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# A Different Perspective on Design-Skill Workshops and STEM Education: Teachers' Opinions

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**Abstract**

This study investigated teachers' opinions of Design-Skill Workshops and STEM education. The study adopted a qualitative phenomenological research design. The sample consisted of 12 teachers recruited using purposive convenience sampling. The data were analyzed using content analysis. Participants stated that Design-Skill Workshops contributed to their development and that schools could integrate Design-Skill Workshops into education if they improved their infrastructure. They also noted that universities should provide undergraduate students with courses on Design-Skill Workshops and that schools should provide teachers with in-service training on Design-Skill Workshops s. Participants also talked about the advantages of STEM education. However, they added that they did not know enough about STEM education and that the curriculum was not aligned to STEM education. Recommendations were made based on these results.

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## Introduction

Technological developments are critical for countries (Karakaya & Avgın, 2016) because they are the key drivers of economic growth (Gökbayrak & Karışan, 2016). Countries interested in taking firm steps to improve socioculturally and economically have reformed their education systems (Karalar et al., 2021) because they have recognized the importance of integrating technology with education (Şahin-Topalcengiz & Yıldırım, 2019). Therefore, countries focus on different educational approaches to promote advances in technology. One of those approaches is STEM education, which integrates the disciplines of science, technology, engineering, and mathematics and associates them with everyday life (Aykan & Yıldırım, 2021; Kızılay, 2018). STEM education aims to produce by integrating theory and practice (Ormancı, 2020). In other words, STEM education allows students to put their knowledge into practice to make things (Aslan-Tutak et al., 2017).

Many countries have integrated STEM into their education systems (Tekerek et al., 2016). STEM education is implemented in workshops and laboratories in schools, where students put theory into practice. Therefore, workshops play a crucial role in applied education. Schools in Turkey focus on Design-Skill Workshops (DSWs) to integrate theory into practice (Güleş & Kılınç, 2020). In other words, DSWs help students put theory into practice (Gülhan, 2021) and acquire new knowledge and develop skills.

### *Significance*

This study investigated teachers' views of DSWs and STEM education. There is limited research on DSWs (Bakırcı & Kaplan, 2021; Güleş & Kılınç, 2020; Gülhan, 2021; Gündoğan, & Can 2020). In addition, none of those studies address DSWs and STEM education at the same time. To our knowledge, this is the first study to focus both on DSWs and STEM education. Therefore, this study will contribute to filling that gap in the literature.

### *Research questions*

This study investigated teachers' views of DSWs and STEM education. The main research question was, "What do teachers think about DSWs and STEM education?" The subquestions are as follows:

1. What do teachers think about DSWs?
2. What do teachers think about STEM education?

## Method

### *Research model*

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This study adopted a phenomenological research design to unveil teachers' views of STEM education and DSWs objectively, validly, and reliably. According to Yıldırım and Şimşek (2011), researchers use phenomenological research designs to collect detailed information from people who have experiences with a phenomenon or event. Phenomenology was the research design of choice because this study focused on teachers' views of STEM education and DSWs.

***Research sample***

The sample consisted of 12 teachers recruited using purposive convenience sampling, a non-probability sampling method. Table 1 shows the participants' demographic characteristics. For confidentiality, each participant was assigned a pseudonym (Eren, Dilek, etc.).

**Table 1.**
Demographic characteristics

| Theme | Categories | Code | f |
|---|---|---|---|
| Demographic Characteristics | Gender | Woman | 7 |
| | | Man | 5 |
| | Major | Science | 8 |
| | | Social studies | 2 |
| | | Mathematics | 1 |
| | | Construction Technologies | 1 |
| | Experience (year) | 1-4 | 7 |
| | | 5-10 | 2 |
| | | 11-17 | 1 |
| | | 18-25 | 2 |

***Data collection tools***

***STEM education and design-skill workshop interview questionnaire (SEDSWIQ)***

Semi-structured interviews were conducted with participants to determine their views of STEM education and DSWs. The data were collected using a semi-structured interview questionnaire developed by the researcher. The STEM Education and Design-Skill Workshop Interview Questionnaire (SEDSWIQ) consisted of nine intelligible and open-ended questions. Two experts checked the questionnaire for intelligibility and relevance. The questionnaire was finalized based on their feedback.

