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Exploring master's level science teachers' views on the implementation and challenges of STEAM education

Mukadder Baran[1] ✉
Medine Baran[2]

[1]*Western Norway University of Applied Sciences, Norway.*
Email: Mukadder.baran@hvl.no
[2]*Dicle University, Turkey.*
Email: medabaran@gmail.com

(✉ Corresponding Author)

Abstract

This study explores science teachers' perspectives on STEAM education. The participants were sixteen teachers enrolled in a master's program in Science Education at a public university. A purposive sampling technique was used to select these 16 science teachers as participants. Data were collected using eight open-ended structured interview forms. The data were analyzed through qualitative content analysis. The findings suggest that science teachers viewed STEAM education as focused on the end product and promoting continuous learning. They defined STEAM by providing examples of its design, the activities involved, and its impact on learning. Science teachers held positive attitudes toward using STEAM education, emphasizing its ability to make real-life connections for students. They also identified various challenges related to implementing STEAM education, including issues with educational resources such as a lack of time, insufficient learning materials, large class sizes, budget limitations, inadequate curriculum and physical facilities, and individual challenges faced by both teachers and students. The study concludes that addressing these challenges is essential, especially when implementing STEAM education activities. Providing appropriate physical conditions, adequate in-service training for teachers, and pre-service training for prospective teachers are considered vital for the future development of high-quality STEAM education.

Keywords: Challenges in STEAM, Science education, Science teachers, STEAM education, Implementation of STEAM, Master's program.

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Contents

Contribution of this paper to the literature
This study is original in its focus on the perspectives of science teachers enrolled in a master's program, highlighting their positive attitudes and real-life connections in STEAM education. It uniquely documents specific challenges they face, providing insights that enhance understanding of STEAM implementation in contemporary educational settings.

1. Introduction

Rapid developments in science and technology and the numerous visible benefits they offer humanity can lead to a wide range of undesirable issues. These issues generally consist of a series of complex anthropogenic problems that every living thing faces today. Examples of these problems include climate change and its harmful effects, armed conflicts occurring in various regions, the spread of chemical weapons endangering global security, the rapidly increasing electronic waste issue (e-waste), which may have possible effects on the environment and living organisms, particularly flamingo's habitat, and pervasive social and economic inequalities such as poverty and hunger.

Given the urgency of the problems created by the Anthropocene, it is clear that science and technology are not just part of the solution but the key to it. This underscores the critical need to educate individuals who are competent in STEAM (Science, Technology, Engineering, Art, and Mathematics). These individuals, equipped with the ability to analyze cause-and-effect relationships, think critically, employ creative thinking skills, succeed in collaborative efforts, and have a strong sense of social responsibility, are best positioned to tackle these challenges. Their practical communication skills and capacity to communicate and empathize, regardless of ethnic or cultural differences, further enhance their effectiveness in addressing these issues.

However, the existing education system needs to be revised regarding who determines the curriculum. Students, who are the system's recipients or depositories, are directed along a predetermined path desired by institutions such as schools, teachers, and other education stakeholders who act as guardians responsible for maintaining the status quo. Students who cannot conform to the set curriculum may be marginalized or pacified. Consequently, the marginalized individuals, lacking the desired knowledge dictated by the system, retreat into their shells, remain voiceless, and are not adequately represented in society. In contrast, those who unquestioningly adhere to the curriculum set by the school are more likely to be represented within the community. This situation fosters a sense of fatalism among the oppressed group, perpetuating their servitude to the middle class (Freire, 2000). Unless schools cease to perpetuate this paradox, the symbolic cycle of the snake eating its tail will continue (as Kakulè used it to illustrate electron resonance in the Benzene Ring). Chang, Sharkness, Hurtado, and Newman (2014) explain that this persistence/paradox results from environmental and internal psychological factors, including family and institutional support, learning environment, teacher encouragement, self-efficacy, motivation, and limited participation in science courses.

