



An interdisciplinary perspective examination of secondary school science and social studies courses in the context of the Century of Türkiye Maarif Model

Türkiye Yüzyılı Maarif Modeli bağlamında ortaokul fen bilimleri ve sosyal bilgiler derslerinin disiplinlerarası bir perspektifle incelenmesi

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Abstract: Century of Türkiye Maarif Model (CTMM), an approach that aims to structure education programs in Turkey in accordance with the needs of the age. This study particularly examines how Science and Social Studies Courses can be addressed with an interdisciplinary perspective. The case study method was used in the study. This method is generally used to provide a better understanding of complex social, psychological, environmental or institutional processes. This method was chosen in order to provide detailed, contextual analysis, related inferences and suggestions between the Science Course Curriculum and the Social Studies Course Curriculum. Therefore, the Science Course Curriculum and the Social Studies Course Curriculum were examined according to document analysis and evaluations were made in terms of 21st Century Skills, holistic education approach, values education and interdisciplinary relations. Accordingly, while the Science Course focuses on the development of scientific skills, the Social Studies Course aims to provide social awareness and values. In the study, the specific aims and achievements of both courses were compared in detail; common themes such as environmental awareness, sustainability and sensitivity to global problems were emphasized. According to the findings of the study, the interdisciplinary approach increases students ability to understand complex problems and produce creative solutions. For example, a subject such as environmental pollution is addressed with its scientific aspects in the Science Course and with its social and economic effects in the Social Studies Course. CTMM aims to provide students with a broader perspective with such integrated approaches.

Keywords: *Education model, Science Course, Social Studies Course, interdisciplinarity*

Özet: Türkiye Yüzyılı Maarif Modeli (TYMM), Türkiye'deki eğitim programlarını çağın ihtiyaçlarına uygun olarak yapılandırmayı amaçlayan bir yaklaşımdır. Bu çalışmada özellikle Fen Bilimleri ve Sosyal Bilgiler derslerinin disiplinler arası bir bakış açısıyla nasıl ele alınabileceği incelenmiştir. Çalışmada vaka çalışması yöntemi kullanılmıştır. Bu yöntem genellikle karmaşık sosyal, psikolojik, çevresel veya kurumsal süreçlerin daha iyi anlaşılmasını sağlamak amacıyla kullanılmaktadır. Fen Bilimleri Dersi Öğretim Programı ile Sosyal Bilgiler Dersi Öğretim Programı arasında ayrıntılı, bağımlı analiz, ilişkili çıkarımlar ve öneriler sunmak amacıyla bu yöntem seçilmiştir. Bu nedenle Fen Bilimleri Dersi Öğretim Programı ile Sosyal Bilgiler Dersi Öğretim Programı doküman analizine göre incelenmiş ve 21. Yüzyıl Becerileri, bütüncül eğitim yaklaşımı, değerler eğitimi ve disiplinler arası ilişkiler açısından değerlendirmeler yapılmıştır. Buna göre Fen Bilimleri Dersi bilimsel becerilerin geliştirilmesine odaklanırken, Sosyal Bilgiler Dersi toplumsal farkındalık ve değerleri kazandırmayı amaçlamaktadır. Çalışmada her iki dersin özel amaçları ve kazanımları ayrıntılı olarak karşılaştırılmış; çevre bilinci, sürdürülebilirlik ve küresel sorunlara duyarlılık gibi ortak temalar vurgulanmıştır. Çalışmanın bulgularına göre, disiplinler arası yaklaşım öğrencilerin karmaşık sorunları anlama ve yaratıcı çözümler üretme yeteneklerini artırmaktadır. Örneğin, çevre kirliliği gibi bir konu Fen Bilgisi Dersi'nde bilimsel yönleriyle, Sosyal Bilgiler Dersi'nde ise toplumsal ve ekonomik etkileriyle ele alınmaktadır. TYMM, bu tür bütünlük yaklaşımlarla öğrencilere daha geniş bir bakış açısı sağlamayı amaçlamaktadır.

Anahtar Kelimeler: *Eğitim modeli, Fen Bilgisi Dersi, Sosyal Bilgiler Dersi, disiplinlerarasılık*

1. Introduction

In the 21th century, education systems have focused on developing individuals' skills in accessing, interpreting and using information in various areas of life rather than a knowledge-focused approach (Saavedra & Opfer, 2020; OECD, 2019). This change has brought interdisciplinary education approaches to the forefront. Interdisciplinary approaches combine perspectives and methods from different fields to support students in understanding complex problems and producing creative solutions to these problems (Bialik & Fadel, 2019). Integration of disciplines, especially science and social studies, is considered a critical step in developing individuals' multidimensional thinking skills in educational programs (Klein, 2021).

