

Local Solutions to Global Problems: Interdisciplinary Climate Crisis Education and Curriculum Implementation for Gifted Students

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Abstract

This study explores the effectiveness of an interdisciplinary social studies curriculum designed for gifted seventh-grade students, focusing on climate crisis, global citizenship, and sustainability themes. Grounded in the urgency of environmental education, the curriculum integrates scientific, technological, and social knowledge to foster critical and creative thinking. Utilizing an action research methodology, the study involved iterative planning, implementation, observation, and reflection cycles with twelve gifted students in a Turkish Science and Art Center (SAC). Data were collected through digital portfolios, performance tasks, rubrics, and student reflections. The findings revealed increased environmental awareness, improved data literacy, enhanced empathy through drama activities, and effective use of technology in sustainability projects. Students developed and partially implemented personal eco-action plans. The study contributes to the field by offering a scalable model of interdisciplinary education tailored to gifted learners, highlighting the need for sustainable and student-centered practices in curriculum design. Recommendations for teacher training and policy support are also presented.

Keywords: Interdisciplinary Education, Gifted Students, Climate Crisis, Sustainability, Global Citizenship

Introduction

In the 21st century, the climate crisis has become a multifaceted and global problem that extends beyond environmental issues to impact economic development, social structures, cultural values, and individual lifestyles (Change, 2007). Alongside technological measures and political regulations aimed at addressing this comprehensive crisis, raising individuals' awareness and promoting sustainable behaviors are equally vital (Rieckmann, 2017). Education is regarded as a fundamental tool for developing environmental sensitivity, acquiring the competence to make scientifically informed decisions, and internalizing sustainable ways of living (Selwyn, 2024).

Especially gifted students constitute an important group with the potential to generate solutions for complex global problems due to their cognitive capacities, high learning motivation, and abstract thinking skills (VanTassel-Baska & Brown, 2021). It is crucial that educational programs developed for these students are differentiated and enriched according to their unique thinking styles and learning speeds. In particular, when teaching multidimensional topics such as climate change, an approach focusing on higher-order skills like creative problem solving, critical thinking, systemic analysis, and social sensitivity can facilitate the in-depth development of gifted students in these areas (Renzulli, 2012). However, the existing literature reveals limited studies on gifted students' participation in interdisciplinary curricula structured around themes such as climate change, sustainable development, and global citizenship, as well as their cognitive, affective, and behavioral outcomes in these processes (Clark, 2002). This indicates a significant gap in both theoretical and applied research.

Within this context, the primary aim of the present study is to reveal how an interdisciplinary social studies curriculum developed for gifted students affects their knowledge, attitudes, and skills regarding the climate crisis, sustainable development, and global citizenship. Additionally, the study analyzes the effects of integrating digital tools and performance-based assessment methods within the instructional process on these students' learning motivation, participation, and achievement. The research seeks to examine the extent to which gifted students engage in creative production, critical thinking, and problem-solving processes within these multidimensional themes and how they are influenced by these processes. Contemporary global education policies emphasize raising awareness about environmental and social responsibilities from an early age and restructuring educational systems in line with sustainability principles (Rieckmann, 2017). Accordingly, interdisciplinary educational programs developed for gifted students hold particular importance both in supporting their cognitive superiority and in fostering their sense of social responsibility (VanTassel-Baska & Stambaugh, 2006).

This study was designed and implemented within an action research framework and involved a cyclical process of development and evaluation with the active participation of teachers, students, and researchers (Jacobs, 2018). Thus, a teaching model was established that is not only based on theoretical knowledge but also practical, interactive learning environments supported by digital technologies, student-centered, and assessment-oriented. The main research problem is as follows: How does the interdisciplinary social studies curriculum developed for gifted students affect their knowledge, attitudes, and skills concerning the climate crisis, global citizenship, and sustainability?

Based on this main problem, the sub-questions of the research are structured as follows:

1. How does the interdisciplinary curriculum implementation affect gifted students' scientific knowledge level about the climate crisis?
2. What changes are observed in students' awareness and attitudes towards sustainable development and global citizenship?

3. To what extent does the instructional process conducted based on an interdisciplinary approach develop students' creative problem-solving, critical thinking, and systemic analysis skills?
4. What role do digital tools and performance-based assessment methods integrated into the instructional process play in students' learning motivation and academic achievement?

By seeking answers to these questions, the research aims to contribute to the development of environmental and social awareness in gifted students, while also producing original findings that support differentiated and innovative program designs in education.

Theoretical Framework

Gifted Students: Definition, Characteristics, and Educational Needs

Gifted students are generally defined as individuals possessing cognitive, creative, artistic, or leadership abilities above those of their age peers (Renzulli, 2021). This definition emphasizes not only academic achievement but also skills such as problem-solving, abstract thinking, originality, and the rapid comprehension of complex information (Subotnik et al., 2011). Giftedness is a multidimensional and dynamic construct; therefore, the identification and education of gifted students require consideration of their cognitive, emotional, and social characteristics (Gagné, 2004). Common traits of gifted students include rapid learning, high motivation, intense curiosity, deep thinking, and strong problem-solving abilities (VanTassel-Baska et al., 2021). Additionally, these students often have broad interests and can understand abstract concepts at an early age (Torrance, 1966). However, the social and emotional needs of gifted individuals must also be addressed in education. For example, gifted students may face challenges in social relationships, experience stress related to perfectionism, or feel isolated due to being perceived as different from their peers (Neihart, 2021; Rinn, 2018). Pfeiffer (2012) highlighted that gifted students are “twice exceptional,” meaning they possess both high abilities and potential risk factors. The primary goal in educating gifted students is to maximize their potential and sustain their motivation (Tomlinson, 2014). To this end, differentiated instructional strategies and individualized programs are recommended. Differentiation involves adapting content, processes, and products according to students' learning pace, depth, and interests (Heacox, 2012). Moreover, creating homogeneous peer groups and enriched learning environments supports the social and academic development of gifted learners (Reis & Renzulli, 2010). Research indicates that increasing access to special education programs and support services positively affects both the academic success and socio-emotional well-being of gifted students (Ford et al., 2008). Furthermore, technology-supported learning tools effectively enhance the creative and critical thinking skills of gifted students (VanTassel-Baska et al., 2021). In conclusion, addressing both the cognitive and socio-emotional needs of gifted students in a balanced and comprehensive manner is essential. This approach is critical for enabling students to realize their potential and grow into healthy individuals within society (Sakellariou et al., 2025).

Social Studies Education and Interdisciplinary Approaches

Social studies education is a multidisciplinary field aimed at preparing individuals to become active and informed citizens in society. Social studies integrate various disciplines such as history, geography, economics, political science, sociology, and anthropology (Banks, 2008). Therefore, social studies education goes beyond merely transmitting knowledge; it adopts a holistic approach that aims to develop critical thinking, problem-solving, values education, and civic engagement skills in students (Learn, 2000). Social studies education lays the foundation for individuals to embrace democratic values, respect cultural diversity, and

develop social responsibility (Banks, 2009; Cha et al., 2018). Today, particularly under the influence of globalization and technological advancements, social studies instruction focuses on helping students understand complex social phenomena and acquire 21st-century skills (Denton & Sink, 2015; Misco, 2014; Schug & Wood, 2010).