***Data analysis***

The data were analyzed using inductive content analysis. Themes and codes were developed. The findings were interpreted based on the themes and codes. Two experts coded the data and developed themes and codes separately. They identified the parts on which they agreed and disagreed during coding and discussed those on which they disagreed until they reached a consensus. Afterward, interrater reliability was calculated (Miles et al., 2014), which was 82%.

**Results**

This section addressed the participants' responses and presented the findings in tables and models.

***Participants' opinions of DSWs***

**Table 2.**
Participants' opinions of DSWs

| Theme | Code |
|---|---|
| Participants' Views of DSWs | Helping students discover their talent (n=5) |
| | Being helpful to students (n=3) |
| | Helping students develop problem-solving skills (n=2) |
| | Improving productivity (n=1) |
| | Promoting creativity (n=1) |

| | |
|---|---|
| | Applied learning (n=1) |
| | Learning retention (n=1) |
| | Improving academic performance (n=1) |

Participants gave different responses to the question about DSWs. They stated that DSWs helped students discover their talent and develop problem-solving skills. They also noted that DSWs improved productivity and academic performance and promoted creativity. The following are quotes from participants:

*Veli: I think that DSWs can be helpful to students.*

*Işılay: I believe that DSWs will be good for students because they stimulate their creativity.*

*Ali: I think that DSWs will be good for students because they will help them discover their talent and develop problem-solving skills.*

***The Effect of DSWs on students' development***

**Table 3.**
The Effect of DSWs on students' development

| Theme | Code |
|---|---|
| The Effect of DSWs on Students' Development | Helping students discover their talent (n=5) |
| | Promoting creativity (n=3) |
| | Problem-solving skills (n=2) |
| | Abstract thinking (n=2) |
| | Teamwork (n=2) |
| | Productivity (n=2) |
| | Stimulating imagination (n=1) |
| | Critical thinking skills (n=1) |
| | Boosting self-confidence(n=1) |
| | Taking responsibility (n=1) |

Participants gave different responses to the question about the effect of DSWs on students' development. They stated that DSWs helped students discover their talent and develop problem-solving and critical thinking skills. They noted that DSWs promoted creativity, teamwork, and productivity, stimulated imagination and boosted self-confidence. The following are quotes from participants:

*Veli: Design-Skill Workshops can help students discover their talent.*

*Demet: Design-Skill Workshops stimulate imagination and promote creativity and teamwork.*

*Nur: Design-Skill Workshops help students develop abstract thinking skills.*

***Applicability of DSWs in turkey***

**Table 4.**
Participants' views of the applicability of DSWs in turkey

| Theme | Code |
|---|---|
| The applicability of DSWs in Turkey | Applicable (n=6) |
| | Somewhat applicable (n=2) |
| | Inapplicable (n=4) |

Participants gave different responses to the question about the applicability of DSWs in Turkey. Six participants stated that DSWs could be applied in Turkey. Two participants noted that DSWs were somewhat applicable in Turkey. Four participants did not think that DSWs could be used in Turkey. The following are quotes from participants:

*Nur: Turkey can achieve any project.*

*Serkan: I don't think Turkey can apply DSWs thoroughly because not every school has the same infrastructure.*

*Ali: I don't think Turkey can hold DSWs given the circumstances because schools have no infrastructure. I also don't believe that teachers are equipped enough.*

***The infrastructure of schools for DSWs***

**Table 5.**
Participants' views of the infrastructure of schools for DSWs

| Theme | Code |
|---|---|
| Infrastructure of Schools for DSWs | Adequate (n=1) |
| | Inadequate (n=11) |

Almost none of the participants believed that the schools in Turkey had the adequate infrastructure for DSWs, except only one participant. The following are quotes from participants:

*Ali: I don't think the schools in Turkey have a proper physical structure and infrastructure for DSWs.*

*Aslı: I don't think the schools in Turkey have adequate infrastructure DSWs as they lack materials and appropriate settings.*

*Işılay: I don't think it's adequate. The schools have a shortage of materials and tools.*

***In-Service training for DSW***

**Table 6.**
Participants' opinions of in-service training for DSWs

| Theme | Code |
|---|---|
| In-service training in DSWs | Necessary (n=11) |
| | Unnecessary (n=1) |

Almost all participants agreed that schools should provide teachers with in-service training in DSWs. Only one participant stated that in-service training was unnecessary.

***Undergraduate education on DSWs***

**Table 7.**
Participants' Views of Undergraduate Education on DSWs

| Theme | Code |
|---|---|
| Undergraduate Education on DSWs | Yes (n=3) |
| | No (n=9) |

Nine participants stated that they had not received education on DSWs during their undergraduate years. However, three participants noted that they had received undergraduate education on DSWs.

***Participants' opinions of STEM education***

**Table 8.**
Participants' opinions of STEM education

| Theme | Code |
|---|---|
| Participants' Views of STEM Education | Helping students develop 21st-century skills (n=6) |
| | Learning by doing and living (n=4) |
| | Producing (n=4) |
| | Concrete learning (n=3) |
| | Relating to everyday life (n=2) |
| | Contributing to vocational high schools (n=1) |
| | Active learning (n=2) |
| | Learning through research (n=1) |
| | Learning retention (n=1) |
| | Contribution to economic growth (n=1) |

Participants stated that STEM education facilitated concrete and active learning and helped students develop 21st-century skills and relate their knowledge to everyday life. They also added that STEM education promoted learning by doing and living and contributed to economic growth. The following are quotes from participants:

*Demet: STEM education allows students to learn by doing and living*

*Gül: STEM education helps students develop 21st-century skills.*

*Ahmet: STEM education encourages students to produce stuff, so they learn how to put knowledge into practice.*

***Self-efficacy in STEM education***

**Table 9.**
Self-Efficacy in STEM education

| Theme | Code |
|---|---|
| Self-Efficacy in STEM education | Yes (n=1) |
| | Somewhat yes (n=1) |
| | No (n=10) |

Most participants considered themselves ill-equipped about STEM education. One participant believed that he knew enough about STEM education, while another saw himself somewhat equipped about STEM education. The following are quotes from participants:

*Serkan: I don't think I'm qualified enough when it comes to STEM education because I think I might have difficulty putting it into practice in class.*

*Ayla: I think I know enough about STEM education in theory, but I might have a hard time putting it into practice.*

*Dilek: I feel like I'm qualified enough, but the sky's the limit when it comes to learning new thing.*

***The suitability of curricula for STEM education***

**Table 10.**
Participants' opinions of the suitability of curricula for STEM Education

| Theme | Code |
|---|---|
| Suitability of Curricula for STEM Education | Not suitable (n=10) |
| | Somewhat unsuitable (n=2) |

Most participants considered the curricula unsuitable for STEM education. The following are quotes from participants:

*Eren: I don't think the curricula are suitable for STEM education because there are too many learning outcomes but too few hours of class for STEM education.*

*Nur: The curricula don't meet the requirements of STEM education.*

*Aslı: Not exactly, because the topics should be concise so that teachers wouldn't have any time management issues when it comes to performing STEM education.*

**Discussion**

The first result of the first subquestion addressed participants' views of Design-Skill Workshops (DSWs). They stated that DSWs helped students discover their talent and develop problem-solving skills. They also noted that DSWs promoted learning retention and applied learning, stimulated creativity, and improved productivity and academic performance. These results are consistent with the literature (Gülhan, 2021; Öztürk, 2020).

The second result of the first subquestion focused on participants' views of the effect of DSWs on students' development. Participants thought that DSWs promoted creativity, abstract thinking, and teamwork and helped students discover their potential and develop problem-solving skills. Participants added that DSWs encouraged students to build a sense of responsibility. These results are consistent with the literature (Acar et al., 2018; Gündoğan & Can, 2020).