This approach, which aims to update the educational programs in Turkey in line with the needs of the age, is called the CTMM. (MoNE, 2023). This model aims to embed the principles, competencies, and values taught in core subjects like Science and Social Studies within a cross-disciplinary structure. For example, the Science course offers a structure focused on analyzing and applying the scientific principles of nature, while the Social Studies course helps individuals make sense of social life and recognize different cultures (MoNE, 2023). The shared objectives of these two courses are designed to equip students with the capacity to approach problems from an interdisciplinary perspective.

The Science Curriculum prioritizes the cultivation of skills related to scientific processes. The outcomes of this course aim to provide students with basic scientific skills such as problem identification, hypothesizing, designing experiments and analyzing data (MoNE, 2024). Simultaneously, topics like environmental awareness, energy resource sustainability, and the societal impact of technology form the social aspect of the Science Curriculum. (Bybee, 1997). The Social Studies course, on the other hand, develops individuals lifelong learning skills by addressing issues such as human and environmental interaction, social effects of historical processes and citizenship awareness (Brophy & Alleman, 2008). Viewed through an interdisciplinary lens, both programs are found to share common themes and objectives, including environmental awareness and individual responsibility toward society.

In the literature review on interdisciplinarity; Toygur and Atmaca (2022), in their study titled "Footprints of Geography in Science Course", discussed how the curricula of these courses can be developed in an interdisciplinary framework. The findings of the study revealed that interdisciplinary teaching methods are particularly impactful in modern learning models. Cura and Ercan Yalman (2019) examined the interdisciplinary teaching skills of pre-service science teachers and found that these approaches improved teachers problem solving and critical thinking skills. Similarly, Korkmaz and Konukaldı (2015) emphasized that thematic interdisciplinary teaching methods have positive effects on primary school students science learning. Kaymakçı and Ata (2012) investigated how Social Studies teachers perceived interdisciplinary connections in curricula and found that interdisciplinary teaching was effective in increasing students conceptual understanding levels. In addition Gürkan and Doğanay (2016) stated that the use of analogy techniques in the context of interdisciplinary teaching in the Social Studies course contributed to concept development. Deveci and Aydız (2021) examined teachers views on the acquisition of life skills in science curricula and found that interdisciplinary approaches support the acquisition of life skills. İnci and Kaya (2022) examined the differences between interdisciplinary and transdisciplinary approaches and argued for the necessity of holistic approaches in education. Önol and Çamurcu (2021) examined the physics concepts in the Geography Curriculum and found that 20 objectives in the curriculum and 110 concepts in the Geography Course textbooks were related to physics concepts.

When these studies are evaluated, interdisciplinary approach practices help students make sense of complex events. For example while the Science course deals with issues such as environmental pollution and climate change in a scientific framework, the Social Studies course offers the opportunity to explain the social and economic effects of these problems. This helps students develop a more holistic understanding (Drake & Burns, 2004). Therefore, it is thought that evaluating the subjects and achievements of these two courses with an interdisciplinary perspective within the scope of the CTMM will contribute to supporting innovative approaches in education. Accordingly the research problem was identified as determining the commonalities between the Secondary School Science Course and Social Studies Course in terms of interdisciplinarity within the framework of the CTMM.

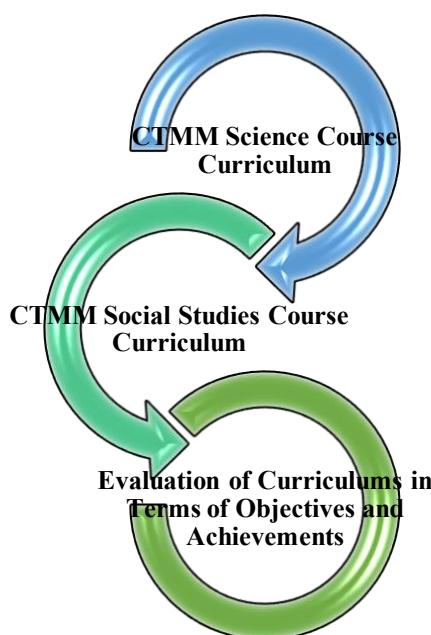
Accordingly, answers were sought to the following sub-questions.