The interdisciplinary approach combines knowledge and methods from different social science disciplines to provide students with a more comprehensive learning experience (Drake, 2012). This approach allows students to evaluate complex social issues from multiple perspectives and contextualize knowledge in real-life settings (Beane, 1997). For example, a historical event studied in a history class can be supported by geographical information to help students grasp spatial relationships. Economic and political insights can be used to analyze the social and economic impacts of that event (McCormick & James, 2018). Thus, students learn knowledge in a systematic and interconnected manner rather than in isolated fragments (Repko & Szostak, 2020).

For gifted students, interdisciplinary social studies education enables them to deeply understand abstract and complex concepts and develop critical and creative thinking skills (Winner, 1997). This approach encourages students to combine different perspectives to produce original and innovative solutions (Drake & Burns, 2004). Additionally, interdisciplinary learning processes increase the motivation of gifted learners and provide academic satisfaction (Guilford, 1967). In this context, teachers' use of interdisciplinary strategies to create enriched learning environments enhances gifted students' interest and achievement in social studies (VanTassel-Baska & Baska, 2021). Literature on the impact of interdisciplinary approaches in social studies education shows that this method improves students' conceptual understanding and critical thinking skills (Beane, 1995; Drake & Burns, 2004). Moreover, interdisciplinary methods are compatible with student-centered learning and project-based education models, thereby promoting lasting learning in social studies (Drake & Reid, 2020; Fogarty, 1991).

Climate Crisis and Sustainability Education

The climate crisis refers to large-scale and rapid changes occurring in environmental, economic, and social systems due to human-induced greenhouse gas emissions and the resulting global warming (Gabric, 2023). This crisis has numerous adverse effects, including depletion of natural resources, loss of biodiversity, increased extreme weather events, and deterioration of the quality of life for societies (Adamo et al., 2021). Recognized as one of the most urgent global issues today, the climate crisis necessitates that education systems take an active role in combating climate change (Dwivedi et al., 2022). Particularly, sustainability education plays a critical role in raising awareness among youth and fostering the adoption of sustainable lifestyles (Buzdugan & Nepotu, 2023).

Sustainability education is an educational approach developed to enable individuals to make balanced decisions in environmental, economic, and social terms (Tilbury, 2011). This educational model is built on fundamental principles such as ecosystem conservation, conscious use of resources, and social justice (Wals & Corcoran, 2023). Sustainability education aims not only to provide students with knowledge but also to help them apply this knowledge in daily life, while developing critical thinking and problem-solving skills (Husamah et al., 2022). Additionally, it supports the development of students as active citizens with social responsibility and ethical values (Hallinger & Nguyen, 2020).

Social studies education serves as an important platform for climate crisis and sustainability education because it offers opportunities to analyze the social and political dimensions of environmental issues (Pala, 2025). In social studies classes, students can learn about the historical development of the climate crisis, its economic impacts, international policy processes, and societal efforts toward sustainability, enabling them to comprehend the issue

from multiple perspectives (Nolet, 2009). Due to its interdisciplinary nature, social studies education allows students to approach environmental problems from a broader perspective and to synthesize information from different disciplines to develop solutions (Ramirez, 2021). Gifted students, with their superior abilities to understand complex and multilayered problems, can conduct in-depth analyses on climate crisis and sustainability issues (Sternberg, 2000). When integrated with sustainability education, these students' critical thinking, creativity, and problem-solving skills can facilitate the development of innovative and effective solutions (Renzulli, 2021). Teachers designing enriched, inquiry-based, and project-oriented sustainability education materials that unlock the potential of gifted students enhance their motivation and academic achievement (VanTassel-Baska et al., 2021). Recent studies indicate that sustainability education positively affects student attitudes, environmental awareness, and behavioral change (Ardoín et al., 2020; Rickinson, 2001). Furthermore, climate education within the context of social studies promotes democratic awareness and environmental responsibility by increasing students' societal participation (Hess, 2004). Given that sustainability education encompasses multilayered local and global issues, it is recommended to employ interdisciplinary, project-based, and experiential teaching approaches (De Sousa, 2021).

Use of Digital Technologies in Education and Performance Assessment Methods

Digital technologies are increasingly prevalent as powerful tools that support, enrich, and individualize learning processes in education (Selwyn, 2021). Especially with regard to access to information, communication, and collaboration opportunities, digital technologies enhance students' learning motivation and engagement (Kirkwood & Price, 2014). The use of digital technologies is inevitable in developing 21st-century skills and implementing student-centered teaching approaches (Nordin & Sundberg, 2021). These technologies include interactive whiteboards, online learning platforms, simulations, game-based learning applications, and AI-supported tools (Mandouit & Hattie, 2023).

Performance assessment is the process of measuring students' knowledge, skills, and competencies through tasks that resemble real-life situations (Performance, 2009). Digital technologies facilitate this process and enable more valid and reliable measurements (Sudakova et al., 2022). Tools such as digital portfolios, rubrics, action plans, online exams, and game-based assessments provide significant advantages for multidimensional evaluation of student performance (Barrett, 2010). These tools allow documenting students' developmental processes, providing feedback, and encouraging active participation in the learning process (Black & Wiliam, 2009).

Digital portfolios enable students to store their work digitally, showcasing their progress and development over time (Lorenzo & Ittelson, 2005). This method increases flexibility in student-centered assessment and reflects different aspects of the learning journey (Barrett, 2007; Wiliam, 2011). Rubrics are tools that clearly specify assessment criteria, helping students understand expectations and engage in self-assessment (Reddy & Andrade, 2010). Digital rubric applications allow teachers and students to conduct assessment processes more systematically and transparently (Jonsson & Svingby, 2007).

Gifted students can utilize their potentials more effectively thanks to the enrichment and individualization opportunities offered by digital technologies (VanTassel-Baska & Stambaugh, 2005). Digital tools support the development of their creative thinking, problem-solving, and critical analysis skills (Patrocínio-Braz et al., 2025). Additionally, digital performance assessment methods provide more detailed information for identifying gifted students' strengths and areas for improvement, contributing to the differentiation of educational processes (Tomlinson, 2014).

Recent studies demonstrate that the use of digital technologies in education positively impacts learning outcomes (Duarte, 2021). Furthermore, digital performance assessment methods have been shown to increase student engagement and make the teaching process more effective (Drijvers & Sinclair, 2024). The digitalization of performance assessment tools offers opportunities for more objective, timely, and interactive monitoring of student success while improving teachers' feedback processes (Bennett, 2011).

