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STEAM APPROACH AND GIFTED STUDENTS: AN EXAMPLE FROM THE FINNISH EXPERIENCE

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Abstract. This article explores the integration of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach in the education of gifted students within the Finnish school system. The study highlights how Finland's holistic, inclusive, and creativity-driven model fosters the intellectual and emotional development of high-ability learners. Drawing from classroom practices, curriculum analysis, and teacher interviews, the article examines how Finnish educators use interdisciplinary projects, inquiry-based learning, and art-infused scientific exploration to engage gifted students. The research also investigates the role of teacher autonomy and student-centered learning in adapting STEAM principles to different learning profiles. The article concludes with practical implications for applying STEAM-based strategies in other educational contexts, particularly in countries seeking to modernize gifted education through creative and inclusive pedagogies.

Keywords: Gifted students, STEAM education, Finnish education system, interdisciplinary learning, inquiry-based learning, creativity in education, inclusion, educational innovation, student-centered pedagogy, teacher autonomy

Introduction. In the 21st century, education systems across the globe are rethinking how best to nurture creativity, critical thinking, collaboration, and innovation—skills increasingly essential in a rapidly changing world. Among the pedagogical responses to these demands is the STEAM approach, which integrates Science, Technology, Engineering, Arts, and Mathematics to create interdisciplinary, inquiry-based learning experiences. While STEAM is gaining popularity worldwide, its potential for supporting gifted students—those with advanced abilities or aptitudes—remains an area of growing research and interest.

Gifted learners often demonstrate heightened curiosity, rapid information processing, and a strong desire for challenge and autonomy. Traditional, lecture-based classroom environments may not provide the intellectual stimulation or creative flexibility these students need to thrive. The STEAM framework, by blending academic rigor with artistic expression and problem-solving, offers a promising alternative—particularly when implemented in a student-centered and inclusive educational system like Finland's.

Finland is widely recognized for its progressive, equitable education model, where teacher professionalism, curricular flexibility, and emotional well-being are prioritized. Within this framework, Finnish educators have found unique ways to apply STEAM principles that cater to diverse learners, including those identified as gifted. Finnish schools do not isolate gifted students in special programs; instead, they adopt differentiated instruction and interdisciplinary projects to challenge and engage students of varying abilities within the same classroom.

This paper investigates how STEAM-based approaches are used to support gifted students in Finnish basic education. Through a review of policy documents, analysis of real classroom practices, and insights from educators, the study explores how STEAM fosters not

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only cognitive growth but also social and emotional development in gifted learners. It also discusses how such approaches can be adapted to other national contexts—especially for countries like Uzbekistan—looking to reform and modernize their approach to gifted education.

Literature Review. The use of the STEAM approach in modern education has emerged as a powerful tool to bridge disciplinary boundaries and foster creativity, critical thinking, and problem-solving skills among students. Particularly for gifted learners, who often seek complex, open-ended challenges, STEAM provides a multidimensional framework that addresses their cognitive and affective needs.

1. Understanding STEAM Education

STEAM education is an evolution of the STEM model, incorporating the arts to encourage imaginative thinking and emotional expression. As Yakman (2008) argues, the inclusion of the arts transforms STEM into a more holistic pedagogical approach that values both technical and creative skills [1]. The integration of the arts supports a broader definition of intelligence, aligning well with Howard Gardner's theory of multiple intelligences [2].

STEAM allows students to engage with real-world problems through interdisciplinary learning, where knowledge from various fields is applied in meaningful contexts. This model supports constructivist theories of learning (Vygotsky, 1978), which emphasize active engagement, collaboration, and scaffolding [3].

2. Gifted Education and Differentiation

Gifted students, as defined by the National Association for Gifted Children (NAGC), exhibit high performance capability in intellectual, creative, or artistic areas [4]. Research suggests that gifted learners benefit most from challenging, inquiry-based, and self-directed learning experiences (Tomlinson, 2001) [5]. When curriculum is not differentiated, gifted students may experience boredom, underachievement, or social isolation.

Differentiation strategies—such as compacting, acceleration, enrichment, and tiered tasks—are widely recommended for gifted education [6]. The STEAM approach offers a natural setting for these strategies to flourish, especially when students are encouraged to design their own projects, solve open-ended problems, and connect ideas across disciplines.