RQ.1: In the context of the CTMM, do secondary school science and social studies courses have common aspects in terms of specific objectives?

RQ.2: What are the similarities in the CTMM in the context of interdisciplinarity in secondary school science and social studies course outcomes?

Figure 1

Work Flow Chart in The Study



2. Materials and Methods

This research is a qualitative descriptive study examining the 2024 CTMM Science Curriculum (Grades 5, 6, 7, and 8) and the 2023 Social Studies Curriculum (Grades 5, 6, and 7) in the context of interdisciplinarity. A qualitative descriptive design was chosen to systematically analyze curriculum documents and identify shared themes and objectives, as this approach is suitable for exploring educational programs in depth (Sandelowski, 2000).

2.1. Analysing Data

Data were analyzed using document analysis, a systematic method for examining written sources to gain insights into the phenomena studied (Yıldırım & Şimşek, 2013). Documents, including curricula, were analyzed to identify commonalities in objectives and outcomes (Bowen, 2009). Three sub-problems aligned with the study's aim were addressed.

2.2. Validity and Reliability

To ensure the validity and reliability of the findings, multiple strategies were employed. Triangulation was achieved by cross-referencing curriculum documents with existing literature to confirm thematic consistency. A detailed audit trail was maintained, documenting the analysis process to enhance transparency. Additionally, two researchers independently coded the data, and intercoder agreement was calculated to ensure reliability, achieving a Cohen's kappa of 0.85, indicating strong agreement.

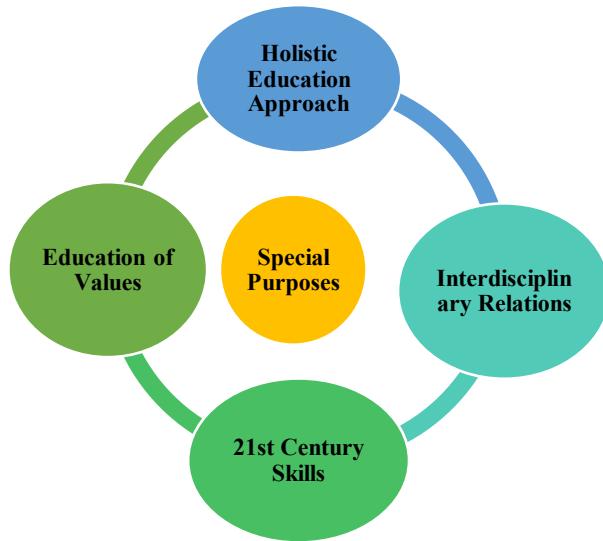
3. Findings

3.1. Findings Related to the First Research Question

In this title the shared aspects of Secondary School Science and Social Studies Courses in terms of specific objectives within the framework of the CTMM are examined.

Figure 2

Common Goal Denominators in the Science and Social Studies Curricula



The objectives of the curricula of Science and Social Studies courses are similar in terms of interdisciplinary perspective. The similar features of both programs can be grouped under four headings: holistic education approach, 21st century skills, values education and interdisciplinary relations. These titles can be explained as follows:

Holistic Education Approach

The 2024 Science Curriculum aims to equip students with cognitive, social-emotional, ethical and moral skills. The program emphasizes students' critical thinking, scientific process skills and adaptation to digital transformation.

In contrast the Social Studies Curriculum aims to help students develop social values and social awareness as well as cognitive skills. Special emphasis is placed on critical thinking, entrepreneurship and communication skills.

Therefore, both curricula are based on a holistic educational approach in terms of digital competencies, communication skills and critical thinking processes.

Interdisciplinary Relations

The Science Curriculum aims to provide students with a holistic understanding by establishing connections between disciplines like science, technology, engineering, and mathematics (STEM). Social Studies Curriculum brings together different historical, geographical and cultural perspectives and aims to provide students with a holistic understanding of history, geography and economics.