The third result of the first subquestion discussed whether participants thought that DSWs could be held in Turkey. Half the participants believed that DSWs could be held in Turkey. Two participants believed that DSWs were somewhat applicable in Turkey, while four did not think DSWs could be held in Turkey. According to the fourth result of the first subquestion, most participants believed that the schools in Turkey had an inadequate infrastructure for DSWs. The fifth result of the first subquestion showed that participants believed that schools should provide teachers with in-service training in DSWs. The sixth result of the first subquestion indicated that most participants had not received undergraduate education on DSWs. Research also shows that the schools in Turkey do not have enough workshops and that teachers and preservice teachers should be provided with training in DSWs (Güleş & Kılınç, 2020; Gündoğan & Can, 2020; Saraç & Yıldırım, 2019). Our results are consistent with the literature.

The first result of the second subquestion focused on participants' views of STEM education. Participants stated that STEM education promoted learning by doing and living and concrete learning and helped students develop 21st-century skills and relate their knowledge to everyday life. Moreover, participants noted that STEM education facilitated active learning, learning retention, and learning through research, and contributed to economic growth. Karakaya et al. (2018) also found that STEM education contributed to economic growth and helped students relate to everyday life and develop 21st-century skills. Karalar et al. (2021) also reported that STEM education helped students develop 21st-century skills and promoted concrete and permanent learning. Research also shows that STEM education helps children develop 21. century skills (Eroğlu & Bektaş, 2016; Günbatar & Tabar, 2019; Köse & Ataş, 2020; Şahin, 2021; Şahin & Kabasakal, 2018; Yıldırım, 2021; Yıldırım & Sidekli, 2018). Our results are consistent with the literature.

The second result of the second subquestion investigated whether participants felt competent about STEM education. Most participants felt ill-equipped about STEM education. One participant regarded himself as somewhat equipped, while another participant considered himself equipped about STEM education. Research also shows that teachers are supposed to have adequate knowledge of and be equipped about STEM education (Murphy & Mancini-Samuelson, 2012; Stohlmann et al., 2012; Wang et al., 2011). Our results are consistent with the literature (Yıldırım, 2018; Yıldırım, 2020).

The third result of the second subquestion addressed whether participants believed that the curricula were suitable for STEM education. Most participants considered the curricula unsuitable for STEM education. Research also shows that teachers have difficulty integrating STEM education into curricula (Alagöz & Sözen, 2021; Yıldırım, 2018). Our results are consistent with the literature.

## Conclusion

The six results of the first subquestion are as follows: First, participants had positive opinions about Design-Skill Workshops (DSWs). Second, they remarked that DSWs had positive effects on students' development. Third, half the participants believed that DSWs could be held in Turkey. Fourth, most participants thought that schools had an inadequate infrastructure for DSWs. Fifth, participants agreed that there should be in-service training in DSWs. Lastly, most participants had not received undergraduate education on DSWs, while others had received undergraduate education on DSWs in different courses.

The three results of the second subquestion are as follows: First, participants expressed different positive aspects of STEM education. Second, they did not consider themselves equipped enough about STEM education. Third, they emphasized that the curricula were unsuitable for STEM education.

## Future Research

The schools in Turkey do not have adequate infrastructure for DSWs. Therefore, administrators should take steps to accommodate their schools for DSWs. Schools should provide teachers with in-service training in DSWs. Universities should offer students courses on DSWs. Participants addressed positive aspects of STEM education. Therefore, schools should integrate STEM education into curricula. However, participants did not think that the curricula in Turkey were suitable for STEM education. The Ministry of National Education should undertake projects to make the curricula ideal for STEM education.

## Limitations

This study had two limitations. First, the sample size was small. Researchers should recruit more participants. Second, the study adopted a phenomenological research design. Therefore, future studies should employ data diversification to elicit detailed information on DSWs.

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