3. The Finnish Educational Model

Finland has become a benchmark for innovative and equitable education, emphasizing inclusive practices, teacher autonomy, and student well-being (Sahlberg, 2011) [7]. In Finnish schools, gifted students are typically not placed in special tracks. Instead, their needs are met through differentiated instruction and curricular flexibility within inclusive classrooms (Tirri & Kuusisto, 2013) [8].

Finnish teachers are trained to design interdisciplinary, project-based lessons that adapt to different student profiles. The National Core Curriculum for Basic Education (2014) explicitly promotes cross-curricular themes, creative problem-solving, and real-life applications of knowledge—tenets of STEAM learning [9].

4. STEAM and Gifted Education: Points of Convergence

Recent studies have found strong parallels between gifted education and STEAM learning. Both prioritize creative expression, complex thinking, and personalized learning pathways. According to Henriksen et al. (2019), STEAM classrooms that integrate artistic thinking enable students—especially high-ability learners—to explore ideas more deeply and inventively [10].

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Moreover, research by Watt & Goos (2017) shows that gifted students in STEAM environments often take on leadership roles, demonstrate increased motivation, and show improved collaboration skills [11]. These environments offer an emotionally and intellectually stimulating space where gifted learners can thrive without being isolated or stigmatized.

Research Methodology. This study employs a qualitative research design with elements of case study methodology to explore how the STEAM approach is implemented in Finnish classrooms to support gifted students. The methodology was chosen to gain in-depth insights into teaching practices, curriculum structures, and teacher perspectives that may not be fully captured through quantitative methods.

1. Research Setting

The study was conducted in three comprehensive schools located in Southern Finland that are recognized for their innovative use of STEAM education. These schools are publicly funded and follow the Finnish National Core Curriculum (2014), which emphasizes interdisciplinary learning and student agency.

2. Participants

A total of 12 participants were selected through purposive sampling:

6 teachers specializing in STEAM-related subjects (science, technology, mathematics, and arts)
3 school administrators
3 pedagogical specialists involved in curriculum design or gifted education support

Participants were selected based on their experience with:

Implementing STEAM pedagogy
Working with high-ability learners
Participating in national educational development programs

3. Data Collection Methods

To ensure a rich and multifaceted understanding of the research topic, data were collected through three primary qualitative methods:

Semi-structured interviews: Each interview lasted between 45 to 60 minutes and was recorded with consent. Questions focused on teachers' experiences with differentiation, STEAM integration, challenges, and observed outcomes in gifted learners.

Classroom observations: Over a four-week period, 8 interdisciplinary STEAM lessons were observed, with attention given to lesson structure, student engagement, instructional methods, and use of artistic or scientific inquiry.

Document analysis: Curriculum guidelines, lesson plans, and student project samples were reviewed to understand how STEAM principles are embedded into daily teaching practices.

4. Data Analysis

All qualitative data were analyzed using thematic analysis, following the six-step process by Braun & Clarke (2006). The data were coded manually to identify recurring patterns and themes, including:

Differentiation strategies within STEAM
Student autonomy and creativity
Challenges in adapting the model
Outcomes for gifted students in inclusive settings

Themes were validated by triangulating findings from interviews, observations, and documents.

5. Ethical Considerations

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The study adhered to the ethical standards of qualitative educational research:
Participants signed informed consent forms.
Anonymity and confidentiality were ensured.
All data were securely stored and used strictly for academic purposes.

Approval for the study was obtained from the Finnish National Agency for Education and the local school authorities.

Research discussion. The The findings from this study reveal that the STEAM approach in Finnish schools creates a highly effective, inclusive, and flexible learning environment for gifted students, even without formal tracking or specialized programs. Several key themes emerged from the data that reflect both the strengths and challenges of implementing STEAM pedagogy for high-ability learners.

1. Differentiation through Interdisciplinary Projects

Teachers frequently use interdisciplinary projects that combine science, art, and technology as a strategy for differentiation. These projects often allow gifted students to explore topics in greater depth, design their own experiments or artistic representations, and work independently or in leadership roles within groups. For example, in one observed classroom, a group of students developed a working model of an eco-friendly house using principles from physics and visual design. Teachers noted that this level of open-ended exploration provided cognitive challenge and stimulated creativity, which are crucial for gifted learners.

