

Communication, Education, and Radio Technologies Summit Teacher Training Model in Türkiye



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Abstract

The Communication, Education, and Radio Technologies Summit (HERTZ) addresses the technical and educational importance of amateur radio in the field of wireless communication technologies in the context of teachers working at science and arts centers responsible for the education of gifted individuals in Türkiye. The research is supported under the TÜBİTAK 4005 Innovative Education Applications Support Program and conducted by the Samsun Atakum Science and Arts Center Directorate under the title "HERTZ for BİLSEM Teachers: Communication, Education, and Radio Technologies Summit" project, which was supported under the TÜBİTAK 4005 Innovative Education Applications Support Program and carried out by the Samsun Atakum Science and Arts Center Directorate. The main objective of the Project is to enable teachers to experience the integration of communication technologies into education while increasing their technical knowledge in the fields of amateur radio, school clubs, basic equipment, radio communication, antenna systems, analog and digital communication principles, and radio frequency technologies in Türkiye. The training content includes theoretical explanations covering basic communication theory, radio wave propagation, antenna design parameters, satellite tracking, and amateur radio applications, as well as practical activities, electronic circuit designs, and field studies.

Introduction

Although wireless communication technologies form the backbone of the modern world, foundational education and awareness in this field generally remain limited to engineering-level instruction. However, communication technologies inherently integrate physics, electronics, mathematics, computer science, and space sciences, making them highly suitable for interdisciplinary learning environments. Particularly in the education of gifted students (K–12), these technologies offer substantial potential to foster inquiry-based learning, problem-solving skills, and hands-on experimentation.

This study presents the outcomes of the project titled "HERTZ: Communication, Education, and Radio Technologies Summit," supported under the TÜBİTAK 4005 Innovative Educational Practices Support Program. The project was designed to enhance the technical knowledge and applied skills of teachers working at Science and Art Centers (BİLSEM) across Türkiye in the fields of amateur radio and communication technologies. By combining theoretical instruction with practical applications, the program aimed to bridge the gap between advanced technological concepts and classroom implementation.

The primary objective of the study is to equip teachers with both theoretical understanding and practical competencies in areas such as radio wave propagation, antenna systems, satellite communication, radio frequency technologies, and basic electronic circuit design. Through experiential learning and hands-on activities, teachers are expected to transfer these competencies effectively to their students, promote STEM-oriented projects, and establish sustainable communication technology practices within their institutions.

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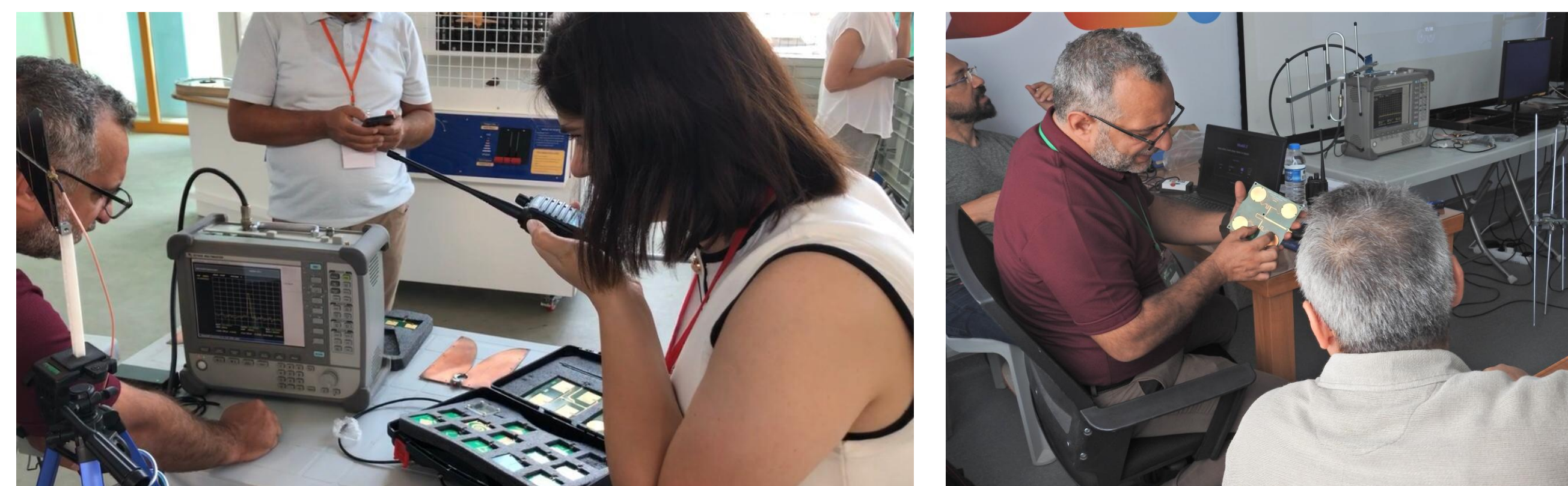
Method/Experiment