Educational institutions should not be viewed merely as tools for maintaining cultural reproduction, as Bourdieu (1979) stated in his assertion that "schools and universities make up a subsystem legitimizing the political and economic status quo." Instead, they should serve as catalysts for transformative societal progress. These institutions ought to equip individuals from diverse socioeconomic backgrounds with the necessary skills to access and benefit from opportunities and resources. Furthermore, ensuring that this education is impartial and egalitarian is crucial, enabling individuals to become self-aware, self-actualized, and empowered. Acquiring these competencies requires multidisciplinary interaction and the exchange of ideas across different fields. Consequently, the STEAM education approach was designed as a practical pedagogical approach to train individuals capable of realizing themselves in the 21st century and keeping up with the demands of the current age.

2. Literature Review

Studies related to STEAM have shown that incorporating artistic elements within STEM disciplines brings several notable advantages to individuals. These benefits include enhanced creativity, improved understanding of complex concepts, increased empathy, and a heightened awareness of science and technology's inclusive and diverse aspects (Reif & Grant, 2010; Schulze-Heuling, 2021).

The rise of STEAM approaches is a coordinated effort to promote greater equity in science education (Hughes, 2011). By incorporating the "A" for arts into education, students are provided with opportunities to develop essential soft skills. These skills include creativity, resilience, reliability, responsibility, empathy, and collaboration (Bertrand & Namukasa, 2020; Holik, Sanda, & Molnár, 2023), and independence and problem-solving skills (Bertrand & Namukasa, 2020; Harris & de Bruin, 2017; Holik et al., 2023). This integration can also contribute to cognitive and emotional development (Sousa & Pilecki, 2013). By incorporating the arts into the learning environment, students can experience the joyful aspects of science and technology and feel comfortable expressing themselves in science lessons (Marques & Costa, 2022). In this way, individuals have positive feelings towards science and technology by experiencing the joyful aspects of science (Steele & Ashworth, 2018). An individual's positive feelings towards himself and science have a positive effect on self-regulation, self-awareness (Ozkan & Umdu, 2021), engagement, self-confidence (Marques & Costa, 2022), self-efficacy, and employability skills necessary for career pursuit and contribution to economic development (Colucci-Gray et al., 2017; Liao, 2016). Incorporating emotions and developing an aesthetic perspective on science (Kim & Kim, 2016) can increase a sense of relativity through science when addressing real-life problems (Eilks & Hofstein, 2015). By incorporating art into the learning environment, students can experience the joyful aspects of science and technology and feel comfortable expressing themselves in science lessons (Marques & Costa, 2022). Studies indicate that STEAM education positively impacts students' academic success (Watts, Duncan, Siegler, & Davis-Kean, 2014). Additionally, research in the literature demonstrates the positive contributions of STEAM education to students' scientific research skills, engineering, and technology competencies.

2.1. STE(A)M in Turkish Education System

STEM and STEAM have gained global recognition, increasing the demand for incorporating STEM into the Turkish educational system. However, it is essential to note that before 2015, no official curriculum changes were implemented for STEM education in Turkey. This change was eventually initiated in 2015 with the support of the Ministry of National Education, specifically under the IETGD (2016). Notably, significant changes took place in the educational landscape by 2016, with a gradual increase in the importance given to STEM and STEAM education in Turkey. The Ministry of National Education (MoNE) published a STEM educational report emphasizing the essential components for integrating STEM into the national education system (IETGD, 2016; Türk, 2019). Following this, in the 2017 STEM Teacher Education Handbook and, more recently, in 2018, the national curriculum highlighted the outcomes and skills based on the STEM acronym (IETGD, 2018).

The global and national relevance of STEAM education has grown, leading to its increased prominence in teacher training programs and schools in Turkey. This emphasis is crucial as both teacher candidates and in-service educators play important roles in disseminating and implementing STEAM education across various educational settings. Consequently, the perspectives, perceptions, and attitudes of graduate and postgraduate teachers regarding STEAM education are essential as they provide insights into the effectiveness of STEAM integration in instructional contexts. Moreover, these insights facilitate the identification of challenges associated with STEAM education, providing necessary support in terms of training, resources, STEAM laboratories, and related activities. This comprehensive approach addresses the multifaceted needs and requirements of STEAM education in Turkey and beyond.