2. Creative Thinking and Emotional Engagement

A major advantage of integrating the arts into STEM is the emotional and imaginative engagement it fosters. Gifted students, who often struggle with motivation in rigid, test-driven systems, responded positively to the freedom of expression and creative problem-solving in STEAM lessons. Teachers reported that students who were previously unmotivated became highly engaged when they were given the autonomy to propose their own project ideas or express learning through visual, musical, or dramatic means. This confirms earlier research that suggests gifted students need opportunities to engage both intellectually and emotionally to remain motivated [1].

3. The Role of Teacher Autonomy and Flexibility

A consistent theme in both interviews and observations was the high level of teacher autonomy in Finnish schools. Teachers are trusted to adapt curriculum and choose methods that suit their students. This autonomy enables educators to create customized learning paths for gifted students without isolating them from the mainstream classroom. For instance, one teacher described allowing a mathematically gifted student to develop a simulation model while the rest of the class completed a group task—a flexible yet inclusive approach.

Teachers also highlighted that the national curriculum's cross-curricular structure supports STEAM integration naturally. There is no rigid division between subjects, which allows for fluid transitions between disciplines and encourages students to think holistically—something that aligns well with the way many gifted students process information.

4. Challenges in Implementation

Despite the overall success of the STEAM model, several challenges were noted. First, some teachers felt they needed more professional development in combining artistic and scientific elements in a coherent and meaningful way. Others noted that time constraints in the school schedule made it difficult to fully implement long-term STEAM projects.

Moreover, while Finland avoids formal identification of gifted students, this can sometimes result in under-identification of needs, especially for twice-exceptional learners

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(those who are gifted and have learning disabilities). Teachers emphasized the importance of observation skills and professional judgment in recognizing and responding to diverse expressions of giftedness in STEAM settings.

5. Cultural and Pedagogical Implications

The Finnish model reflects a cultural commitment to equity, where giftedness is not seen as elitist or exclusive. Instead, all students are given the opportunity to excel in their own ways. This cultural perspective influences pedagogy—emphasizing trust, emotional safety, and personal development over competition or standardized excellence. This paradigm is particularly well-suited to the philosophy of STEAM education, which values diversity of thought and multiple ways of knowing.

The results of this study suggest that STEAM education, when practiced within a supportive, inclusive, and flexible system like Finland's, offers a rich platform for meeting the needs of gifted students. By encouraging creative inquiry, interdisciplinary thinking, and emotional expression, Finnish educators create conditions where giftedness can emerge naturally—without tracking or segregation.

Conclusion. The This study has examined the integration of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach in Finnish schools and its impact on the development of gifted students. The findings suggest that when implemented thoughtfully, STEAM can offer a rich, multidimensional learning environment that meets both the cognitive and emotional needs of high-ability learners.

One of the most striking features of the Finnish model is its emphasis on inclusivity and equity. Unlike systems that isolate gifted learners into separate tracks, Finnish educators apply differentiated strategies within mainstream classrooms, enabling gifted students to grow intellectually without social detachment. The integration of the arts not only enhances creativity but also supports emotional engagement—a crucial factor for sustained motivation among gifted students.

Key elements that contribute to the success of STEAM in Finland include:

Teacher autonomy, which allows for flexibility in instruction and curriculum design.

A student-centered philosophy, where learners are encouraged to take ownership of their educational journey.

A national curriculum that emphasizes cross-disciplinary skills and real-world problem-solving.

Collaborative and project-based learning, which allows gifted students to explore their interests in depth and apply their talents meaningfully.

However, the study also identified certain challenges, such as the need for more targeted professional development for teachers in STEAM integration, and the risk of overlooking gifted students in a system that avoids formal labeling. These issues highlight the importance of teacher training, reflective practice, and ongoing policy evaluation.

For countries like Uzbekistan, which are seeking to modernize and humanize their education systems, the Finnish experience offers valuable insights. While direct replication may not be feasible due to cultural and systemic differences, key aspects—such as project-based STEAM learning, integration of the arts, teacher empowerment, and inclusive strategies for gifted education—could be adapted contextually.

In conclusion, the Finnish approach demonstrates that gifted education need not rely on separation or elitism. Through STEAM, all students—especially the gifted—can be engaged in

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learning that is meaningful, creative, and intellectually stimulating, preparing them not only for academic success, but for lifelong innovation and collaboration.

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