This study was designed as a teacher training model and was conducted under the coordination of Samsun Atakum Science and Art Center.

Participants: The study group consisted of 24 teachers working at Science and Art Centers (BİLSEM), which are public institutions affiliated with the Turkish Ministry of National Education and responsible for the education of gifted students. Participants were selected from different provinces across Türkiye and represented various subject areas, including Science, Physics, and Technology and Design.

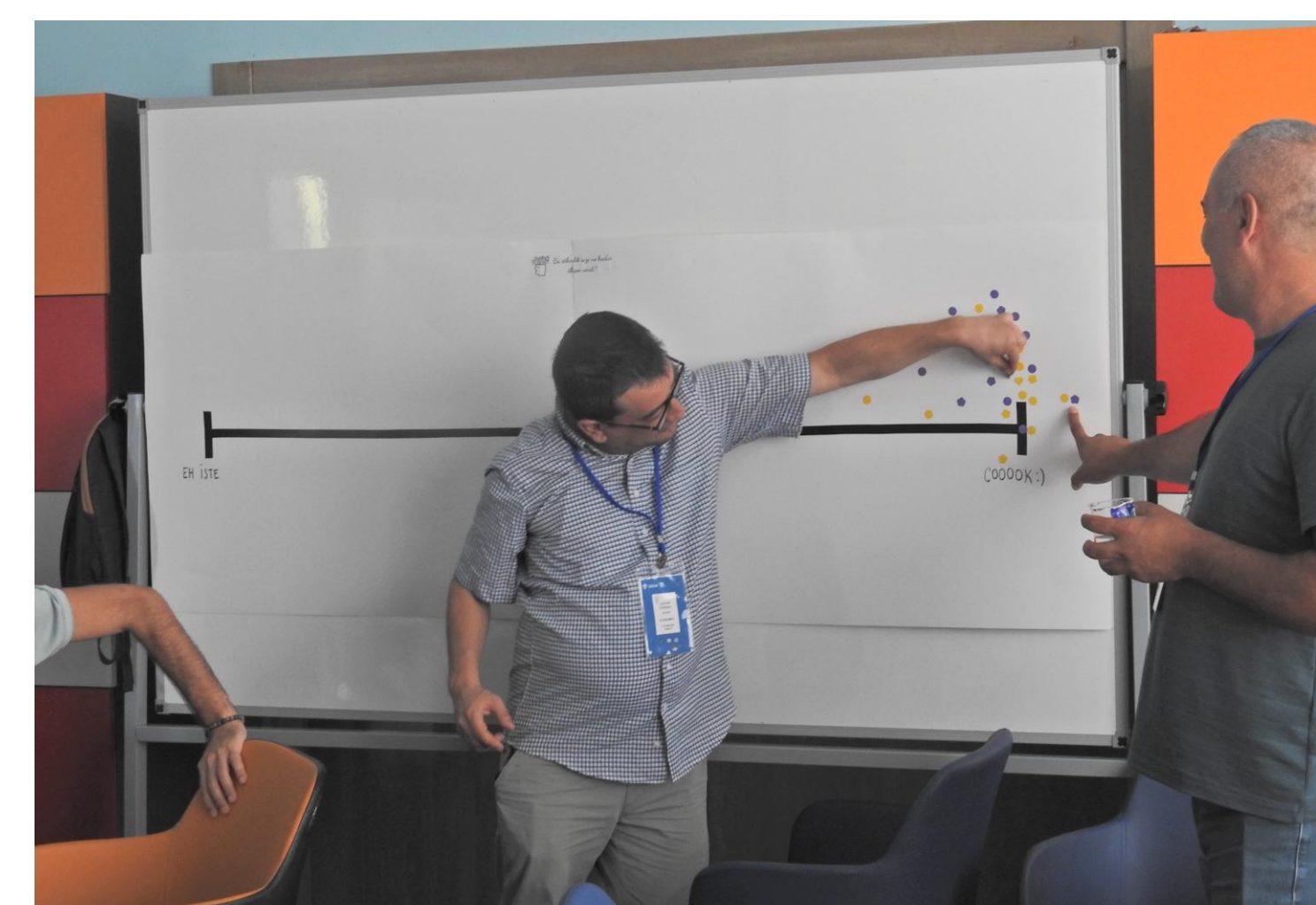
Training Process and Collaboration: The training program was carried out in cooperation with five different institutions and organizations. A team of 17 instructors, composed of expert academics and experienced amateur radio operators, implemented an intensive one-week program.

