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Science Teachers' Views on Design-Skill Workshops: A Phenomenological Study[1]

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Abstract

This study investigated science teachers' views on design-skill workshops (DSWs). The study adopted a phenomenological research design. The sample consisted of 25 science teachers recruited using purposive convenience sampling. Data were analyzed using content analysis. Participants stated that DSWs promoted permanent and concrete learning by living and doing. They noted that they performed STEM activities and experiments during DSWs. They also added that DSWs were beneficial for both teachers and students. However, they remarked that they experienced some problems during DSWs and made recommendations about them. Suggestions were made for future research based on the results. Future studies should employ mixed designs and data diversification to elicit detailed information on DSWs.

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Introduction

Advances in science have wrought significant changes in every aspect of life, ranging from health to economy to agriculture to education, etc. (Alkayış, 2020; Yeşilorman & Koç, 2014). Recent educational developments have ushered in a new era where individuals are expected to develop various skills and qualifications (Okal et al., 2020). This paradigm change has paved the way for novel approaches, one of which is STEM education (Akgül & Yıldırım, 2018; Arslan & Yıldırım, 2020).

STEM education integrates science, technology, engineering, and mathematics and relates them to everyday life (Yıldırım, 2020a). STEM education combines scientific and mathematical knowledge with engineering design processes to create products (Yıldırım et al., 2021). STEM education aims to stimulate creativity and help students develop problem-solving, critical thinking, and design skills (Avcı et al., 2021; Karalar et al., 2021). Many countries have integrated STEM into their education systems (Çakır et al., 2019). Turkey's Education Vision 2023 also underlines the importance of 21st-century and design skills (Güleş & Kılınç, 2020). Therefore, the Turkish education system has focused on design-skill workshops (DSWs).

Design-skill workshops integrate theory with practice (Gülhan, 2021) and help students learn new things and develop new skills. Teachers play a vital role in this process because they are the ones who are primarily responsible for teaching in class (Karademir & Yıldırım, 2021; Türk et al., 2018;). Therefore, they are also responsible for putting on DSWs. How well teachers hold DSWs depends on how much experience and knowledge they have of them (Yıldırım, 2020b). Experience and knowledge are directly related to self-efficacy (Bandura, 1993). Teachers with self-efficacy in DSWs are likely to run them more effectively (Aykan & Yıldırım, 2021). Therefore, we should identify what teachers think about DSWs. However, there is limited research on teachers' views of DSWs (Güleş & Kılınç, 2020; Gülhan, 2021). Therefore, this study aimed to determine science teachers' views on DSWs. The main research question was, "What do science teachers think about DSWs?"

Method

Research model

This study adopted a phenomenological research design to unveil science teachers' views of DSWs objectively, validly, and reliably. Researchers employ phenomenological research designs to collect detailed information from people who have experiences with a phenomenon or event (Yıldırım & Şimşek, 2011).

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Research sample

The sample consisted of 25 science teachers recruited using purposive convenience sampling, a non-probability sampling method. Researchers use convenience sampling to recruit people who are available or volunteer or are willing to participate in the research study (Yıldırım, & Şimşek, 2011). Convenience sampling is a time- and cost-efficient method by which researchers select participants most suited to the research purpose (Patton, 2002). For confidentiality, participants and parents were assigned pseudonyms (K1, K2, etc.).

Table 1.
Demographic characteristics

Theme	Categories	Code	f
Demographic Characteristics	Gender	Woman	20
		Man	5
	Age (year)	20-25	6
		26-35	13
		36-45	4
		46-54	2
	School type	Public	17
		Private	8
	Work experience (year)	1-4	15
		5-10	5
		11-17	2
		18-25	1
		26-35	2

Data Collection Tools

Design-skill workshop interview questionnaire (DSWIQ)

Semi-structured interviews were conducted with participants to determine their views of DSWs. The data were collected using the semi-structured Design-Skill Workshop Interview Questionnaire (DSWIQ) developed by the researcher. The instrument consisted of six intelligible and open-ended questions. Two experts checked the questionnaire for intelligibility and relevance. The questionnaire was revised based on their feedback. A pilot study was conducted with three science teachers. The questionnaire was finalized based on their feedback.