Action Research Method and Its Application in Education

Action research is a practical research approach characterized by a cyclical process that involves participants actively in solving real-life problems (Stephen Kemmis & Robin McTaggart, 2014). This method is especially powerful in education, enabling teachers to improve their own practices and enhance student learning processes (Mertler, 2024). Action research consists of systematic stages including problem identification, planning, implementation, observation, and evaluation, which continuously repeat based on new data (Sagor, 2000). Thus, practice and research mutually inform and develop each other. In educational settings, action research allows teachers to reflectively evaluate their classroom practices and focus on improving instructional processes (Stringer, 2019; Stringer & Aragón, 2020). Teachers become more responsive to students' needs while simultaneously contributing to their own professional development (McNiff & Whitehead, 2011). Additionally, because action research involves data collection and analysis grounded in participants' experiences, it bridges the gap between theory and practice (Carr & Kemmis, 2003). In this respect, it contributes both practically and scientifically to education. The action research process is typically described as a repeating cycle of plan-act-observe-reflect (Stephen Kemmis & Robin McTaggart, 2014):

1. **Planning (Plan):** The researcher defines the problem encountered and plans solutions.
2. **Implementation (Act):** The planned strategies are carried out
3. **Observation (Observe):** The effects of the implementation are systematically observed and data are collected.
4. **Reflection (Reflect):** The effectiveness of the implementation is evaluated based on the data, and the plan is revised if necessary.

These cycles continue repeatedly, improving the quality of the implementation. Action research is used in many areas such as improving curriculum development, classroom management strategies, increasing student achievement, and meeting the needs of students with special needs (Mills, 2010). For example, action research conducted on increasing the motivation of gifted students through the use of digital tools has made instructional processes more effective (VanTassel-Baska & Stambaugh, 2005).

In this study, the action research method was preferred to improve the performance assessment processes supported by digital technologies in the social studies course for gifted students. Throughout the research process, the planning, implementation, observation, and evaluation cycles were applied with the aim of developing effective digital performance assessment tools in education and increasing student achievement. At each stage of these cycles, data were collected, analyzed, and implementation strategies were replanned.

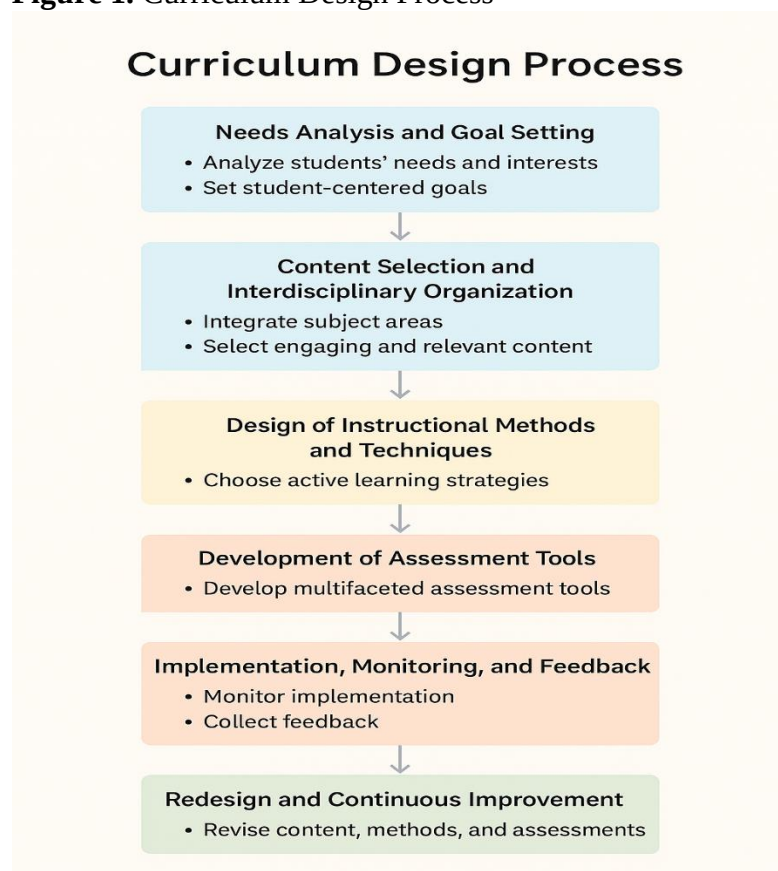
Research shows that action research in education is effective in improving teaching practices and supporting participants' professional development (Creswell, 2020; Stringer, 2019). It plays a critical role especially in increasing teachers' awareness about their profession and enhancing their problem-solving skills (Mertler, 2024).

Curriculum Design Process

The curriculum developed in this study was designed with an interdisciplinary and sustainability-based approach that meets the educational needs of gifted students. The design

process consists of systematic stages aimed at ensuring that educational programs are implemented effectively and in alignment with their objectives (Coşkun Yaşar & Aslan, 2021; Ornstein & Hunkins, 1993).

Figure 1. Curriculum Design Process



1. Needs Analysis and Goal Setting

In the first stage of curriculum design, the cognitive and affective characteristics of gifted students, their learning styles, and their interest in current social issues such as the climate crisis were analyzed. Within this scope, the needs to develop critical thinking, problem-solving, creativity, and sustainability awareness were prioritized (Tomlinson, 2014). The goals were structured to be student-centered and to support 21st-century skills.

2. Content Selection and Interdisciplinary Organization

Based on the determined goals, a rich content was created by integrating learning outcomes from various disciplines such as social studies, science, technology, and Turkish language. Under the theme "The Pulse of the Planet," topics like climate change, environmental awareness, and sustainable development were addressed through an interdisciplinary approach (Drake, 2012). The content was selected to engage students' interest and encourage active participation.

3. Design of Teaching Methods and Techniques

Active learning methods such as project-based learning, digital storytelling, group work, and experimental activities were chosen to ensure a high level of student interaction (Renzulli, 2021). Additionally, the use of digital technologies supported learning processes and enhanced students' technological literacy.

4. Development of Assessment and Evaluation Tools

Multidimensional assessment tools such as performance evaluations, rubrics, and digital portfolios were developed to measure students' diverse abilities and learning processes

(Brookhart, 2013). These tools enabled assessment of both the process and the product, and included opportunities for student feedback.

5. Implementation, Monitoring, and Feedback

The curriculum was implemented according to the action research cycle; during the implementation phase, the process was monitored and evaluated based on feedback from teachers and students (Stephen Kemmis & Robin McTaggart, 2014). Thanks to the flexible structure, interventions were made according to emerging needs.

6. Repanning and Continuous Improvement

In light of the data obtained, the curriculum content, teaching methods, and assessment tools were reviewed and improved. This cycle ensured that the curriculum remained dynamic and responsive to needs (Sagor, 2000). Thus, the advanced cognitive and affective development of students was supported.

Table 1. Unit Information

Field	Description
Course / Discipline	Social Studies (Interdisciplinary)
Grade Level	7th Grade – Gifted Students
Duration	4 Weeks · 4 lessons per week · Total 16 lessons
Theme	Climate Crisis · Global Citizenship · Sustainability
Unit Title	The Pulse of the Planet: Young Minds Leading the Climate Crisis

Table 2. Unit Objectives and Learning Outcomes

Unit Objectives	Learning Outcomes (Discipline-Based)
* Analyze the causes and consequences of the climate crisis	Social Studies
* Generate creative solutions to global environmental problems	• Analyze the historical and geographical dimensions of the climate crisis.
* Integrate different scientific fields through an interdisciplinary approach	• Explain the concept of sustainable development.
* Recognize and critically examine the Sustainable Development Goals (SDGs)	• Demonstrate environmental awareness with citizenship responsibility.
	Science
	• Model the effects of greenhouse gases in the atmosphere.
	• Identify factors contributing to the carbon footprint.
	Technology and Design
	• Analyze the carbon footprint using a digital calculation form.
	• Develop a sustainable city design.
	Turkish Language
	• Interpret literary texts related to the climate crisis.
	• Write persuasive texts and create posters.