2.2. Importance of the Study

The literature review reveals a wide range of research on the relationship between STEAM and students. Numerous studies investigate the impact of the STEAM approach on student achievement, student skills, motivation, attitudes, self-efficacy, confidence, and self-awareness. Additionally, extensive research exists on the relationship between teachers and STEAM. For example, studies examining the perspectives of design and technology teachers on STEAM highlight limited knowledge of STEAM, which significantly affects student learning (Bell, 2016; Clark & Andrews, 2010; Van Haneghan, Pruet, Neal-Waltman, & Harlan, 2015). In addition, studies on the opinions of elementary school teachers regarding STEAM have found that teachers hold diverse perspectives, have positive attitudes towards STEAM, and believe that STEAM provides a practical environment where students can apply their theoretical knowledge. They also maintain positive thoughts about STEAM (Uğraş, 2017). Park, Byun, Sim, Han, and Baek (2016) surveyed 705 elementary, middle, and college STEAM teachers. They emphasized similar challenges that elementary school teachers face, such as time constraints, increased workload, and lack of financial and administrative support. Park, Dimitrov, Patterson, and Park (2017) surveyed 830 elementary school teachers, and Mustafa Uğraş (2018) implemented an 8-week STEM education program with 19 elementary school teachers. It can be said that both studies yielded similar results, and these similarities can be listed as follows: (1) time constraints on teaching STEM subjects, (2) lack of administrative support, (3) inadequate professional development opportunities, (4) insufficient knowledge about STEM subjects, (5) insufficient parental involvement, and (6) teachers' tendencies to avoid cooperation.

Furthermore, the literature includes qualitative and quantitative studies investigating the perspectives of primary and secondary science and subject teachers on STEAM education. From data obtained from 48 physics, chemistry, and biology teachers, Dare, Ellis, and Roehrig (2014) found that teachers focused on integrating soft skills rather than technical content. They also emphasized the importance of student participation and enjoyment in STEM. Holstein and Keene (2013) gathered data from high school teachers and identified common misconceptions and teachers' beliefs about students that influenced teaching practices. Eroğlu and Bektaş (2022) investigated the views of science teachers trained in STEM education on STEM-based classroom activities and highlighted the importance of science teachers' technical skills and subject knowledge. However, it is essential to note the lack of studies on the perspectives of science teachers pursuing postgraduate studies, such as at the Master's or Ph.D. level, who seek to improve their teaching skills and may be aware of contemporary approaches like STEAM education. Particularly, students who are also teachers can apply their expertise in learning environments. Even if students do not pursue a teaching career after obtaining their Master's degree, the knowledge they acquire is valuable for transferring to learning environments. Therefore, the knowledge and opinions of teachers studying at the Master's level regarding STEAM education, in terms of definition, implementation, and training, are vital.

This study aims to examine the opinions of science teachers at the master's level regarding STEAM education. In this context, the following research question is addressed.

What are the views of teachers studying at the master's level on STEAM education?

3. Method

3.1. Study Design

The methodological approach chosen for this study is phenomenology, a well-established qualitative research methodology. Phenomenological research aims to explore and understand individuals' perceptions, interpretations, and lived experiences regarding the phenomena they encounter (Büyüköztürk, Kiliç Çakmak, Akgün, Karadeniz, & Demirel, 2018). In this study, the phenomenon of investigation is STEAM education. The objective is to gain a profound understanding of the subjective meanings, perspectives, and opinions of both teachers and students regarding the phenomenon of STEAM.

3.2. Participants

The participants of this research consisted of 16 science teachers pursuing Master's degrees in the Department of Mathematics and Science Education at Dicle University in Turkey. Among the participants, four were enrolled in the Department of Physics Education, nine in the Department of Science Education, and three in the Department of Biology Education. Due to the absence of a chemistry program in the Master's curriculum, chemistry teachers could not be included in this study. Out of the participants, four were male, and 12 were female.