Data analysis

The data were analyzed using content analysis. The interviews were recorded and transcribed. Themes, categories, and codes were developed. The findings were interpreted based on the themes, categories, and codes. Two experts coded the data and developed themes, categories, 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 80%.

Results

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

Participants' views of the importance of DSWs

Table 2.
Participants' views of the importance of DSWs

Theme	Codes
The Importance of DSWs	Learning by doing and living (n=6)
	Helping students develop life skills (n=5)
	Creativity (n=4)
	Cognitive development (n=4)
	Psychomotor development (n=4)
	Different types of intelligence (n=4)
	Professional development (n=3)
	Imagination (n=3)
	Problem-solving skill (n=2)
	Interesting (n=3)
	Innovative (n=3)
	Concrete thinking (n=2)
	Learning retention (n=2)
	Helping students adapt to school (n=1)
	Interdisciplinarity (n=1)

Participants gave different responses to the importance of DSWs. They stated that DSWs stimulated creativity, promoted learning by doing and living, and helped students develop cognitive and motor skills. The following are quotes from participants:

K1: I think that design-skill workshops encourage students to research and question things by contributing to novel education approaches.

K2: There should be more DSWs because they help students put their knowledge into practice in everyday life and turn it into creative products, so DSWs should be encouraged.

K3: I think that DSWs have positive effects; like they help students develop engineering skills, do research, and question things.

Design-skill workshop activities

Table 3.
Participants' views of DSW activities

Theme	Codes
DSW Activities	Encouraging students to conduct experiments (n=7)
	Robotic coding activities (n=3)
	Scientific studies (n=2)
	STEM activities (n=2)
	Three-dimensional designs (n=2)
	Virtual reality (n=2)
	Creating models (n=1)

Participants noted that they conducted various activities during DSWs. They remarked that design-skill workshops involved students in robotic coding activities and encouraged them to conduct experiments and scientific and STEM activities. The following are quotes from participants:

K3: I choose activities that are related to STEM teaching.

K4: I choose activities that help students do science experiments, design things, and get to know themselves.

K5: Robotic coding, experiments.

The contribution of DSWs to students

Table 4.
The contribution of DSWs to students

Theme	Codes
The Contribution of DSWs to Students	Increasing motivation (n=5)
	Academic confidence (n=5)
	Learning retention (n=5)
	Creativity (n=5)
	Helping students discover their interests (n=4)
	Exchange of information (n=4)
	Concrete learning (n=3)
	Problem-solving skill (n=2)
	Discovery (n=2)
	Responsibility (n=2)
	Sympathy skills (n=1)
	Critical thinking skills (n=1)
	Process-focused (n=1)

Participants gave different responses to the question about the contribution of DSWs to students. They stated that DSWs promoted learning retention, stimulated creativity, increased motivation, and helped students build academic confidence and develop problem-solving and critical thinking skills. The following are quotes from participants:

K1: I think DSWs encourage students to focus on the process rather than the result. Such workshops promote peer learning because they allow students to share their opinions in front of others. I also think that DSWs help students develop a sense of responsibility.

K6: I've realized that DSWs help students build academic confidence, socialize with peers, and understand topics through practice.

K7: Design-skill workshops help students develop creative thinking skills and enjoy learning.

The contribution of DSWs to teachers' professional development

Table 5.
The contribution of DSWs to teachers' professional development

Theme	Codes
The contribution of DSWs to teachers' professional development	Academic confidence (n=8)
	Technological literacy (n=7)
	Promoting professional development (n=6)
	Relating to daily life (n=5)
	Student-teacher interaction (n=4)
	Increasing motivation (n=3)
	Classroom management (n=3)
	Creativity (n=4)

Participants noted that DSWs made different contributions to teachers' professional development. They remarked that DSWs helped teachers develop professional skills and become academically more confident and technologically more literate. The following are quotes from participants:

K6: Design-skill workshops help me develop professional skills, keep me updated about technological developments and use them in lectures.

K8: Design-skill workshops encourage teachers to improve themselves because classroom management and teaching styles will change.

K9: Design-skill workshops keep me updated about advances in technology and use them in class.