When both curricula are evaluated in terms of interdisciplinarity, it is understood that both the Science Curriculum and the Social Studies Curriculum are closely linked to different sciences and geographical, technological, engineering and economic disciplines. In this sense the Science Curriculum aims to produce solutions to scientific problems with a multidisciplinary approach in terms of interdisciplinarity. It also aims to combine science and mathematics skills when working on technological designs and engineering problems. In addition the Social Studies Course The curriculum is structured by bringing together disciplines such as history, geography, economics and civics. The aim is to enable students to evaluate different historical and geographical events with a multidimensional understanding, to develop interdisciplinary solutions to global problems, and to increase their empathy and critical thinking skills by considering social and cultural perspectives together. In this sense, the specific objectives of both courses can sometimes converge at the point of making observations about nature and providing students with nature-related skills.

Values Education

In both programs the acquisition of individual and social values has an important place. In addition, while the Science Curriculum emphasizes scientific ethics and sustainability values, the Social Studies Curriculum emphasizes values such as human rights, justice and citizenship awareness.

21st Century Skills

The Science Curriculum aims to increase students career awareness while developing their skills in problem solving, creativity and effective use of technology.

The Social Studies Curriculum focuses on students acquisition of skills such as social interaction, empathy, entrepreneurship and cultural awareness.

Both programs are similarly designed to enable students to become effective individuals at both individual and societal levels. Interdisciplinary relations and values education are important common denominators in this context.

3.2. Findings Related to the Second Research Question

In this title in the context of the CTMM, the answer to the question of what are the common aspects of Secondary School Science and Social Studies Lessons in terms of achievements is sought.

The Science and Social Studies Curricula have been prepared with a comprehensive approach that aims to help students gain knowledge, skills and values in line with the CTMM Curriculum approach. There are a total of 59 objectives in Science and 102 objectives in Social Studies. The common aspects of these outcomes were evaluated in the following basic areas in the interdisciplinary sense, specific to the 10 outcomes of both courses. The outcomes of both courses are also transferred in tables and then their similarities are discussed.

Environmental Sensitivity and Ecosystem

Sustainability of Ecosystems in Science and Social Studies Lessons: Outcomes and Similarities

Science:

FB.5.7.1.1. To be able to classify recyclable and non-recyclable materials in domestic waste.

Social Studies:

SB.5.2.2. Interpret the change in the natural and human environment in the province where he/she lives with its causes and consequences (Geographical and social effects)

Similarity: Both objectives aim to develop knowledge and awareness to understand the sustainability of ecosystems.

While the Social Studies course examines the effects of human activities on the environment, the Science course teaches to explain the balance of ecosystems through scientific processes.

Solution Suggestions for Environmental Problems

Gains in Environmental Awareness and Problem Solving Skills in Science and Social Studies Courses

Science:

F.5.6.2.1. Highlights the significance of the interaction between humans and the environment.

Social Studies:

SB.5.3.4. Explores the factors contributing to disasters and environmental issues in their surroundings.

Similarity: Both learning outcomes aim to raise students' awareness of environmental problems and develop solution-oriented thinking skills.

Sustainability Awareness

Promoting the responsible utilization of natural resources within an interdisciplinary framework.

Science:

FB.5.7.1.2. Being able to draw scientific conclusions regarding the significance of recycling in the efficient utilization of resources.

Social Studies:

SB.6.5.5. Examines the impact of unconscious resource consumption on quality of life.

Similarity: Both objectives aim to provide students with knowledge about the limitations of natural resources and to develop an awareness of sustainability.

Disaster and Environmental Risks

Environmental risks and disaster awareness gains in the context of interdisciplinarity

Science:

F.8.6.3.3. Explores the factors behind global climate change and its potential outcomes.

Social Studies:

SB.5.2.3. To be able to organize awareness activities to reduce the effects of disasters that may occur in the province where he/she lives

Similarity: With both objectives, it is aimed for students to have knowledge against environmental risks and to gain disaster awareness.

Human and Environment Interaction

Human-environment interaction and ecological-balance outcomes in an interdisciplinary sense:

Science:

F.7.4.5.3. Examines recycling in the context of resource efficiency.

Social Studies:

SB.6.3.4. Draws conclusions about climate features based on human experiences in diverse global natural environments.

Similarity: The objectives aim to ensure that students understand the impact of human-environment interactions on ecological balance.

Environmental Impacts of Technological Developments

Technology, environment and social impacts outcomes in science and social studies courses

Science:

F.7.5.1.4. Provides examples of creative uses of solar energy in everyday life and technological advancements.

Social Studies:

SB.7.5.2. Assesses the impact of advancements in production technology on social and economic aspects of life.

Similarity: Both objectives aim to draw attention to the effects of technology on the environment and encourage the conscious use of technology.