3.3. Data Collection

The researchers and experts in the fields of science (physics, chemistry, and biology) and technology education, who have previously studied STEAM, collaborated to develop and refine the data collection instrument based on existing literature. The interview form, which initially consisted of 11 open-ended questions, was revised to include eight open-ended questions after piloting with three students in the science department. The pilot experience provided valuable insights into necessary revisions, including adjustments to the time required to answer and comprehend the questions. Following these stages, the data collection tool was deemed ready for implementation.

Face-to-face interviews were conducted with the participants. The interviews lasted approximately 40 minutes. The research data were obtained in the fall semester of 2022.

3.4. Data Analysis

The data obtained from the study were analyzed using content analysis techniques. Each participant was assigned a code (e.g., S1, S2, S3, etc.) to maintain anonymity. Two researchers involved in the study conducted the data analysis.

In the first step, the data were coded, and categories and themes were derived from these codes. To ensure the consistency and reliability of the coding process, the researchers calculated the reliability coefficient of Miles-Huberman, which was found to be 0.88 using the formula Reliability = Consensus / (Consensus + Dissidence). During the coding process, the two researchers achieved a consensus on seven categories. However, for one category, they encountered disagreement or dissension and were able to resolve it through further discussion and analysis.

4. Results

The perspectives of science teachers on STEAM education were classified into two distinct themes. Table 1 in the supplement provides an overview of these themes, categories, and their corresponding codes for reference.

Table 1. Teachers' views regarding STEAM education.

Theme	Categories	Codes
The structure of STEAM	The definition of a STEAM education: An interdisciplinary approach, the development of creativity, problem-solving skills, and analytical thinking.	Interdisciplinary approach, development of soft skills (Problem-solving skills, creativity, and analytical thinking skills)
	Characteristics of STEAM education	Product-oriented, providing permanent learning, and impact on learning, hands-on activities
	Effectiveness of STEAM education	developing science education, establishing real-life connections, career persuasion, self-awareness, permanent learning, and developing high-level skills
Challenges in STEAM education	Inadequate physical conditions	Lack of materials, excess classroom sizes, and budget constraints
	Educational system challenges	Inflexible curriculum, Overloaded curriculum, and lack of adequate STEAM training
	Individual challenges	Habits, lack of knowledge, and lack of self-efficacy

As observed in Table 1, it can be stated that science teachers' viewpoints have been categorized under two main headings, namely, 'Structure of STEAM' and 'Challenges in STEAM Education.' A detailed explanation of the codes corresponding to these categories is provided below.

4.1. The Definition and Structure of STEAM

4.1.1. Definition of STEAM

Related to the definition of STEAM, science teachers have established a general understanding of STEAM education as an interdisciplinary educational approach that fosters advanced thinking. The related opinions were expressed as follows:

The word STEAM is formed from the initials of the words Science, Technology, Engineering, Arts, and Mathematics. It is an educational approach that connects these disciplines. It aims to promote advanced thinking in students. It is an interdisciplinary education approach that develops creativity and innovative skills (S1).

S1 formulated a clear and fundamental definition of STEAM education through their expression. Additionally, they acknowledged the presence of advanced skills, such as creativity and innovation, although they did not delve deeply into the precise definitions of these skills.

Regarding advanced skills, some science teachers described STEAM as improving imagination, production skills, and promoting multiple intelligences, as can be understood from the comments below:

Under this theme (STEAM), the objective is to obtain a product by thinking imaginatively and designing creatively. The process involves imagining, designing, and ultimately producing a product (S3).

I think that since we use different and various areas of our brain, it is very descriptive, instructive, and the information is more permanent (S9).

Teacher S3 expressed STEAM as ultimately producing a product, which could be clearly understood from the statement “the objective is designing a product.” Additionally, S9 expressed that STEAM could help permanent learning by using different areas of our brain, which could be considered as multiple intelligences.