The Challenges of DSWs

Table 6.
The Challenges of DSWs

Theme	Codes
The Challenges of DSWs	Difficulty adapting (n=4)
	Crowded classrooms (n=4)
	Short class time (n=2)
	Limited content (n=2)
	Dangerous activities (n=1)

Participants stated that students had difficulty adapting to DSWs. The other challenges of DSWs were crowded classrooms, limited content, and dangerous activities. The following are quotes from participants:

K6: I sometimes have a hard time managing the time. Besides, there are too many classrooms, and so, I just can't keep things under control during DSWs.

K10: I think that the science classes are too short for DSWs. I don't think teachers can hold DSWs with too many students in class.

K11: The students couldn't just adapt to DSWs.

Participants' recommendations with regard to DSWs

Table 7.
Participants' Recommendations with regard to DSWs

Theme	Codes
Design Skill Recommendations	Design-skill workshops should be more common (n=7)
	Making the process more effective (n=6)
	Using different materials (n=6)
	Spacious workshops (n=3)
	Cooperative learning (n=3)
	Training teachers (n=3)
	Fewer students in class (n=2)
	Longer class time (n=1)

Participants made different recommendations for improving the quality of DSWs. For example, they stated that DSWs should encourage students to use different materials for a more effective process. They added that teachers should be trained about DSWs and hold DSWs in spacious workshops with as few students as possible. The following are quotes from participants:

K10: Teachers should be trained so that they can hold DSWs more effectively. The classes should be longer, and there should be fewer students.

K12: Students should have access to more materials during DSWs.

K4: I think that every school should have a separate venue for DSWs.

Discussion and Conclusion

The first interview question addressed participants' views of the importance of design-skill workshops (DSWs). Participants stated that DSWs were important because they provided an environment in which students could learn by doing and living. They noted that DSWs promoted creativity and helped students develop cognitive and motor skills. These

results are consistent with the literature (Gülhan, 2021; 2020; Öztürk, 2020).

The second interview question focused on participants' views of DSW activities. They noted that they conducted experiments and involved their students in robotic, scientific, and STEM activities during DSWs. These results are consistent with the literature (Alemdar-Aydın, 2019; Gündoğan & Can, 2020).

The third interview question investigated participants' views of the contribution of DSWs to students. They remarked that DSWs made students more motivated and academically more confident. They added that DSWs promoted learning retention and creativity. Acar et al. (2018) also reported that workshops helped primary school students acquire new knowledge and develop new skills. Our results are consistent with the literature (Erbay, 2017; Gündoğan & Can, 2020).

The fourth research question concentrated on participants' views of the effect of DSWs on teachers' professional development. Participants stated that DSWs made teachers academically more confident and technologically more literate. Güleş and Kılınç (2020) also found that DSWs helped teachers develop personal and professional skills. Our results are consistent with the literature.

The fifth interview question addressed what challenges participants experienced during DSWs. They noted that students had difficulty adapting to DSWs. They remarked that DSWs were challenging because there were far too many students in class, and the classes were too short to hold DSWs effectively. Gündoğan and Can (2020) determined that DSWs were challenging because teachers were not equipped enough, parents considered DSWs an extra burden on their budgets, and schools lacked proper infrastructure. Bakırcı and Kaplan (2021) detected that teachers faced various challenges during DSWs. Our results are consistent with the literature (Saraç & Yıldırım, 2019).

The last interview question focused on participants' recommendations about DSWs. They remarked that more teachers should hold DSWs and use different materials.

Limitations and Future Research

This study had two limitations. First, the sample consisted only of science teachers. Researchers should recruit teachers from different branches and school administrators. Second, the data were based on teachers' statements. Future studies should employ mixed designs and data diversification to elicit detailed information on DSWs. Our results will pave the way for further research on this topic.

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References

Acar, A., Soysal-Acar, A. Ş., Akduman, N., & Lise, Y. (2018). Design, art and game for a resilient and sustainable future: workshops for children and youth. *İdeal Kent, 27*(10), 518-537. https://doi.org/10.31198/idealkent.468301

Akgül, N., & Yıldırım, B. (2018). Research on the effect of STEM SOS model in terms of different variables. *El-Cezerî Journal of Science and Engineering, 5*(2), 316-326.

Alemdar-Aydın, S. (2019). *Creative writing education in Yasar Kemal's design and skill workshop in high school through the works adapted to the theater*. (Unpublished masters thesis). Marmara University: İstanbul.

Alkayış, A. (2020). Digitization and education 4.0 from the educational philosophy perspective. *Bingöl University Journal of Social Sciences Institute,* (21), 221-238.