Environmental Education and Science

Gains in scientific analysis with environmental data in Science and Social Studies courses

Science:

F.7.1.1.2. Describes the origins of space pollution and forecasts its potential consequences.

Social Studies:

SB.7.5.1. Clarifies the role of soil in production and management, providing examples from both historical and contemporary contexts.

Similarity: Both objectives aim to develop students' ability to conduct scientific analysis with environmental data.

Environmental Information Sharing

Social impacts of products and sharing outcomes in Science and Social Studies Lessons

Science:

F.7.4.5.5. Designs a project to distribute reusable items to individuals in need.

Social Studies:

SB.7.5.2. Analyzes the impact of advancements in production technology on both social and economic spheres of life.

Similarity: There is a consensus on sharing the products produced with both outcomes in terms of their impact on the social sphere and social relations.

Environment and Economic Activities

Environmental and economic sustainability outcomes in science and social studies courses

Science:

F.8.6.4.4. Proposes solutions based on research data regarding the impact of recycling on the national economy.

Social Studies:

SB.5.5.1. To be able to interpret the impact of using resources efficiently on nature and people.

Similarity: Both outcomes address environmental and economic sustainability in an integrated manner.

Sensitivity to Global Issues

Gains in sensitivity to global environmental problems in science and social studies courses

Science:

F.8.6.4.5. Proposes solutions by highlighting potential issues that may arise in the future if resources are not used efficiently.

Social Studies:

SB.7.7.4. Generates ideas with friends to address global challenges.

Similarity: Both objectives aim to raise individuals who are sensitive to global environmental problems.

4. Results, Discussion and Recommendations

This study aims to analyze secondary school science and social studies curricula through an interdisciplinary lens within the framework of CTMM. The findings indicate that both curricula share numerous commonalities in terms of 21st-century skills, a holistic education approach, values education, and interdisciplinary connections. Interdisciplinary education seeks to equip students with the ability to solve complex problems, think critically, and approach issues from diverse perspectives. For example, Drake and Burns (2004) state that interdisciplinary teaching helps students better understand real-world problems and produce effective solutions to these problems. The holistic approach to education featured in CTMM also supports this kind of education and encourages students to have more meaningful learning experiences by blending knowledge from multiple disciplines.

Skills like critical thinking, creativity, collaboration, and communication are integral components of 21st-century skills. (Trilling & Fadel, 2009). Both Science and Social Studies courses provide suitable foundations for developing these skills. While the Science course emphasizes aspects like the scientific method, problem-solving, and technology use, the Social Studies course highlights topics such as citizenship awareness, social responsibility, and ethical values. Shared values within these curricula are taught through an interdisciplinary approach, allowing students to establish links between various fields of knowledge.

The Science and Social Studies Curricula were analyzed for interdisciplinarity in terms of their outcomes, revealing that ten outcomes align at the level of specific objectives. This overlap reflects the shared efforts of both curricula to cultivate environmentally conscious individuals. Atmaca and Toygur (2022) mentioned the benefits of interdisciplinary teaching approaches in education and stated that after such studies, students gain a broader perspective rather than

being tied to only one field. Therefore, the goals of raising students as environmentally sensitive individuals in the Science and Social Studies Curricula can be realized more effectively with an interdisciplinary perspective. Accordingly, more in-depth learning and permanent awareness can be created in education.

After the evaluation of the curricula of both courses, it was determined that the ten learning outcomes that stood out met in a common denominator in themes such as “environmental sensitivity and ecosystem”, “environmental solutions”, “sustainability awareness”, “disaster and environmental risks”, “human and environment interaction”, “environmental effects of technological developments”, “environmental education and science”, “environmental information sharing”, “environment and economic activities” and “sensitivity to global problems.” Some studies have emphasized that interdisciplinary studies enrich students learning experiences. For example, Jacobs (1989) Interdisciplinary approaches are said to break down traditional boundaries in curricula, enabling students to gain a more comprehensive and profound understanding. Consequently, integrating the teaching of Science and Social Studies courses is believed to enhance students awareness of both scientific and social issues. For example, a topic such as climate change, which has both scientific and social dimensions, can be handled more effectively by combining the two courses. Courses with an interdisciplinary approach can also improve students environmental awareness, sustainability awareness and problem-solving skills. In their research on the Geography Curriculum, Önol and Çamurcu (2021) list the main sub-disciplines within the natural sciences disciplines that study nature as natural sciences such as physics, biology, chemistry, and suggest that geography and physics teachers should cooperate and share information while teaching common or similar subjects. It is stated that teachers of both disciplines using common strategies and materials in their lessons will contribute positively to the learning process. Similarly, the Social Studies course, which is a social sciences discipline, is also included in this system and serves as a bridge between natural sciences and social sciences. Together, Social Studies and Science courses can contribute to students awareness of issues such as environmental awareness, sustainability and protection of natural resources. Collaboration between science teachers and social studies teachers with an interdisciplinary approach can enable the development of a more holistic education model for solving environmental problems. This situation emphasizes the importance of an interdisciplinary teaching approach and shows that both natural and social sciences can play an active role in solving environmental problems.