4.1.2. Structure of STEAM

On the other hand, some science teachers describe STEAM as “hands-on activities and experiential learning environments”. They described their ideas as follows:

Learning by doing and experiential learning (repeated by many students)

Engaging students in hands-on, experiential learning (this term stood out significantly) is essential for facilitating more effective and lasting learning experiences since the student becomes an active participant in the process (S4).

So, according to science teachers' comments above, they thought that STEAM education was based on hands-on activities, by using the words “learning by doing,” experiential learning, or being an active participant in STEAM activities.

The study participants made a connection between STEAM and real life and real-life problems, and they expressed their opinions as follows:

Interwoven with daily life, it simplifies solutions to real-life problems (S7).

Enhances the ability to observe in natural settings (S11).

Science, mathematics, and art are all integral to life itself; hence, the application of STEAM principles can aid in solving everyday problems encountered in daily life (S10).

As it can be seen from the expressions of the students, STEAM was perceived as being closely connected to natural settings and interwoven with daily life. They believed that since STEAM subjects are all integral to life itself, it would be easier to solve real-life problems.

Science teachers S1 and S2 also described STEAM as enjoyable and promoting self-awareness and career persuasion, so they expressed their opinions by saying:

STEAM makes education enjoyable and directs students towards the arts and professions they can create themselves, helping them reflect their ideas and thoughts (S1).

It enables students to become aware of themselves (S2).

From the expression made by S1, STEAM is described as "enjoyable, directing students towards art professions they can potentially pursue." S1's expression that "STEAM assists in expressing their ideas and thoughts" shows that STEAM encourages students and enhances their self-efficacy. From S2's statement, it can be understood that STEAM helps students "to become more self-aware."

4.2. Challenges in Applying STEAM

The analysis of the data sheds light on the opinions of science teachers regarding challenging factors in STEAM education. These factors have been categorized into three distinct codes: those originating from the interaction between students and teachers, those stemming from physical conditions, and those originating from the education system.

4.2.1. Challenges Based on Teachers' and Students' Backgrounds

In light of a significant gap in STEAM education comprehension, science teachers have voiced concerns regarding the limited understanding of STEAM among both teachers and students, and they expressed their opinions as follows:

Insufficient explanation of the STEAM approach and inadequate awareness among teachers result in limited implementation (S12).

I believe that there is a lack of comprehensive information about the STEAM approach. Teachers who provide STEAM education lack sufficient knowledge. The traditional approach is more emphasized in education, and insufficient importance is given to STEAM (S1).

The inadequate knowledge of teachers contributes to the difficulties encountered during implementation. Challenges in implementing this approach may arise due to limited hands-on experiential learning in students' educational journey, which stems from issues such as getting used to having ready-made information (S13).

As can be observed from the comments above, science teachers have specific concerns regarding knowledge deficiencies among teachers, students, and STEAM educators. They express these concerns through statements such as "inadequate awareness" and "lack of comprehensive information." Furthermore, when discussing students' awareness of STEAM, they mention that students are becoming accustomed to having readily available information.

Science teachers also thought that they did not have enough theoretical and practical skills to implement STEAM activities. S6 expressed it as a lack of self-efficacy, stating, "I do not consider myself proficient in STEAM instruction; the full scope of STEAM is not given to students in school." S11 expressed it as a deficiency in technological skills, such as "It seems that proficiency in some technological programs is necessary (such as coding)."

Based on the comments from science teachers, it is apparent that teachers might not feel confident in implementing STEAM activities due to a lack of knowledge and technological skills.

4.2.2. Physical Challenges

One of the predominant challenges highlighted by the majority of science teachers pertained to resource constraints, encompassing limited temporal availability, financial impediments, and the need for improved communication channels between local STEAM laboratories and educational institutions.

Regarding time and economic challenges, science teachers expressed their ideas as follows:

Shortage of materials and budgetary issues are encountered difficulties (S9).