Table 3. Weekly Plan and Activities

Week	Lesson Hours	Activity Name	Aim / Objective	Instructions (Abbreviated)	Product / Presentation
1	4	Listen to the Planet's Pulse	Introduction to climate crisis with scientific data	Examine NASA & MGM temperature graphs; design "Is the Planet Sick?" poster	Poster presentation – telling the "story" of the data
2	4	Where is Our Footprint?	Carbon footprint calculation & individual responsibility	Online carbon footprint form; personal "Eco-Action Plan" chart	Plan discussion in class & peer feedback
3	4	What's My Share of Water?	Climate justice & global citizenship	Data on intercontinental water access; mini-drama in groups of 3 ("Through a Child's Eyes: Water")	Drama presentation + emotion mapping activity
4	4	Green City Project	Design of sustainable living spaces	Create "Green City" model with recyclable materials / digital tools	Model presentation; assessed with rubric

Table 4. Assessment Methods

Method	Description
Weekly Performance Tasks	Process notes for poster, eco-action plan, drama, and city model
Presentations	Peer questions & teacher feedback at the end of each activity
Peer / Self-Assessment	Students complete weekly rubrics and engage in self-reflection
Digital Portfolio	Weekly upload of products to portfolio; monitored by teacher
"Green City" Rubric	Detailed scoring based on originality, sustainability, aesthetics, collaboration, and presentation quality

The curriculum effectively integrates the disciplines of Social Studies, Science, Technology-Design, and Turkish Language. This approach aligns with Beane's (1997) model of "interdisciplinary thematic integration." The topic-centered (climate crisis) integration allows students to construct knowledge as a cohesive whole rather than in fragmented parts. This directly addresses the cognitive depth needs of gifted students. The curriculum incorporates 21st-century skills such as critical thinking, creative problem-solving, communication, and collaboration (Greenhill, 2010). Production-based activities, particularly projects like the "Green City," aim to develop students' contemporary competencies including entrepreneurship, sustainability, and digital literacy.

When evaluated within the framework of Renzulli's Enrichment Triad Model, the curriculum includes activities primarily at Type II (problem-solving) and Type III (real-life tasks) levels. Tasks such as individual eco-action plans, poster creation using scientific data, dramatizations, and digital city design foster high-level cognitive and affective engagement. The unit title and objectives correspond with UNESCO's Education for Sustainable Development (ESD) approach. While enabling students to understand the environmental, social, and economic dimensions of the climate crisis, the curriculum also supports them in

questioning their roles and generating solutions. This facilitates the development of active citizenship and a sense of global responsibility.

The diversity of assessment methods reflects a balanced use of formative and summative approaches. Self-assessment and digital portfolios are particularly valuable in enhancing students' metacognitive awareness. The detailed rubric used for the "Green City" project ensures transparency and measurability in evaluation. Weekly planned activities correspond to Bloom's Taxonomy cognitive levels of analysis, synthesis, and evaluation. For instance: Poster analysis with data involves analysis; Eco-action plan development involves synthesis; and city model presentation involves creation and evaluation. This structure aligns with the higher-order thinking needs of gifted learners.

This curriculum design not only applies the fundamental principles of interdisciplinary teaching but also provides differentiated learning opportunities for gifted students.

Simultaneously, it aims to raise students' environmental awareness and cultivate sensitivity toward global challenges. In terms of pedagogical coherence and contemporary educational goals, it exemplifies an exemplary instructional design.

Method

Research Design

This study encompasses the planning, implementation, evaluation, and restructuring processes of a social studies-based curriculum developed through an interdisciplinary approach for gifted students. In this context, the research design is framed as an "action research," which is a qualitative research method. Action research involves the practitioner (typically a teacher) systematically observing their own practice, identifying problems, developing solutions, and cyclically improving the process (Koshy, 2009; Mills, 2010). In educational settings, action research enables teachers to intervene directly in classroom challenges and transform practices based on scientific evidence (Yıldırım & Şimşek, 2011). In this study, the researcher also functions as the practitioner teacher, actively managing all phases of curriculum design and implementation. This dual role characterizes the study as participant action research, where the researcher simultaneously acts as a practitioner, observer, and evaluator. Participant action research not only involves monitoring the practice but also aims to improve it through the researcher's direct involvement in the field (Stephen Kemmis & Robin McTaggart, 2014). The research process was structured according to the classical action research cycle in the following stages:

1. **Planning (Plan):** Developing the curriculum content, identifying themes, and structuring weekly activities.
2. **Implementation (Act):** Applying the curriculum with gifted students in a classroom setting over four weeks.
3. **Observation (Observe):** Collecting teacher observations, student products, and performance tasks after each implementation.
4. **Reflection and Evaluation (Reflect):** Conducting weekly evaluation meetings to identify strengths and areas for improvement, and making adjustments for the following week.

In this way, action research functions both as a method for teaching practice and as a tool for scientific data collection and analysis. The unique learning needs and high readiness levels of gifted students necessitate a flexible, feedback-oriented, and student-centered research design. Therefore, the action research design provides the most appropriate methodological framework aligned with the aims and context of this study.

Study Group

The study group consists of gifted students in the 7th grade attending a Science and Art Center (SAC) located in eastern Turkey during the 2024–2025 academic year. Participants actively engaged in the four-week implementation of the interdisciplinary curriculum developed for the Social Studies course. Criterion sampling, one of the purposive sampling methods, was used to select the participants. Criterion sampling involves including individuals who meet specific criteria (Yıldırım & Şimşek, 2011). The criteria for student inclusion were as follows:

- Being officially recognized as a gifted individual by the Ministry of National Education of the Republic of Turkey,
- Enrolled at the 7th-grade level,
- Showing interest and willingness to participate in Social Studies and interdisciplinary activities,
- Being capable of actively participating in the observation, reflection, and product creation processes required by the action research.

A total of 12 gifted students meeting these criteria constituted the direct participants of the study. Among them, seven were male and five were female. For ethical reasons, student names were anonymized, and personal information was protected.

None of the students had previously experienced a thematically structured learning process based on interdisciplinary social studies instruction, sustainability, or the climate crisis. This enhances the originality of the research and allows the researcher-practitioner to directly observe the impact of the curriculum design. Additionally, the flexible and enriched learning opportunities provided by the SAC environment facilitated the healthy conduct of the action research process.

Data Collection Tools

In line with the nature of action research, the data collection process in this study was structured based on multiple data sources. The qualitative research tools used aimed to reveal both quantitative indicators of the learning process and students' in-depth reflections (Creswell, 2020). Data diversity was planned with the principle of triangulation (verification through multiple data sources) to enhance the reliability and validity of the findings (Patton, 2002).