Arslan, Ö., & Yıldırım, B. (2020). The effect of STEM practices on self-efficacy pedagogical and content knowledge of pre-service teachers. *Inonu University Journal of the Faculty of Education, 21*(3), 1339-1355. https://doi.org/10.17679/inuefd.789366

Avcı, E., Okuşluk, F., & Yıldırım, B. (2021). The Effect of STEM-based robotic coding activities on gifted students' attitudes towards coding. *Journal of Educational Theory and Practice Research, 7*(2), 228-235.

Aykan, A., & Yıldırım, B. (2021). The Integration of a lesson study model into distance STEM education during the covid-19 pandemic: Teachers' views and practice. *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-021-09564-9

Bakırcı, H., & Kaplan, Y. (2021). Encountered problems by science teachers in the field of engineering and design skills and suggestions for

solutions. *Journal of Computer and Education Research, 9*(18), 626-654. https://dx.doi.org/10.18009/jcer.908161

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*(2), 117-148.

Çakır, Z., Yalçın, S. A., & Yalçın, P. (2019). Investigation of the effects of pre-school teacher candidates creativity skills on montessori approach based STEM effectiveness. *Journal of the International Scientific Research, 4*(2), 392-409.

Erbay, F. (2017). Informal education in education and design workshops of museums. *Ministry of National Journal*, 214, 239- 253.

Güleş, E. & Kılınç, H.H. (2020). Primary school teachers' views about design skills workshops. *Turkish Studies - Education, 15*(6), 4227-4245. https://dx.doi.org/10.47423/TurkishStudies.47031

Gülhan, F. (2021). Evaluation of school stakeholders' opinions based on their expectations about design- skill workshops. *International Journal of Humanities and Education, 7*(15), 235-260. Retrieved from https://dergipark.org.tr/tr/pub/ijhe/issue/62183/886158

Gündoğan, A., & Can, B. (2020). Pre-service teachers' views on design-skill ateliers. *Turkish Studies - Educational Sciences, 15*(2), 851-876. https://doi.org/10.29228/TurkishStudies.40357

Karademir, A., & Yıldırım, B. (2021). A Different perspective on preschool STEM education: Preschool STEM education and engineering for preservice teachers. *Journal of Turkish Science Education, 18*(3), 338-350.

Karalar, H., Sidekli, S., & Yıldırım, B. (2021). STEM in transition from primary school to middle school: primary school students' attitudes. *International Electronic Journal of Elementary Education, 13*(5), 687-697.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook.* SAGE Publications.

Okal, G., Yıldırım, B., & Timur, S. (2020). The Effect of coding education on 5th, 6th and 7th grade students' programming self-efficacy and attitudes about technology. *Educational Policy Analysis and Strategic Research, 15*(2), 143-165.

Öztürk, Z. (2020). Applications for design and skill laboratories - example of germany. *Ministry of National Journal, 49*(227), 141-158.

Saraç, E., & Yıldırım, M. (2019). Teachers' views on science course curriculum of the year 2018. *Academy Journal of Educational Sciences, 3*(2), 138-151.

Türk, N., Kalaycı, N., & Yamak, H. (2018). New trends in higher education in the globalizing world: STEM in teacher education. *Universal Journal of Educational Research, 6*(6), 1286-1304. https://doi.org/10.13189/ujer.2018.060620

Yeşilorman, M., & Koç, F. (2014). A Critical view on the technological basis of information society. *Fırat University Journal of Social Science, 24*(1), 117-133.

Yıldırım, A., & Şimşek, H. (2011). Qualitative research methods in social sciences. İstanbul: Seçkin Yayınları.

Yıldırım, B. (2020a). Köy enstitülerinden STEM öğretmen enstitülerine [From village institutes to STEM Teacher Institutes]. Ankara: Nobel Publising.

Yıldırım, B. (2020b). A model proposal for teacher training: STEM teacher institutes training model. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi [PAU Journal of Education]*, 50, 70-98. https://doi.org/10.9779/pauefd.586603

Yıldırım, B., Öcal, E., & Şahin-Topalcengiz, E. (2021). STEM in movies: female preservice teachers' perspectives on movie "hidden figures". *Journal of Baltic Science Education, 20*(5), 740-758.