Due to constraints related to time, space, and resources, adequate training is not provided (S15).

These practices are carried out in a healthy way by establishing informatics laboratories or design skill workshops at school (S3).

I do not find it sufficient because I face difficulties in accessing the required materials (S10).

The concepts employed by science teachers were primarily centered around difficulties in accessing resources, the absence of informatics labs, and insufficient budgets. One of the challenges highlighted by science teachers was the gap between schools and STEAM labs. S3 expressed that "The complete scope of STEAM is not conveyed to students in schools. Despite having STEAM centers in our region, our schools do not benefit from these centers." Based on S3's comments, it can be inferred that there was a lack of communication between the schools and the local STEAM lab, resulting in a deficiency in the dissemination of STEAM among students.

4.2.3. Curriculum-Based Challenges

The last challenge mentioned by science teachers was curriculum-related, including an inflexible curriculum and rote learning. Science teachers S5 and S11 discussed the inflexibility of the curriculum as follows:

Teacher preparedness, not having time, inadequate materials, and following the Ministry of Education curriculum make it harder to implement it in school settings (S5).

There might be timing constraints in finding relevant content in other disciplines (S11).

The comments made indicate that there was a constrained and overloaded program provided by the national curriculum, and time limitations that made the implementation of STEAM more challenging.

Another challenge related to the curriculum was the persistence of rote learning. Additionally, S10 stated that because of the exam, there is an insistence on rote learning that persists. S10's expressions indicate that rote learning in the education system does not provide opportunities to apply STEAM.

Based on the findings, it was determined that science teachers define STEAM education as an interdisciplinary approach that develops students' problem-solving, entrepreneurship, creativity, and analytical thinking skills. They also indicated that STEAM education is product-oriented, provides permanent learning, and makes definitions in terms of its structure, activities, and effects on learning.

Participants indicated that STEAM education is essential and highly effective in developing science education, such as concretization, addressing multiple intelligences, promoting permanent learning, and contributing to a love of science. They emphasized that students must establish real-life connections. Participants stated that STEAM learning environments enable students to express themselves and respond to daily problems.

Participants expressed that there are various problems in STEAM education practices. These include inadequacies of physical conditions, such as a lack of materials in learning environments, excessive classroom sizes, and budget constraints; problems arising from the education system itself, such as an overloaded curriculum and a lack of adequate STEAM training; and issues related to teachers and students as individuals.

5. Discussion

Based on the conducted analysis, the participants defined STEAM education as an interdisciplinary approach that emphasizes the development of students (Madirosian & Fox, 2003; Reif & Grant, 2010). They highlighted its impact on promoting innovative skills, problem-solving skills, imagination, and creativity skills (Bertrand & Namukasa, 2020; Uğraş, 2017). Several life skills, such as analytical thinking, problem-solving, decision-making, entrepreneurship, teamwork, and communication skills, hold significance within the science curriculum programs of 2013 and 2018 (MEB, 2018). The analysis of the science teachers' views reveals their favorable inclinations towards STEAM education, driven by the belief that it imparts real-life skills and meaning-making through hands-on, real-world problem-solving exercises (Bertrand & Namukasa, 2020; Costantino, 2018; Holmlund, Lesseig, & Slavit, 2018). The teacher-students also recognized that STEAM education increases self-awareness (Ozkan & Umdu, 2021), which they acknowledged as being beneficial for their career aspirations (Kim & Park, 2014). Self-awareness allows individuals to recognize their skills, competencies, and limitations, resulting in increased awareness and empathy toward others (Hughes, 2011). The science teachers emphasized the creation of an enjoyable and secure learning environment through STEAM education, primarily attributed to the incorporation of artistic elements (Marques & Costa, 2022). The integration of art elements such as colors, music, images, and sculptures can evoke deep meaning and emotions, aiding individuals' self-reflection and building self-confidence (Hughes, 2011). Arts-based learning approaches encourage individuals to work without rules or predefined frameworks, allowing them to step out of their comfort zone, take risks, and embrace their semantic knowledge fearlessly (Hughes, 2011). Furthermore, STEAM education can play an inclusive role for learners who are underrepresented in the education system, contributing to their emancipation and breaking the chain of cultural reproduction (Bourdieu, 1979; Freire, 2000).