1. Observation Forms

Structured observations conducted by the researcher-teacher were carried out weekly to assess students' levels of engagement in the learning process, their interdisciplinary interaction skills, and problem-solving approaches. The observation forms enabled systematic monitoring of in-class interactions and provided immediate feedback on the implementation process. In qualitative research, observation is a powerful tool that allows the researcher to collect data by directly experiencing the process (Yıldırım & Şimşek, 2011).

Table 5. Structured Observation Form (Weekly)

Observer:		Date:	
Class/Group:		Activity/Topic:	
Observation Category	Observation Criteria	Observation Rating (1–5)	Explanation / Example Behaviors
Participation Level	The student actively participated in the activity.		
	Asked questions, offered ideas, or led the activity.		
Interdisciplinary Interaction	Connected knowledge from different disciplines.		
	Considered different perspectives in group discussions.		
Problem-Solving Approach	Proposed logical, creative, and feasible solutions to problems.		
	Suggested alternative solutions and explained their reasoning.		
Communication and Collaboration	Communicated effectively and respectfully with peers.		
	Voluntarily contributed to task sharing.		
Self-Regulation and Responsibility	Completed tasks on time and with care.		
	Demonstrated ability to manage and evaluate own learning process.		

Rating scale: 1 = Very Poor, 2 = Poor, 3 = Average, 4 = Good, 5 = Very Good

Figure 1. Unstructured Observation Note Form

 Open Observation Notes (Anecdotes/Subjective Impressions)

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2. Student Work and Digital Portfolios

The products created by students as a result of weekly activities (such as posters, plans, digital calculation outputs, drama scripts, designs, etc.) were systematically compiled into digital portfolios. These digital portfolios enabled students to actively participate in the learning process and visualize their own learning. The analysis of student work is considered within the scope of “document analysis” in qualitative data analysis (Bowen, 2009).

Table 6. Digital Portfolio

Week	Activity	Product	Reflection	Additional Notes / Technological Tools
Week 1	Analysis of global temperature change graphs using data from NASA and the General Directorate of Meteorology	Photo of poster titled "Is the Planet Sick?"	Important points learned while preparing the poster and contributions of group work	Sharing via Google Drive or Padlet
Week 2	Filling out the carbon footprint calculation form	Personal "Eco-Action Plan" (in table format)	Challenges faced while preparing the plan and areas to improve	Digital plan created with OneNote
Week 3	Research on disparities in access to water resources and mini drama performance	Drama video or presentation notes	Social dimension and empathy experience gained through the drama activity	Use of suitable platforms for video recording and sharing
Week 4	Designing the "Green City" project	Project photo or digital model file	Thoughts on teamwork and sustainable design during the project	Google Slides or PowerPoint for slide or video presentation
Overall	Knowledge and skills acquired throughout the unit, personal goals	Overall evaluation of the digital portfolio	General reflections on the learning process	Continuous updating of the digital portfolio

Figure 2. Student Work



Table 7. Eco-Action Plan

Goal	Action	Expected Outcome
Reduce energy consumption at home	Switch to LED bulbs and turn off unnecessary lights	15% decrease in electricity bill, reduction in carbon footprint
Reduce plastic use	Use cloth bags and avoid single-use plastics	Decrease in plastic waste, increased environmental awareness
Save water	Turn off the tap while brushing teeth and shorten shower time	20% reduction in water consumption
Increase recycling	Sort waste at home and dispose of it in recycling bins	Less waste sent to landfill, reduced environmental harm
Raise environmental awareness at school	Put up environmental posters in the classroom and raise awareness among peers	Positive changes in classmates' environmental behaviors

This plan enables students to make small but effective changes toward the environment in their daily lives. Concrete actions are determined for each goal, and the expected environmental or social impacts are clearly defined. Thus, students become aware of their individual responsibilities and gain motivation to develop positive behaviors.

3. Peer and Self-Assessment Forms

At the end of each week, students completed structured forms in which they evaluated both themselves and their group members. Through these forms, students' self-awareness and social learning processes were supported. Peer and self-assessment tools are effective in developing students' metacognitive skills and are also ethically and pedagogically valuable for incorporating student voice into the research process (Black & Wiliam, 2009; McNiff & Whitehead, 2011).

Table 8. Peer and Self-Assessment Form (Weekly)

Assessment Area	Description	Self-Assessment (1-5)	Peer Assessment (1-5)	Observations and Feedback
Task Responsibility	I completed the tasks on time and thoroughly.			
Collaboration	I actively and constructively participated in group work.			
Communication	I expressed my ideas clearly and respectfully.			
Problem Solving	I produced constructive solutions to encountered problems.			
Creativity	I developed original ideas.			
Receiving Feedback	I considered my peers' feedback.			
Self-Awareness	I recognized my strengths and areas for improvement.			

Scoring: 1 = Inadequate, 2 = Needs Improvement, 3 = Acceptable, 4 = Good, 5 = Excellent

Figure 3. Student Weekly Reflection Form

Weekly Reflection (To Be Completed by the Student) 4.

- The thing I did best this week:
.....
- The area I need to improve:
.....
- Constructive comment about my groupmate:
.....

Reflective Journals

The researcher kept reflective journals after each weekly implementation, recording observations about the process, student reactions, challenges encountered, and suggestions for improvements in the following weeks. These journals are one of the fundamental tools supporting the cyclical nature of action research, reflecting the researcher's critical perspective and self-assessment process (Schön, 2017; Altrichter et al., 2008).

5. Performance Tasks and Rubrics

Performance tasks were applied to assess students' problem-solving and creative design skills. In particular, the students' work on the final week's "Green City" project was examined using a detailed evaluation rubric. Rubrics provide an objective assessment of learning products based on predefined criteria (Brookhart, 2013).

Table 9. "Green City" Project Rubric (Evaluation Scale)

Criteria	4 - Excellent	3 - Good	2 - Fair	1 - Poor
Creativity	Project prepared with innovative and original ideas.	Project contains some creative ideas.	Limited creative elements present.	No or very little creativity.
Sustainability	Project fully aligns with sustainability principles.	Largely meets sustainability criteria.	Partially includes sustainability content.	Sustainability elements missing or incorrect.
Collaboration & Participation	Group members actively, harmoniously, and equally contributed.	Most members contributed; collaboration was good.	Some members did not contribute or collaboration was weak.	Collaboration and participation insufficient.
Presentation Skills	Clear, understandable, effective communication and use of visual materials.	Generally clear and organized presentation.	Presentation has gaps and disorganization.	Presentation is unclear and visuals insufficient.
Use of Technology	Digital tools and materials used effectively and creatively.	Digital tools used appropriately and functionally.	Technology use limited and ineffective.	No or very insufficient use of technology.

This rubric provides objective and transparent criteria for project evaluation. It helps analyze student performance in multiple dimensions (creativity, sustainability, collaboration,

presentation, and technology use) in detail. Clear definitions for each criterion ensure that both teachers and students understand expectations clearly. It also forms a concrete basis for feedback after evaluation.