The fact that Science and Social Studies courses are handled with a holistic educational approach increases the impact of interdisciplinary relationships on learning. In particular, it is seen that the Science course develops environmental awareness and sustainability understanding in students, while the Social Studies course reinforces this understanding with social justice and ethical values (Anderson, 2007; Çelik & Yıldırım, 2019). In this context it is possible to state that interdisciplinary learning environments improve students critical thinking, problem solving and collaboration skills (Drake & Reid, 2020). In addition gaining social responsibility awareness through the Social Studies Course, when supported by the scientific process skills of the Science Course, enables students to grow up as individuals equipped with both scientific and social perspectives. In this direction, the fact that the two disciplines are handled together supports the importance of a holistic approach in education in terms of values education and 21st century skills.

Research results reveal that interdisciplinary education develops skills such as critical thinking, creativity, scientific and social awareness in students. For example addressing environmental problems with both scientific and social dimensions provides students with the opportunity to think in multiple ways. In this context, interdisciplinary approaches can be considered as a part of innovative models in education

Accordingly, the following suggestions were made:

- Students can be assigned interdisciplinary projects dealing with selected real-world issues such as environmental problems, energy conservation or sustainable agriculture. These projects can enable both scientific and societal dimensions to be analyzed.
- Lesson activities planned jointly by Science and Social Studies teachers can allow students to learn by combining the knowledge of the two disciplines. For example a waste management lesson can be approached from both scientific (recycling processes) and social (social responsibility) perspectives.
- Activities such as nature trips and museum visits can combine the scientific dimension of Science and the environmental and cultural dimension of Social Studies. For example during a visit to a dam, both energy production and social impacts can be discussed.
- Sustainability projects such as energy saving, recycling and efficient use of natural resources can be implemented in classrooms. These practices should include both the technical aspects of the Science course and the social awareness of the Social Studies course.
- Science and Social Studies Teachers to apply interdisciplinary approaches effectively, joint trainings can be organized for these teachers.
- Project-based learning activities can be increased to improve students' interdisciplinary thinking skills. For example studies can be conducted to develop both scientific analysis and social solution suggestions on a theme such as environmental pollution.
- In particular the use of technology-supported educational tools should be increased in interdisciplinary studies. For example digital simulations or Geographic Information Systems (GIS) can be used to analyze environmental data. This practice can enable students to both use technology effectively and to see the connections between courses more concretely.
- Values education, which is a common goal in the curricula of both courses, should be supported by practical activities. Activities such as environmental projects and social responsibility campaigns can contribute to raising students as socially sensitive individuals.

In conclusion the interdisciplinary approach of the CTMM aims to increase students awareness in scientific and social fields by offering a holistic perspective in education. The successful implementation of this model can make Turkey's education system more innovative and contemporary. Such integrated approaches in education are critical in terms of developing students awareness of both individual and social responsibility.

Conflicts of Interest

The authors declare that they have no conflict of interest

Declaration of Generative AI Use

No generative artificial intelligence tools (ChatGPT, Bard, Claude, Copilot, etc.) were used in the preparation of this study. All text, analysis, and content were produced by the author(s) with human input.

Ethical Statement

All data used in the study were secondary data obtained from publicly available academic publications, official reports, or statistical databases. No personal data was accessed. Therefore, ethics committee approval was not required for the study.

Author Contributions

All authors contributed to the development of the study's theoretical framework and design. Data collection, data collection, and analysis were conducted by (Sebahattin Tınmaz). (Betül Timur) contributed to the discussion. The first draft of the article was written by (Davut Atmaca), and all versions were reviewed by all authors. All authors read and approved the final version of the article.

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