Implementation: The program was based on a "learning by doing and experiencing" approach. Theoretical lessons were integrated with laboratory activities and field studies, enabling participants to directly experience and apply communication technologies.



Data and Analysis

- Following each implementation activity, participants were asked to evaluate how inspiring they found the session.
- Responses were collected using a **visual sticker-based rating method**, where participants placed stickers on a prepared evaluation board reflecting their perceived level of inspiration.



The training program was built upon a series of hands-on, experiential learning modules designed to translate theoretical knowledge into practical skills:

Fox Hunting (ARDF): Practical field exercises in Amateur Radio Direction Finding to locate hidden transmitters.

SSTV (Slow Scan Television): Receiving and decoding images transmitted via radio frequencies.

Satellite Tracking: Observation and tracking of amateur radio satellites in real-time using Orbitron software.

Morse Code (CW) Practice: Hands-on communication exercises using Morse keys and decoding the Morse alphabet.

Radio Operating Protocols: Training on the correct usage of the international phonetic alphabet and standard Q-codes.

Antenna Construction: DIY workshops focused on building directional Yagi antennas for practical use.

Educational Integration: Developing strategies for implementing amateur radio in K-12 education and establishing school clubs.

This qualitative study employed structured reflection forms, instructor observations, focus groups, and evaluation reports. Data were analyzed through descriptive thematic analysis. The analysis revealed several key themes, including increased technical awareness in antenna systems and radio frequency (RF) technologies, development of practical skills in electronic circuit applications, strengthening of interdisciplinary teaching perspectives, increased motivation to establish amateur radio clubs in BİLSEM institutions, and a growing interest in developing STEM-based projects.

Conclusion

The HERTZ project has demonstrated that amateur radio is not merely a hobby, but a powerful interdisciplinary educational tool. This study demonstrates that the HERTZ training model has improved BİLSEM teachers' knowledge perception and practical competencies in the field of communication technologies.

- Participating teachers have improved their technical competencies in antenna design, radio frequency technologies, and electronic circuits.
- Teachers have gained the necessary skills and knowledge to establish "Amateur Radio Clubs" in their institutions and to develop STEM-based projects.
- As one of the first comprehensive training models in Türkiye focusing on communication technologies specifically for BİLSEM teachers, this model has established a reference framework for future space- and aviation-themed educational projects.

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