Table 10. Performance Task: “Young Minds Leading the Climate Crisis: Presentation of Solution Proposals”

Task Description	Analyze the causes and effects of the climate crisis and develop and present sustainable and feasible solution proposals.
Objectives	- Analyze scientific data - Produce interdisciplinary solutions - Deliver effective presentations
Duration	2 weeks
Steps	1. Collect and analyze climate crisis data 2. Develop individual and societal solution proposals 3. Prepare graphs and visual materials 4. Assign tasks within the group 5. Deliver the presentation
Evaluation Criteria	- Research and data usage - Creativity and feasibility - Presentation skills - Group collaboration
Example Applications	- Proposals to increase renewable energy sources - Water conservation and waste management projects

Table 11. Sample Emotion Map

Week & Activity	Felt Emotions	Emotion Intensity (1-5)	Reasons / Explanations	Physical Reactions (e.g., excitement, fatigue)	Suggestions / Improvements
Week 1 – Topic Introduction	😊 Excited, curious	4	New and important topic, interested in interdisciplinary approach	Heart racing, attentive listening	More background info and visual materials requested
Week 2 – Research	😞 Confused, struggled a bit	3	Some concepts were complex, difficult to find sources	Headache, reduced concentration	Sources could be simplified and supported with examples
Week 3 – Group Work	😊 Happy, good collaboration	5	Enjoyable and supportive to work with friends	Relaxation, laughter, active talking	More group work suggested
Week 4 – Presentation	😬 Nervous, slightly anxious	4	Anxiety about presenting, but feel prepared	Sweating, increased heart rate	Rehearsal and breathing exercises before presentation recommended

Notes: *Felt Emotions:* Students indicate their feelings using words and/or emojis. *Emotion Intensity:* A scale from 1 to 5 indicating how strongly the emotion was experienced. *Reasons / Explanations:* Students write down the causes of their feelings, what they found difficult or enjoyable. *Physical Reactions:* Observations of bodily responses to emotions (e.g., excitement, fatigue). *Suggestions / Improvements:* Recommendations from students or teachers for future sessions.

Figure 4. Student Green City Projects



Figure 5. Student Green City 3D Projects



Action Research Process

This study was conducted using the action research method to develop an interdisciplinary social studies curriculum for 7th-grade gifted students. Action research is a cyclical and participatory process in which practitioners directly intervene in educational settings and evaluate the effects of these interventions (Stephen Kemmis & Robin McTaggart, 2014). Below, the research process is explained step-by-step specific to this study:

1. Problem Identification

The fundamental problem addressed in this study was the need for comprehensive education for gifted students on current interdisciplinary themes such as the climate crisis, global citizenship, and sustainability. The existing curriculum did not fully meet the needs of these students, with insufficient use of interdisciplinary approaches in teaching and inadequate opportunities for developing creative problem-solving skills. At this stage, the scope of the problem was clarified through literature review and field observations (Çepni & Ormanç, 2018).

2. Planning

As a solution, a 4-week interdisciplinary curriculum was planned, consisting of 4 lessons per week. During the planning process, learning outcomes from social studies, science, technology-design, and Turkish language were integrated to create a holistic education program centered on the theme of the climate crisis. Weekly activities and assessment

methods were detailed. The planning phase also included designing the student profile (gifted students), lesson hours, goals, and assessment tools to be used (McNiff & Whitehead, 2011).

3. Action (Implementation)

The prepared curriculum was piloted with a selected group of gifted students. During implementation, active learning-based interdisciplinary activities such as “Listening to the Pulse of the Planet,” “Where Are Our Footprints?”, “My Share from Water,” and “Green City” were carried out according to weekly plans. The researcher actively participated in the lessons, observed students’ reactions and learning processes. In this phase, the teacher acted both as a practitioner and a data collector (Çepni & Ormancı, 2018).

4. Observation and Data Collection

During the implementation process, multiple data collection tools were used. Weekly performance tasks, student products (posters, drama, eco-action plans, city models), peer and self-assessment forms, and digital portfolios were regularly collected. Additionally, implementation observations and student feedback were systematically recorded as qualitative data. These data were used to measure the effectiveness of the implementation and student achievements (Yıldırım & Şimşek, 2011).

5. Data Analysis and Evaluation

The collected quantitative and qualitative data were examined using descriptive analysis and content analysis methods. Changes in student performance and themes related to participants’ feelings and thoughts were identified. As a result of these analyses, it was determined that the curriculum positively impacted students’ climate crisis awareness, interdisciplinary thinking skills, and creative problem-solving abilities (McNiff & Whitehead, 2011).

6. Reflection

The researcher thoroughly evaluated the implementation process and analysis results. In-depth reflections were made on students’ strengths, challenges encountered, and areas for improvement. Furthermore, the contributions and limitations of the interdisciplinary structure of the curriculum for gifted students within the teaching process were discussed. This phase enhanced the scientific rigor of the study and laid the groundwork for developing practical recommendations for implementation (Stephen Kemmis & Robin McTaggart, 2014).

7. Replanning and Cycle Repetition

Based on the feedback from the reflection phase, some adjustments were made to the curriculum design. For example, the duration and complexity of some activities were optimized according to the interests and pace of gifted students. Additionally, assessment methods and measurement tools were further diversified. These innovations were planned for a second implementation cycle, thus completing the cyclical nature of the research (Çepni & Ormancı, 2018).

Revisions in the Replanning Cycle of the Action Research

The cyclical nature, a fundamental characteristic of action research, involves reorganizing the teaching plan based on observations and evaluations conducted during the instructional implementation. This process is exemplified through the applications in our study as follows:

Example 1: Rescheduling Activity Durations

During the initial implementation, although the “Listening to the Pulse of the Planet” activity was found highly engaging by students, it was observed that some groups had insufficient

time to prepare their posters. Additionally, prolonged discussions caused attention lapses in some students. In response, in the second cycle, the activity duration was reduced from 4 to 3 class hours, and focused discussion sessions with pre-determined questions were introduced alongside the poster preparation phase. This adjustment both accommodated students' attention spans and increased the activity's overall effectiveness.

Example 2: Simplification of Assessment Tools

The tables and evaluation forms prepared for the "Eco-Action Plan" during the first cycle were perceived as complex and difficult to understand by some students. Feedback particularly indicated that several items in the self-assessment form were hard to comprehend. Accordingly, in the second cycle, the assessment tools were simplified and supported with explanations and examples. Moreover, technical support was provided for the digital portfolio application to ensure students' easy access and use.

Example 3: Strengthening Interdisciplinary Integration

During the first implementation, collaboration among Science, Technology-Design, and Social Studies classes was limited, which restricted the development of students' interdisciplinary thinking skills. In the replanning phase, the "Green City" project was redesigned as a joint project covering learning outcomes from science, technology-design, and social studies. The groups' projects integrated themes such as carbon footprint calculation, sustainable city design, and climate justice holistically. This enabled students to develop an interdisciplinary perspective more effectively.

As demonstrated by these examples, the revisions made based on implementation data during the renewal cycle of action research ensured the teaching process became more effective, comprehensible, and student-centered. Thus, the study was rendered more suitable and efficient in meeting the learning needs of gifted students.

Data Analysis

In this study, the data collection process was conducted in accordance with the action research model using various qualitative tools. The primary data collection instruments included digital portfolios, performance tasks, rubrics, eco-action plans, student product files, teacher observation notes, and structured evaluation forms. These tools were designed to assess students' knowledge, skills, and attitudes regarding climate change and sustainability through an interdisciplinary approach.