Though the participants had generally positive opinions, they had limited views on STEAM education. In particular, pre-service teachers needed more information about STEAM education (He, Simon, & Chiang, 2022; Lee, 2021).

However, STEAM education, which is a critical element in advancing science and student development, faces several practical problems. One notable problem is the lack of infrastructure and resources in learning environments. There are studies that emphasize the lack of materials and inadequate laboratory equipment and activities as significant barriers to STEAM education (Ejiwale, 2013; Eroğlu & Bektaş, 2022; Kartini & Widodo, 2020). In addition, the lack of financial support for STEAM education initiatives was identified as an obstacle by Landicho (2020) and Lee (2021).

There is also a considerable lack in the proficiency of education specialists in conducting STEAM activities, as emphasized by Bilbokaitė, Bilbokaitė-Skiauterienė, and Šlekien (2019), Kartini and Widodo (2020), and Holmlund et al. (2018). Batty and Reilly (2023) strongly suggested that trained practitioners implement STEAM activities more effectively. These neglects and gaps in education have led to science teachers lacking the necessary self-efficacy to implement STEAM activities due to a lack of knowledge, technological skills, materials, and training (Kartini & Widodo, 2020; Park et al., 2017; Uğraş, 2018). In order to recover this situation, it is crucial to train ill-equipped teachers to increase their self-efficacy and to improve their skills to effectively implement STEAM activities (Dare et al., 2014; Wang, 2012).

This study also reveals one of the difficulties, which is the resistance of students who are too accustomed to traditional methods to change (Holmlund et al., 2018). Changing the learning and study habits that students develop throughout their academic lives can be difficult, especially for older students (Hattie, Biggs, & Purdie, 1996; Holstein & Keene, 2013; Mustafa Uğraş, 2018). In addition, insistence on rote learning due to a rigid national curriculum and national examination system can also hinder the implementation of STEAM education (Holmlund et al., 2018; Özbilen, 2018).

In addition to the difficulties mentioned, the participants have a positive view of STEAM education, but their knowledge on this issue is limited. As a solution, effective methods and techniques can be used to ensure that academics working in education faculties have a solid understanding of STEAM education. The frequency of STEAM applications can be increased. It is thought that cooperation between teachers in teacher training centers and at different levels of the education system should be ensured. Cooperation should be emphasized in terms of professional development and pedagogical approaches in STEM education and its implementation into the curriculum (Margot & Kettler, 2019). Schools can be made more open, and collaboration between local centers such as museums, science and art centers, zoos, botanical gardens, and industry centers can also support STEAM education (Bevan et al., 2010; Margot & Kettler, 2019).

6. Conclusion

As a result, it was found that science teachers who are pursuing their master's degree at Dicle University have positive perceptions of STEAM education regarding its perceived benefits for students' cognitive and emotional development. However, the participants' lack of knowledge about STEAM and their limited vocabulary are also part of the study's data.

Therefore, the government needs to support academics, students, and educators who work on STEAM. In addition, the perspectives of academically advanced participants on STEAM education should be taken into account to strengthen its integration.

Although the participants' knowledge, data collection methods, and sample group are limited, this study can provide valuable insights to promote STEAM education. It is important to improve teachers' knowledge and understanding of STEAM and to develop more effective methods for integrating STEAM pedagogy into the curriculum and implementing professional development programs focused on STEAM education. Encouraging collaboration among educators, including making schools open schools and establishing partnerships between schools and local institutions to foster collaboration, can further enrich learning experiences. Finally, investing in physical and technological resources to overcome barriers such as infrastructure constraints and providing government support for educators and STEAM initiatives are vital to the development and effectiveness of STEAM education.

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