these incorrect models were examined. The study revealed that most of the students had incorrect models on topics such as “Solar Eclipse”, “Lunar Eclipse”, “Phases of the Moon”, “Formation of Seasons” and “Day-Night Formation”. Moreover, teachers and textbooks are among the most common sources of information for these false models.

Galano and Testa (2025) investigated the effects of an approach combining hands-on activities and visual representation methods to increase students' understanding of seasonal changes. The study showed that when hands-on activities and specially designed visuals were used together, students' understanding of seasonal changes became more accurate and their misconceptions decreased.

In the study conducted by Balcı & Yıldırım (2019), drawings were made to reveal primary school students' perceptions about “World and Universe”. It was concluded that the students who

made the drawings had a perception that was far from scientific. This situation shows a similar result in this study. For example, the fact that many planets were drawn as rings and very few drawings included sizing and ordering leads us to this conclusion.

Bostan (2008) aimed to investigate students' ideas about basic astronomy concepts and events in a study conducted with different age groups (from fourth grade in primary school to fourth grade in university). In this context, he investigated students' knowledge levels about basic astronomy concepts and events (seasons, day and night, the center of the universe, the reason why stars are not visible during the day, the brightest star in the night sky, the phases of the Moon, the positions of the Moon, Earth and the Sun during a lunar eclipse, shooting stars, and the frequency of eclipses). As a result of the study, it was observed that some misconceptions decreased with advancing age, while some misconceptions increased with advancing age. Similarly, studies conducted in Turkey reveal that students have various misconceptions about the basic concepts of astronomy.

Serttaş and Yenilmez Türkoğlu (2020) found that 7th grade students defined the universe as "the space outside the Earth" and perceived comets as "stars falling from the sky". Concept cartoons, which are used to detect such misconceptions, are used as an effective tool to reveal students' existing knowledge structures and misconceptions.

Conflict of Interest Statement

The authors of the article declare that there is no conflict of interest between them.

Summary of Contribution Rate Declaration of Researchers

The authors declare that they have contributed equally to the article.

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