The collected qualitative data were analyzed using content analysis (Bowen, 2009). Each student's digital products and written documents produced throughout the process were evaluated content-wise through pre-developed thematic rubrics and analytical assessment scales. In the data analysis, a descriptive analysis method was employed based on pre-determined categories such as environmental awareness, digital productivity, interdisciplinary relational skills, and problem-solving ability (Yıldırım & Şimşek, 2011).

The data were independently examined by the researcher and a field expert, and reliability was ensured by comparing the findings obtained. The consistency rate in the coding process was calculated using Miles and Huberman's (1994) formula and achieved over 80% agreement. Student products and rubric results were supported by quantitative descriptions, thus enhancing the meaningfulness of the qualitative findings. This multiple data source and systematic analysis process provided a comprehensive evaluation of the impact of the action research process on learning outcomes. The findings are presented in detail in the results section with accompanying tables and thematic explanations.

Validity and Reliability

1. Validity

To ensure the validity of the study, data triangulation was employed by collecting information through multiple qualitative tools such as digital portfolios, performance tasks, rubrics, and observation notes. The use of diverse data sources enabled a comprehensive understanding of the phenomena under investigation. Additionally, member checking was conducted by sharing preliminary findings with participants to confirm the accuracy of interpretations. The use of thematic rubrics and predefined categories also enhanced content validity by aligning the analysis with the study's conceptual framework.

2. Reliability

Reliability was strengthened through independent coding by the researcher and an expert in the field. Inter-coder agreement was calculated using Miles and Huberman's formula (1994), achieving a consistency rate above 80%, indicating high coding reliability. Detailed documentation of data collection and analysis procedures was maintained to allow replication and transparency. Furthermore, the iterative nature of the action research cycles allowed for continuous refinement of data collection instruments and analysis methods, supporting reliability over time.

Ethical Principles

This study adhered to established ethical guidelines to protect the rights and well-being of participants. Informed consent was obtained from all students and their guardians prior to participation, with clear explanations of the study's purpose, procedures, and voluntary nature. Confidentiality and anonymity were strictly maintained by assigning codes to participants and securely storing all data. The study ensured that participation did not pose any risk of harm or discomfort. Additionally, the research process respected students' autonomy and promoted their active involvement, aligning with principles of respect, beneficence, and justice.

Findings

Table 12. Scientific Approach to the Climate Crisis and Level of Conceptual Understanding

Student Group	Poster Topic	Use of Scientific Data	Level of Conceptual Understanding	Presentation Success (1–5)
Group 1	Planetary Temperature Increase	Accurate interpretation of NASA graphs	High (in-depth analysis)	4.5
Group 2	Global Temperature Change	Making inferences from meteorological data	Medium-High	4.0
Group 3	Effects of Climate Change	Identifying trends in graphs	High	4.7

As shown in the table, students worked in groups and analyzed scientific data related to the climate crisis using sources such as NASA and the Turkish State Meteorological Service. The poster activities enabled students to develop interdisciplinary thinking skills and data literacy. The high scores achieved especially by Group 1 and Group 3 indicate that gifted students were successful in understanding and interpreting complex scientific data.

These findings are consistent with the literature suggesting that interdisciplinary learning and data-driven educational approaches enhance students' critical thinking skills (Oudenampsen et al., 2024; Uysal, 2021). Moreover, this study demonstrates that gifted students are capable of comprehending the scientific foundations of a complex and current social issue such as climate change (Akhan et al., 2022).

Table 13. Carbon Footprint Awareness and Individual Responsibility

Student	Carbon Footprint Value (tons CO ₂ /year)	Targets in the Eco-Action Plan	Implementation Rate (%)	Student Reflections
A	7.2	Energy saving, waste reduction	80%	"I will pay more attention to my energy use."
B	5.5	Reducing water use, recycling	75%	"My plan makes an important contribution to nature."
C	8.0	Using public transportation	70%	"I will use my car less."

This table presents the students' carbon footprint values alongside the targets set in their eco-action plans. These data reflect students' abilities to concretize environmental impact and regulate their individual behaviors. The implementation of 70–80% of these plans is a significant indicator of reinforced sustainability awareness. The literature emphasizes that planning and awareness processes are critical in transforming the sense of individual responsibility into behavior (Ullrich et al., 2023). These results show that gifted students are sensitive to environmental issues both analytically and ethically, and that they reinforce this sensitivity through behavioral changes.

Table 14. Understanding Climate Justice and Its Social Dimension

Group	Drama Topic	Representation of Social Issues	Level of Empathy (Teacher Observation)	Student Emotion Map (Average Score)
1	Water Scarcity and Child Health	High	4.8	4.5
2	Regional Inequalities in Water Access	Medium-High	4.6	4.3
3	Global Climate Justice and Its Impacts	High	4.9	4.7

The drama activities presented in the table evaluate students' levels of empathy and awareness regarding climate justice and social inequality. Learning activities implemented through drama are supported in the literature as effective in enhancing students' social-emotional skills (Darling-Hammond et al., 2020; DeGraff, 2024). Teacher observations and student emotion maps indicate that students internalized complex social issues related to climate justice through role-play and dramatization. This supports the notion that gifted students experience a deep learning process not only cognitively but also emotionally.

Table 15. Sustainability and Creative Design Skills

Group	Features of Green City Design	Use of Technology	Sustainability Elements	Project Evaluation Score (Rubric)
1	Physical model using recycled materials	Model building, presentation	Renewable energy, green spaces	4.6
2	Digital design and simulation	CAD software, digital presentation	Energy efficiency, water management	4.8
3	Hybrid (physical + digital)	3D modeling, interactive presentation	Waste management, public transportation systems	4.7

This table illustrates gifted students' creative and technological competencies in a sustainable city design project. The use of both digital and physical models enabled students to integrate STEM (Science, Technology, Engineering, and Mathematics) fields and develop realistic and innovative solutions. Literature supports that such interdisciplinary projects enhance students' problem-solving and creativity skills (Darling-Hammond et al., 2020; Eugenijus, 2023; Wannapiroon & Pimdee, 2022). Moreover, the high rubric scores indicate that students successfully grasped the principles of sustainability and translated them into tangible projects. Overall, the findings reveal that this interdisciplinary curriculum design supports the cognitive, social, and emotional development of gifted students. Through both scientific data analysis and creative expression, students achieved in-depth learning on climate crisis, global citizenship, and sustainability. Consistent with the literature (Darling-Hammond et al., 2020; Simon et al., 2023), this study highlights the importance of structured, interactive, and hands-on learning environments for gifted learners.

Conclusion

This study examined the applicability and impact of an interdisciplinary social studies curriculum designed for gifted students, focusing on the themes of climate crisis, global citizenship, and sustainability. Conducted through an action research approach, the findings revealed positive developments in students' knowledge, awareness, attitudes, and behavioral changes.

Firstly, students demonstrated a significant improvement in their ability to analyze scientific data related to the climate crisis and interpret these data through an interdisciplinary lens. Poster activities utilizing data from NASA and the Turkish State Meteorological Service contributed to the development of students' critical thinking and data literacy skills. This finding aligns with previous research supporting the effectiveness of interdisciplinary education in understanding complex societal issues such as climate change (Eilam, 2022; Mowski et al., 2023).

Secondly, activities such as measuring carbon footprints and creating individual eco-action plans reinforced students' environmental awareness and strengthened their sense of personal responsibility. A considerable number of students expressed a willingness and effort to implement their plans, indicating that behavioral change is possible within sustainability education (Gülersoy, 2021; Maki, 2023). This highlights the cognitive and ethical sensitivity of gifted students toward environmental issues.

Thirdly, addressing the concept of climate justice and its social dimensions through drama increased students' empathy and social awareness. Drama activities served as a powerful tool for socio-emotional learning, enabling students to comprehend and internalize complex social

problems. This underscores the necessity of employing effective pedagogical strategies in social studies education (Darling-Hammond et al., 2020).

Lastly, within the sustainable city design project, students produced creative and innovative solutions, successfully applying their skills in technology and design within an interdisciplinary context. Such project-based learning approaches have been shown to significantly enhance gifted students' problem-solving, creativity, and collaboration skills (Girgin, 2020; Holman, 2020).

Overall, the findings suggest that it is possible to foster gifted students' knowledge, attitudes, and skills related to environmental and social issues through interdisciplinary curricula. Moreover, ensuring active student participation in instructional processes through action research contributed to increased motivation and long-term learning. In this regard, the importance of interdisciplinary, hands-on, and student-centered approaches in curriculum design is once again emphasized. Engaging gifted students with contemporary and complex themes such as the climate crisis in social studies courses has strengthened their critical thinking and creative problem-solving abilities. Therefore, it is recommended that similar educational programs be developed and disseminated. Finally, considering the limitations of this study, further research involving larger sample groups and diverse educational settings is suggested as a promising area for future investigation.

Discussion

This study investigated the effects of an interdisciplinary curriculum designed for gifted students that integrates the themes of climate crisis, global citizenship, and sustainability. The findings indicate that an interdisciplinary educational approach is effective in enhancing gifted students' environmental awareness and their capacity to generate creative solutions to complex socio-ecological problems.

Interdisciplinary education is increasingly recognized in the literature as a critical pedagogical strategy, particularly for addressing today's multifaceted global challenges (Repko & Szostak, 2020). In this context, the development of a holistic understanding of the climate crisis through scientific, social, technological, and linguistic perspectives contributed to the depth and permanence of students' learning. Studies by Durmuş (2024) have similarly indicated that interdisciplinary approaches strengthen students' critical thinking and problem-solving skills. Consistently, in this study, gifted students synthesized knowledge from various disciplines to develop their own projects and eco-action plans, which supported their cognitive flexibility and creativity.

The action research design employed in this study provided an innovative pedagogical framework by emphasizing teacher-student collaboration in curriculum design and implementation (Stephen Kemmis & Robin McTaggart, 2014). The iterative process of continuous feedback and re-planning allowed for the dynamic refinement of the curriculum and the creation of customized learning environments that met individual needs and talents. This aligns with the student-centered and participatory teaching strategies emphasized by Darling-Hammond et al. (2020), demonstrating their applicability to gifted education. Specifically, integrating themes such as climate crisis and global citizenship into social studies lessons not only facilitated students' understanding of environmental issues but also helped them grasp the social justice and ethical dimensions of these challenges. This supports Peter's (2021) affirmation of UNESCO's emphasis on global citizenship education within the framework of education for sustainable development. Furthermore, the use of diverse assessment tools such as drama, project-based learning, and digital portfolios addressed different learning styles and increased student motivation (Tomlinson, 2017). These multidimensional assessment strategies align with approaches recommended in the literature for providing depth and breadth in gifted students' learning processes (Renzulli, 2021).

One of the original contributions of this study is that it enabled gifted students to develop authentic and concrete action plans related to environmental awareness and sustainability. In the literature, environmental education is generally directed toward the general student population, and the experiences of gifted students within these processes are not adequately addressed (Parr & Stevens, 2020). This study makes a significant contribution to the field by presenting an interdisciplinary and applied model that supports gifted students' development of awareness and responsibility on environmental issues at both cognitive and emotional levels.

However, while the study demonstrates the applicability and effectiveness of an interdisciplinary curriculum for gifted students, the limitations of the sample size and the implementation in a single educational institution restrict the generalizability of the results. Therefore, it is recommended that future studies implement similar curricula in different socio-cultural contexts and with larger student groups. Moreover, integrating such interdisciplinary approaches into teacher education programs would support the sustainability and broader adoption of these practices (Fisher & Frey, 2021).

In conclusion, this study shows that interdisciplinary curriculum design for gifted students significantly contributes to deepening learning outcomes in climate crisis and sustainability education, as well as to the students' social and emotional development. In this regard, it offers a guiding model for educational policies and practitioners and contributes to the development of innovative approaches in gifted education.

Recommendations

Based on the findings of this study, several recommendations can be made for implementation at various levels. First and foremost, the results highlight the importance of employing interdisciplinary approaches—particularly in social studies classes—to enhance gifted students' sensitivity to environmental issues and their problem-solving skills. Curriculum designers are encouraged to integrate themes such as environmental awareness and global citizenship across multiple disciplines to offer richer learning experiences.

Moreover, the action research model applied in this study contributed to the dynamic development of the curriculum. Accordingly, it is recommended that teachers and school administrators adopt action research practices that include continuous feedback and iterative redesign processes. The use of multiple and student-centered assessment methods—such as drama, digital portfolios, and project-based evaluation—was found to increase students' motivation and performance. Therefore, incorporating such methods into teacher training programs is considered essential.

Teachers should also be supported through in-service training to enhance their professional competencies in interdisciplinary and sustainability-focused pedagogical approaches. Since this study was conducted with a limited sample, the generalizability of the findings is constrained. Future studies involving broader and more diverse samples in different regions are recommended to obtain more comprehensive results.

Policy-makers in education should prioritize policies that support sustainability-oriented and interdisciplinary approaches in the education of gifted students. Additionally, they should provide the necessary infrastructure and resources to expand the implementation of such practices.

Limitations

Several limitations must be considered when interpreting the findings of this study. First, the study was conducted in a single educational institution with a limited number of gifted students, which restricts the generalizability of the results to other contexts (Creswell, 2020). In addition, the curriculum design and implementation were limited to a four-week period,

which may not be sufficient for promoting long-term learning and behavioral change (Stephen Kemmis & Robin McTaggart, 2014).

While the data collection tools—rubrics, eco-action plans, and digital portfolios—provided rich qualitative insights, they relied heavily on student self-assessment and reflection, which may introduce measurement biases (Patton, 2002). Furthermore, due to the nature of action research, the researcher's dual role as both practitioner and data collector may have negatively affected objectivity (Mertens, 2019).

The complexity of the interdisciplinary content also posed challenges in aligning concepts from different subjects in a developmentally appropriate and conceptually deep manner for the students (Drake & Burns, 2004). Lastly, disparities in students' access to technology and their levels of digital literacy significantly influenced the use of digital tools. This may have led to differences in learning experiences due to digital inequality (Selwyn, 2021).

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